BEFORE THE 1 FLORIDA PUBLIC SERVICE COMMISSION 2 \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ 3 In the Matter of : DOCKET NO. 981591-EG 4 Petition for authority to : 5 implement Good Cents : Conversion Program by Gulf : 6 Power Company 7 \* 8 \* ELECTRONIC VERSIONS OF THIS TRANSCRIPT 9 \* ARE A CONVENIENCE COPY ONLY AND ARE NOT THE OFFICIAL TRANSCRIPT OF THE HEARING AND DO NOT INCLUDE PREFILED TESTIMONY. 10 11 12 PROCEEDINGS: 13 HEARING 14 COMMISSIONER J. TERRY DEASON BEFORE: COMMISSIONER SUSAN F. CLARK 15 COMMISSIONER E. LEON JACOBS, JR. 16 17 DATE : Tuesday, October 12, 1999 18 TIME: Commenced at 9:35 a.m. Concluded at 12:20 p.m. 19 Betty Easley Conference Center PLACE: 20 Room 148 4075 Esplanade Way Tallahassee, Florida 21 JOY KELLY, CSR, RPR 22 REPORTED BY: DOCUMENT NUMBER-DATE FPSC Chief, Bureau of Reporting 65 ည 23 (850) 413-6732 24 2738 25

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13	appearing on behalf of the Commission Staff.
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PROCEEDINGS 1 2 (Hearing convened at 9:35 a.m.) 3 COMMISSIONER DEASON: Call the hearing to order. Could I have the notice read, please? 4 5 MS. COLLINS: Pursuant to Notice issued September 15th, 1999, this time and place have been 6 7 set for public hearing in Docket 981591-EG, petition for authority to implement Good Cents Conversion 8 9 Program by Gulf Power Company. 10 COMMISSIONER DEASON: Thank you. Take 11 appearances. MR. BADDERS: Russell Badders and Jeffry 12 13 Stone of the law firm of Beggs & Lane, 3 West Garden 14 Street, Pensacola, Florida 32501, here on behalf of 15 Gulf Power Company. 16 MR. WATSON: Ansley Watson, Jr., Macfarlane, Ferguson and McMullen, Post Office Box 1531, Tampa, 17 Florida 33631, here for the intervenor, Peoples Gas 18 System. 19 20 MS. COLLINS: Tiffany Collins on behalf of the Commission Staff. 21 22 COMMISSIONER DEASON: Thank you. 23 II Preliminary matters, Ms. Collins. 24 MS. COLLINS: There's one pending motion, 25 Commissioner.

4

On September 7th, 1999, Peoples filed a 1 Motion to Strike portions of Mr. Ted Spangenberg's 2 testimony. I don't know if you want to address this 3 motion now. The appropriate time to address it would 4 probably would be when we get to the direct testimony 5 of Mr. Spangenberg. 6 7 COMMISSIONER DEASON: Was this matter 8 addressed at the prehearing conference? 9 MS. COLLINS: Yes, it was, Commissioner. MR. WATSON: It was noted that the motion 10 11 was pending but there was no ruling made. 12 COMMISSIONER DEASON: Okay. Is oral 13 argument contemplated on this matter? 14 MS. COLLINS: This is within the discretion 15 of the Commission. 16 COMMISSIONER DEASON: Commissioners, do you have a preference as to how we proceed? 17 18 COMMISSIONER CLARK: Did Gulf file in response to the Motion to Strike? 19 20 MR. BADDERS: Yes, we did. 21 COMMISSIONER DEASON: Are the parties 22 prepared to briefly argue this motion. 23 MR. BADDERS: We are. I am. 24 MR. WATSON: Yes. 25 COMMISSIONER DEASON: Okay. Does Staff have

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an objection to hearing argument at this time? 1 2 MS. COLLINS: No, Commissioner. MR. WATSON: This is my motion. I can 3 4 start. The grounds for the Motion to Strike 5 portions of Mr. Spangenberg's testimony is directed to 6 the testimony that appears beginning on Page 12 of his 7 direct testimony, Line 4, and running through the 8 sentence that ends on Line 4 on Page 13. 9 The grounds for People's motion are that the 10 testimony is irrelevant and immaterial, constitutes or 11 is based on hearsay. It contains conclusions of the 12 witness with respect to advertising and promotional 13 materials which the witness has not submitted as 14 exhibits, chose not to submit as an exhibit with his 15 Direct Testimony, in which the Commission and Peoples 16 17 are, therefore, unable to view for purposes of forming their own conclusions regarding the nature of that 18 19 advertising. We, therefore, deem it unduly prejudicial. 20 Relevant evidence is that which has a 21 tendency to prove or disprove any fact which is 22 relevant and material to the Commission's decision on 23 any issue in this docket. 24 Now, this docket was opened on Gulf's 25

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petition for approval of its proposed program for cost 1 recovery under the Conservation Cost Recovery Clause. 2 The program contains as one of its features an 3 4 incentive, or an allowance, to an eligible customer. 5 It's to the necessity for this incentive or allowance 6 that Mr. Spangenberg's testimony, to which our motion 7 is directed, goes. None of the issues identified by the parties in the Prehearing Order goes to either 8 9 whether Gulf needs an allowance to make its program work or to the level of the allowance that it has 10 11 chosen to put in the program.

12 Neither Peoples nor the Staff has raised either the necessity for or the level of the allowance 13 as an issue. If the Commission were to determine that 14 natural gas advertising in Gulf's service area was 15 false and/or misleading, as the witness's testimony 16 characterizes, would that finding have any relevance 17 whatsoever on the issues in this docket? Because the 18 19 primary ultimate issue is whether the program is 20 cost-effective, and whether it is consistent with FEECA. I think the answer to that is no. Therefore, 21 22 how ask the portion of Mr. Spangenberg's testimony, to which our Motion to Strike is directed, be deemed 23 relevant? 24

25

I would add to the grounds set forth in the

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1 motion initially that the record, since Gulf chose not 2 to offer the materials as exhibits, contains no 3 predicate for the witness's opinion on the material, 4 and I would, therefore, add the lack of a predicate as 5 a further ground for striking the testimony.

6 Gulf has responded to our motion that 7 Peoples can't complain of prejudice because it has the ads in its possession; that the materials are 8 9 discoverable; that they were publicly disseminated and that the Commission, Peoples and the Staff can ask 10 questions regarding the testimony and request that the 11 12 information be provided as an exhibit during the hearing. This does not mean that the witness's 13 14 statements, or the advertising to which the testimony refers, is relevant. 15

16 They argue, also, that no special skill, et cetera, is required for Mr. Spangenberg to render 17 18 an opinion on the materials. And even if that's true, 19 there's no predicate for that opinion. If Gulf wanted the witness to offer Gulf's opinion on the materials, 20 the witness should have at a minimum submitted the 21 22 materials as proposed exhibits at the time he filed his Direct Testimony. Having failed to do so, and 23 24 having failed even to submit the materials as exhibits 25 in his Rebuttal Testimony, I think the testimony

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1 should be stricken.

2 I would point out to the Commission that 3 there is absolutely no prejudice to Gulf in striking 4 the portion of the testimony that Peoples seeks to 5 have stricken. The remainder of the witness's answer, 6 to which our motion is not directed, will still convey to the Commission, even though we believe that also is 7 8 irrelevant, why Gulf felt the need to include a \$200 9 allowance in its program.

10 If the portion we seek to have stricken is 11 stricken, the question is why does Gulf Power believe 12 it is necessary to use incentive to encourage its customers to install energy-efficient electric heat 13 pumps? And the answers would be I feel the \$200 14 15 customer incentive that is an element of the Good Cents Conversion Program is needed in order to help 16 17 get the individual consumer's attention long enough for them to understand the energy saving and household 18 19 budget benefits from installing a highly efficient heat pump. 20

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.

1	COMMISSIONER DEASON: Thank you.
2	Mr. Badders.
3	MR. BADDERS: Thank you. Clearly, we
4	disagree with Mr. Watson's analysis. First and
5	foremost, this information is relevant. It is
6	relevant to Issues 1 and 2 which go to the
7	cost-effectiveness of this program. This incentive
8	and the level of the incentive are components of the
9	cost-effectiveness analysis.
10	This appears in the direct testimony of
11	Mr. Spangenberg. In that testimony he has to support
12	this program and the components of the program. That
13	is what he has done. Clearly you could stop where
14	Mr. Watson would like us to stop and just say we
15	believe it's necessary to overcome something in the
16	marketplace. That this incentive is necessry to
17	overcome something in marketplace. We've gone further
18	and we've explained the reason and what it is we are
19	overcoming in the marketplace with this incentive.
20	Clearly it is relevant to that topic and
21	it's something the Commission can consider and it can
22	weigh. There's no prejudice in this.
23	Staff and Peoples Gas can, and could have,
24	conducted discovery, asked what articles were in
25	question and cross examine the witness on that topic

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1	if they so chose. They did not. With full
2	opportunity they chose not to. They've made arguments
3	that this is hearsay and it's not admissible.
4	Clearly, in this proceeding, an administrative
5	proceeding, hearsay is admissible. We're not offering
6	this to prove that this is misleading or false
7	advertising. We're using this to show
8	COMMISSIONER CLARK: Well, it struck me that
9	that's what you said. You're saying here the
10	testimony has been impeded by false and deceptive
11	advertising about the benefits of it. And I took that
12	to mean that you wanted us to take as evidence that it
13	was false and it was deceptive, and, therefore, it is
14	offered for that purpose, not just for the purpose
15	that it was uttered.
16	MR. BADDERS: Our belief is that we needed
17	to have a reasonable belief that this was false; that
18	the utterances made were false.
19	COMMISSIONER CLARK: But you are offering it
20	for that purpose.
21	MR. BADDERS: Only as far as a reasonable
22	basis. We can be wrong. It's what our intent, what
23	our belief was at the time when we read this and what
24	affect it had on the testimony.
25	But continuing. We were offering this
1	1

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solely to show that the utterance was made, and that 1 2 based on that, our reasonable belief was that it was false. And as a result of that we have decided to use 3 4 an incentive at a certain level in this program. And 5 simply that is relevant. That is relevant to the cost-effectiveness in Issues 1 and 2. So we believe 6 7 that the Motion to Strike should be dismissed -- or denied. I apologize. 8 9 COMMISSIONER DEASON: Mr. Watson, anything 10 further? 11 MR. WATSON: I have nothing further. 12 COMMISSIONER DEASON: Questions, Commissioners? 13 14 COMMISSIONER JACOBS: The main weight of this testimony you would argue then does go to the 15 cost-effectiveness analysis? 16 MR. BADDERS: We do. Or at least -- the 17 existence of an incentive. This is the reason -- this 18 is the reason that we've used an incentive, or a 19 reason that we've used an incentive and the level of 20 incentive used. And that is an input into the 21 22 cost-effectiveness. 23 COMMISSIONER JACOBS: I can agree that the 24 issue offering the incentive certainly goes to that. 25 But it strikes me that the testimony would imply --

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1 and I would seek your response to this -- the 2 testimony would imply that the incentive is to 3 overcome public response, or receptance -- or 4 acceptance, of the false advertising. 5 MR. BADDERS: That is correct. 6 COMMISSIONER JACOBS: Well, how then -- you 7 understand my point. The weight of your testimony 8 seems to say that this incentive is not guided to 9 making this program more cost-effective, but on the 10 other hand, it's guided to overcoming a negative 11 public perception of this program. 12 MR. BADDERS: I quess two-fold. I mean it 13 does both. We've decided to use an incentive for that 14 reason. 15 COMMISSIONER CLARK: For what reason? 16 MR. BADDERS: For the reason that we believe there was false misleading advertising in the market. 17 18 That's our belief. Whether or not it is false or 19 misleading --20 COMMISSIONER CLARK: So you are offering it 21 for the purpose of showing it was false and 22 misleading. 23 MR. BADDERS: That we had a reasonable 24 belief that it was. Yes. 25 COMMISSIONER CLARK: I don't understand the

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difference there. Are you offering it to show that it 1 is false or deceptive or that you had a reasonable 2 3 belief that it was? 4 MR. BADDERS: The second; the latter. COMMISSIONER CLARK: How does that take it 5 out of hearsay and make it simply to show it was 6 7 uttered? MR. BADDERS: Okay. If we just showed that 8 the statement was made, that this utility was in the 9 market, that's only half of it. It's what we drew 10 from that; what conclusion we drew from the utterance 11 that was made. 12 COMMISSIONER CLARK: Okay. I'm confused as 13 to -- is there case law or other statute that, 14 therefore, makes it an exception to the hearsay? 15 MR. BADDERS: I believe these are admissions 16 by Peoples Gas, which would be an exception to the 17 hearsay rule. And also in an administrative 18 proceeding such as this, you are allowed to accept 19 hearsay. It just cannot be the sole basis for your 20 21 ruling on a specific point. 22 COMMISSIONER DEASON: Commissioners, I reviewed the motion and the response, and reviewed the 23 testimony, heard the argument here today. I'm 24 certainly willing to take any input and I'm prepared 25

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1 to rule on it.

2 **COMMISSIONER CLARK:** I'm prepared to live 3 with your ruling, but it strikes me that I don't see 4 the relevance of it, and --

COMMISSIONER DEASON: Well, I agree with 5 My concern is the relevancy. I'm not so much 6 you. 7 concerned about the hearsay argument or the fact there were no exhibits filed to accompany it, or the fact 8 9 that there's a question concerning the witness's ability to express the opinion. I'm not concerned 10 about that. I'm concerned about the relevancy to the 11 issues which are listed in the Prehearing Order and 12 for that reason I'm going to grant the motion in part 13 and deny the motion in part. I'm going to grant the 14 15 motion as it relates to testimony which begins on Page 12, Line 4, through Line 21 to the "comma," after 16 17 "marketplace." And then I would allow the response to 18 continue from that point forward. I think from that 19 point forward, the testimony is simply acknowledging that there are programs that are being provided by gas 20 utilities in this part of the state; that it does not 21 22 address whether there is or is not deceptive 23 advertising concerning those programs, which I think goes beyond the relevancy issues. 24

25

COMMISSIONER CLARK: I think so. So it

1 would be --

2	COMMISSIONER DEASON: The testimony that
3	would stand would begin with the word "most" on
4	Line 21, and would continue all the way all the way
5	to the answer, that would be allowed. What would be
6	stricken would be beginning on Line 4 and continuing
7	through Line 21 to the "comma" after "marketplace."
8	COMMISSIONER JACOBS: I concur.
9	COMMISSIONER CLARK: I do too.
10	COMMISSIONER DEASON: That matter has been
11	addressed. Are there other preliminary matters?
12	Mr. Badders, when you present this
13	witness I mean, this ruling has been made and I
14	would expect you to amend the testimony at that time.
15	MR. BADDERS: We will do so.
16	We have one other preliminary matter that we
17	have discussed with the other parties. It has to do
18	with the Order of Witnesses on rebuttal.
19	In reviewing the testimony, Mr. Spangenberg
20	was to precede or actually was to precede
21	Mr. Shell. In doing so, he would be discussing
22	matters that Mr. Shell will be raising in his
23	testimony, which seems to be out of order. After
24	discussing this with the parties it would be best for
25	us to do Mr. Shell first and then end with

Mr. Spangenberg, if there's no objection. 1 2 COMMISSIONER DEASON: Any objection. 3 MS. COLLINS: No objection. 4 MR. WATSON: No objection. 5 COMMISSIONER DEASON: Very well. Okay. 6 Other preliminary matters? 7 MS. COLLINS: No, Commissioner Deason. 8 COMMISSIONER DEASON: Were opening 9 statements contemplated at the prehearing? 10 MS. COLLINS: The parties are prepared to go 11 ahead. 12 COMMISSIONER DEASON: No opening statements 13 were requested. 14 MR. BADDERS: No. 15 COMMISSIONER DEASON: Very well. We will 16 proceed then directly to testimony. 17 All witnesses who are present and have prefiled testimony, please stand and raise your right 18 hand. 19 20 (Witnesses sworn collectively.) 21 MR. BADDERS: Gulf Power would like to call its first witness. Mr. Spangenberg, please take the 22 23 stand. 24 25

17

1	TED S. SPANGENBERG, JR.
2	was called as a witness on behalf of Gulf Power
3	Company and, having been duly sworn, testified as
4	follows:
5	DIRECT EXAMINATION
6	BY MR. BADDERS:
7	<b>Q</b> Please state your name and business address
8	for the record.
9	<b>A</b> My name is Ted Spangenberg. My business
10	address is Gulf Power Company, One Energy Place,
11	Pensacola, Florida.
12	<b>Q</b> Are you the same Ted Spangenberg who
13	prefiled 15 pages of Direct Testimony?
14	A Yes, I am.
15	${f Q}$ Have you also filed revised Pages 4, 5 and
16	10 for that prefiled testimony?
17	<b>A</b> Yes, sir, I have.
18	<b>Q</b> Do you have any changes or corrections to
19	that testimony as revised?
20	<b>A</b> None except for what the Commission just
21	ruled on.
22	<b>Q</b> Right. Please note for the record that
23	Page 12, Lines 4 through 21, has been struck from the
24	record.
25	A Yes.

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1	<b>Q</b> And on Line 21 that is only to the "comma"?
2	<b>A</b> That's correct.
3	<b>Q</b> If I were to ask you the same questions
4	today, would your answers be the same?
5	A Yes, they would.
6	MR. BADDERS: Commissioner Deason, we ask
7	that the prefiled testimony be inserted into the
8	record as though read.
9	COMMISSIONER DEASON: Without objection, it
10	shall be so inserted.
11	<b>Q</b> ( <b>By Mr. Badders</b> ) Mr. Spangenberg, did you
12	have one exhibit attached to your testimony?
13	A Yes, sir, I did.
14	<b>Q</b> And have you filed a revised Page 9 of 9 to
15	that testimony?
16	A Yes, I have.
17	<b>Q</b> Do you have any changes or corrections to
18	that exhibit as revised?
19	A Not as revised, no.
20	MR. BADDERS: We ask that that exhibit be
21	identified.
22	COMMISSIONER DEASON: It shall be identified
23	as Exhibit 1.
24	(Exhibit 1 marked for identification.)
25	

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1		GULF POWER COMPANY
2 3		Before the Florida Public Service Commission Direct Testimony of T. S. Spangenberg, Jr. Docket No. 981591-EG
4		Docket No. 981591-EG Date of Filing: July 22, 1999
5	Q.	Please state your name, business address, and
6		occupation.
7	Α.	My name is T. S. (Ted) Spangenberg, Jr. My business
8		address is One Energy Place, Pensacola, Florida
9		32520. I am employed by Gulf Power Company as its
10		Residential Marketing Manager.
11		
12	Q.	Please summarize your educational and professional
13		background.
14	Α.	I hold Bachelor's and Master's degrees in Electrical
15		Engineering from Auburn University. I have worked for
16		Gulf Power Company and its affiliates within the
17		Southern Company for the past 23 years. My experience
18		during that time frame includes positions and direct
19		work involvement in the areas of load research, market
20		research, demand forecasting, cogeneration, customer
21		service, line service, distribution field engineering,
22		transmission, executive administration, substation
23		engineering, and residential marketing. I am licensed
24		in several states, including Florida, as a Professional
25		Engineer.

í **i** 

1 Q. Do you have an exhibit to which you will refer in your testimony? 2 3 Α. Yes, I have an exhibit consisting of one schedule, 4 (TSS-1) which is a written description of the 5 GoodCents Conversion Program as filed with the Florida 6 Public Service Commission (the Commission) for 7 approval. This exhibit was prepared under my 8 supervision and direction. 9 10 Counsel: We ask that Mr. Spangenberg's 11 Schedule TSS-1 be marked as Exhibit \_\_\_\_\_. 12 13 14 Q. What is the purpose of your testimony in this 15 proceeding? 16 Α. The purpose of my testimony is to provide information 17 about Gulf Power Company's proposed GoodCents 18 Conversion Program (the Program) and to encourage the 19 Commission to approve it as a conservation program 20 eligible for cost recovery under the Energy 21 Conservation Cost Recovery (ECCR) mechanism as 22 provided by the Florida Energy Efficiency and 23 Conservation Act (FEECA). 24 25

2

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

3 The GoodCents Conversion program proposes the use of Α. cash incentives to encourage Gulf Power's residential 4 customers to replace old and inefficient electric air 5 conditioners and fossil-fueled combustion home heating 6 devices with new, efficient, electric heat pumps. 7 Customer participation in the Program will result in 8 reduced annual electrical energy consumption and 9 significantly reduced summer peak electric demand. 10 Further, participating customers will also benefit as 11 a result of significantly reducing the total energy 12 requirements of their home. Customers who make this 13 replacement under the Program would receive a \$200 14 cash incentive, with their heating, ventilation and 15 air conditioning (HVAC) dealer receiving a \$50 cash 16 The GoodCents Conversion name reflects 17 incentive. the nature of the program, which is intended to 18 encourage customers to convert from older, less 19 efficient equipment to new, more efficient equipment. 20 A more complete description of the elements of the 21 GoodCents Conversion Program is contained in Schedule 22 TSS-1. As noted in that exhibit, the expected change 23 in peak kilowatt demand at the meter is a reduction of 24 1.90 kW per participant and the expected change in 25

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. . .

Witness: T. S. Spangenberg, Jr.

Revised 08/25/99

annual electrical energy consumption is a reduction of 1 2 1,030 kWh at the meter. When the reduction in the 3 participant's natural gas requirements is included, the typical impact is the conservation of 33.7 million 4 Btu's of energy per year per participant at the meter. 5 6 Were any recognized methodologies used to assess the 7 Ο. 8 cost effectiveness of the GoodCents Conversion 9 Program? 10 Yes. The Commission has an established, approved Α. methodology for assessing the cost effectiveness of 11 energy conservation programs. This approved 12 methodology is described in the publication "Florida 13 Public Service Commission Cost Effectiveness Manual 14 for Demand Side Management Programs and Self-Service 15 16 Wheeling Proposals" adopted by the Commission in Rule 25-17.008, Florida Administrative Code. The approved 17 18 methodology was used in performing the assessments of the Program. The manual sets forth three critical 19 20 cost-effectiveness tests, the Ratepayer Impact Measure (RIM) Test, the Participant's Test, and the Total 21 Resource Cost (TRC) Test. In order to be cost-22 effective under any of these tests, a program must have 23 24 a benefits to cost ratio greater than 1.0. 25

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Witness: T. S. Spangenberg, Jr.

Revised 08/25/99

1 Using the approved methodology just described, is the Q. GoodCents Conversion Program cost effective? 2 As depicted in Schedule TSS-1, all three key 3 Α. Yes. measures were at least 1.00. In other words, the 4 GoodCents Conversion Program passes all three tests of 5 cost-effectiveness specified in the Commission's 6 manual on cost effectiveness of conservation programs. 7 8 Please describe the assumptions that have been 9 0. incorporated in the cost-effectiveness analysis for the 10 GoodCents Conversion Program. 11 The base home for modeling purposes is a 1680 square 12 Α. foot home with an inefficient central air conditioning 13 unit having an effective Seasonal Energy Efficiency 14 Ratio (SEER) of 7.0 and a central gas furnace with a 15 68% Annual Fuel Utilization Efficiency (AFUE). In 16 Gulf's assumptions, the entire existing heating and 17 cooling system has been removed and replaced with a 18 heat pump having a SEER of 11.0 and a Heating Season 19 20 Performance Factor (HSPF) of 7.4. 21 Are the assumptions incorporated in the cost-22 Ο. effectiveness analysis regarding summer peak demand, 23 winter peak demand and annual energy usage reasonable? 24

25 A. Yes. These cost effectiveness evaluations are the
 26 result of the aforementioned system assumptions input

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5

Witness: T. S. Spangenberg, Jr.

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.

7

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

The typical efficiency rating of the equipment to be 12 Α. replaced under this proposed program is 7.0 SEER. 13 In 14 order to qualify for the Program incentive, the 15 participant must install a heat pump with a rating of 16 at least 11.0 SEER. For the typical home, this yields a reduction of 2,933 kWh for the cooling season, with 17 an addition of 1,903 kWh for the home's heating needs. 18 The net result is an expected reduction in annual 19 electricity use of 1,030 kWh. This is in addition to 20 21 the conservation of 302 therms of natural gas that is also achieved. 22

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- 24
- 25

1 Q. What does FEECA require in terms of energy or demand impact and cost effectiveness in order for a program 2 to be considered a qualifying conservation program? 3 Α. Chapter 366.81, in its opening sentence, pronounces a 4 5 legislative finding that "it is critical to utilize the most efficient and cost-effective energy 6 conservation systems. . . ". It is obvious from the 7 electrical kWh and natural gas therm reductions just 8 cited that encouraging the conversion of existing 9 10 furnace and air conditioner combinations to new heat pumps promotes "the most efficient and cost-effective 11 conservation systems." Further, Chapter 366.81 states 12 that FEECA is to be "liberally construed" in order to 13 14 increase the "efficiency and cost-effectiveness of electricity and natural gas use." There are two 15 specific requirements in FEECA to which our Program 16 applies. These are (1) reducing and controlling the 17 18 growth rate of electric consumption; and (2) reducing the growth rate of weather-sensitive peak demand. 19 An electrical program that achieves either one of these 20 would qualify. The GoodCents Conversion Program 21 reduces annual kWh consumption and qualifies on that 22 count. It also reduces summer peak electric demand, 23 which is when Gulf Power's annual peak demand occurs, 24 so it would also qualify on that count. The proposed 25

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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.

- 6
- 7

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?

Absolutely. Any impact of this or any other Gulf 13 Α. 14 Power program on winter electrical demand is irrelevant as far as FEECA is concerned so long as the 15 16 summer demand is Gulf Power's weather-sensitive system peak demand. Gulf Power plans additional generating 17 resources on the basis of reserves at the time of 18 summer peak demand. While any program that can help 19 reduce the growth rate of annual energy consumption, 20 reduce weather-sensitive peak electrical demand or 21 reduce weather sensitive natural gas peak demand 22 brings added appeal, as long as one of these three 23 criteria is addressed, it satisfies the requirements 24 25 of FEECA.

1

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3	Q.	Is there any precedent before the Commission in which
4		a program has been approved for cost recovery under
5		the ECCR clause when there was not a reduction in more
6		than one criterion e.g. weather-sensitive peak
7		electrical demand and annual kWh?
8	A.	Yes, there is. Several utilities have received
9		approval for ECCR recovery load management programs
10		that reduce peak demand with no reduction in annual
11		energy consumption.
12		
13		
14	Q.	Was this program designed simply as a sales tool for
14 15	Q.	Was this program designed simply as a sales tool for competing against natural gas?
	Q. A.	
15		competing against natural gas?
15 16		competing against natural gas? No, it was not. Gulf Power Company has a long history
15 16 17		competing against natural gas? No, it was not. Gulf Power Company has a long history of pioneering efforts to help customers conserve
15 16 17 18		competing against natural gas? 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
15 16 17 18 19		competing against natural gas? 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
15 16 17 18 19 20		competing against natural gas? 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
15 16 17 18 19 20 21		competing against natural gas? 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
15 16 17 18 19 20 21 21 22		competing against natural gas? 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

electrical demand, the use of promotional incentives 1 was considered because those seem to be one of the 2 most effective tools in today's marketplace for 3 encouraging consumer action. However, the company 4 5 wanted to ensure that all promotional offerings to customers were cost-effective. In all our 6 considerations for potential HVAC upgrade programs, 7 with the natural exception of our geothermal 8 initiatives, we assumed that the cooling aspect of 9 existing and replacement systems would be the 10 traditional refrigerant cycle with air-to-air heat 11 exchange. For the heating cycle we analyzed electric 12 resistance heat, gas furnaces, and air-to-air heat 13 pumps. While knowing that 7.0 SEER was a good average 14 15 for existing systems, we also considered higher SEER's, i.e. newer equipment, for the system being replaced, 16 realizing that the higher SEER's would make the cost-17 effectiveness tests more difficult to pass. The 18 company did everything reasonable to ensure rigor in 19 its analyses. The cost effectiveness tests results for 20 these other variations are shown in Schedule TSS-1 and 21 indicate that the only combination that passed the 22 necessary cost-effectiveness tests was going from a gas 23 furnace, regardless of equipment vintage, to a heat 24 In short, an attempt was made to include the 25 pump.

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Witness: T. S. Spangenberg, Jr.

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.

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

In fact the Commission has approved electric 13 Α. Yes. 14 replacement programs for ECCR treatment for natural gas distributors that provide significant cash rebates to 15 participants only if they are replacing electric 16 heating equipment with natural gas equipment. Given 17 this established practice of the Commission, the 18 company sees no reason why the GoodCents Conversion 19 program should not also be approved. The Program as 20 proposed results in cost-effective conservation by 21 reducing the growth rates of weather-sensitive peak 22 electrical demand and electric consumption. 23

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24 25 . . . . .

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1	Q.	Why does Gulf Power believe it is necessary to use
2		incentives to encourage its customers to install
3		energy-efficient, electric heat pumps?
4	Α.	The decision to install a high efficiency heat pump.
5		either as a replacement to an elder heat pump er as a
6		replacement to a gas furnace bas been impeded by false
7		and/or deceptive advertising about the benefits of
8		natural gas was in Northwest Florida. This use of
9		advortiging and promotional materials has confused
10		consumons by portraying the operating costs of heat
11		pumps using national average heat pump efficiencies,
12		national average electricity costs and national average
13		natural gas costs Typically, the above mentioned
14		advertising and promotional materials falsely portray
15		registance heating officiencies as typical electrical
16		beating officiencies, and/er-base cost comparisons on
17		Btu's entering the home without consideration for heat
18		transfor equipment officiencies, which must be
19		considered in determining what customers will actually
20		pay. In addition to the presence of such false and/or
21		deceptive advertising in the marketplace most gas
22		distributors in Northwest Florida have been providing
23		cash incentives to consumers to replace heat pumps with
24		gas furnaces. The costs of these incentives and the
25		associated advertising are passed directly through to

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1 the general body of customers either through the ECCR 2 mechanism or through rates that are not subject to review and approval by the Florida Public Service 3 Commission. I feel the \$200 customer incentive that is 4 5 an element of the GoodCents Conversion Program is needed in order to help get the individual consumer's 6 attention long enough for them to understand the 7 energy saving and household budget benefits of 8 installing a highly efficient heat pump. 9

10

As a rule, are customers likely to replace existing 11 Q. 12 inefficient HVAC equipment only when it fails? 13 No. The best quantitative data available for Northwest Α. Florida on this issue is from a mid-1980's study of 14 15 over 400 consumers who changed out their HVAC systems to heat pumps. Only 27.3% of those consumers gave 16 "needed major repairs" as the reason for replacing 17 18 their system. Other predominant reasons given included "operating cost too high"-18.2% and "rebate"-19.9%. 19 20 Regardless of how likely consumers are to replace their equipment only when it fails absent a rebate or other 21 promotional incentive, they are much less likely to 22 23 replace it only for that reason when an effective incentive is available, such as the one included in our 24 proposed Program. I believe the earlier 73.7% finding 25

for replacing a system for reasons other than failure
 is generally representative of what could be expected
 with our proposed Program.

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6 Q. Do you believe the Commission should approve this7 program for ECCR treatment?

Since this program, as demonstrated through the 8 Α. Yes. 9 RIM test, provides benefits to all ratepayers, the ECCR funding mechanism provides a means for those ratepayers 10 to financially contribute to its success. Absent ECCR, 11 while it might remain cost-effective from a ratepayer 12 13 perspective, the delay in a positive impact on the company's financial earnings and stockholder benefits 14 make the program a difficult proposition for moving 15 ahead under normal cost recovery mechanisms. 16 17 This Program reduces peak summer electrical demand, reduces annual kWh consumption, and is cost-effective 18 19 under the RIM Test, Participant Test, and TRC Test. The GoodCents Conversion Program promotes energy-20 efficiency and reduces Florida's dependence on outside 21 energy sources, all consistent with FEECA and good 22 public policy. As an unintended benefit, it also 23 reduces weather-sensitive peak natural gas demand. 24 Because of the intended, expected results and the 25

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1		consistency with past practice, I believe the
2		Commission should approve this Program.
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4		
5	Q.	Does this conclude your testimony?
6	Α.	Yes.
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Q(By Mr. Badders)Mr. Spangenberg, please2summarize 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 8 that pays the customer a \$200 cash rebate as an 9 incentive to replace their older, inefficient 10 combustion heating equipment with a heat pump having a 11 minimum efficiency of 11.0 seasonal energy-efficiency 12 ratio or SEER. The results of the analysis of that 13 program are shown as the base case on the chart we're 14 15 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.

23 With the added benefit of a reduction in 24 natural gas consumption, the state of Florida will 25 experience at the meter energy conservation of over

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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 prequisite 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.

14 We believe the Commission should approve 15 this program and it's cost recovery under the 16 authority provided by the Florida Energy Efficiency and Conservation Act, or FEECA. In passing FEECA, the 17 Florida Legislature found it critical for our citizens 18 to utilize the most efficient and cost-effective 19 energy systems available. The legislature also 20 declared that FEECA should be liberally construed in 21 22 order to meet the complex energy problems that are 23 faced by our state. This program promotes the most 24 efficient HVAC technology, while meeting the umbrella 25 requirement of FEECA that programs be cost-effective.

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1	I'm not aware of any single program that has
2	been approved or could be proposed to address all of
3	the aims of FEECA. Rather, to be a valid program need
4	address only one of the aims. The program that Gulf
5	Power has proposed clearly addresses multiple aims of
6	FEECA of reducing electric consumption, reducing
7	weather-sensitive peak demand, increasing the
8	efficiency of electricity use and increasing the
9	efficiency of natural gas use.
10	Gulf Power's proposed program will provide
11	the consumers with desperately needed credible
12	information about the efficiency and benefits of
13	today's high efficiency heat pumps. It will achieve
14	stated aims of FEECA, while meeting the
15	cost-effectiveness requirement. This program should
16	be approved by the Commission.
17	MR. BADDERS: Commissioner Deason, we tender
18	this witness for cross examination.
19	COMMISSIONER DEASON: Mr. Watson.
20	CROSS EXAMINATION
21	BY MR. WATSON:
22	<b>Q</b> Good morning, Mr. Spangenberg.
23	A Good morning.
24	<b>Q</b> Before I get into some of my other
25	questions, let me go to one that remains after the

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ruling on the Motion to Strike. If you could look at 1 2 Page 12 of your direct testimony, on Line 21, the sentence that now reads "most gas distributors in 3 Northwest Florida have been providing cash incentives 4 5 to consumers to replace heat pumps with gas furnaces." 6 Could you identify for us which gas distributors in 7 Northwest Florida would be providing those types of incentives? 8

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

16 Q But Peoples' program would not actually 17 provide an incentive to replace an existing heat pump 18 with a gas furnace?

19 A Not an existing one, no. It pays to 20 displace a new one that otherwise would have been put 21 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?

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1	<b>A</b> Yes, sir, 11 SEER or higher.
2	${f Q}$ And that is what you refer to as your base
3	case?
4	<b>A</b> Yes, sir, that's correct.
5	${f Q}$ On what data does Gulf base its estimate
6	that the cooling equipment that will be replaced with
7	have a SEER of 7?
8	<b>A</b> It's on the data of looking at the vintage
9	of heat pumps, particularly those that were being
10	installed ten to 15 years ago, and looking at what the
11	minimum energy efficiency requirements were in that
12	market in that time frame. We can also look at
13	equipment that's coming out, based on existing
14	programs, even heat pumps, old heat pumps, and looking
15	at the SEER ratings on those old heat pumps that are
16	being replaced with the new heat pumps, and get a feel
17	for the typical efficiencies in the marketplace.
18	${f Q}$ Now, if this program is successful, what is
19	the average SEER of the replacement heat pump that
20	Gulf expects to be installed in lieu of the equipment
21	removed?
22	<b>A</b> Under this program, which requires a minimum
23	11 SEER, which is higher than what's required under
24	anything else, what we found, and particularly in
25	1998, was that the average heat pump that went in that
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1 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
9 past and current efforts to get customers to replace
10 existing HVAC equipment with heat pumps?

11 Particularly replacement, there hasn't been Α 12 a lot of history in terms of replacement. We have often encouraged them through things like our Good 13 14 Cents Home Program which is really more addressed at 15 new home construction, and also as we perform energy 16 audits and assist customers with what their energy 17 needs are. We always encourage them to put in a 18 higher efficiency system than what might be the 19 normal. So while there's no name for those programs, 20 our typical programs or our general programs assisting 21 customers and installing efficiency would help push 22 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?

Basically this current program would -- the 1 Α 2 biggest difference would be a cash incentive. We're not currently offering cash incentives in the 3 marketplace to a consumer to get them to make the 4 5 conversion. And what we found is a lot of apathy on the part of consumers about higher efficiency 6 7 equipment. We found misinformation in the marketplace about the efficiency of a heat pump and the energy 8 benefits of a heat pump. And so this program, it's 9 10 more aggressive in trying to promote energy 11 efficiency, and the aid of that comes with the \$200 12 rebate that we provided as part of this program. 13 Q Well, now if the average SEER of the heat pumps of 11 SEER or higher that Gulf installed in 1998 14 15 due to its past and current efforts was 12.8, why does the conversion program specify a SEER of only 11? 16 17 Because you have to pick some frame of Α reference in which -- becomes the minimum. 18 And 19 anytime you set a minimum, the average of those that 20 are installed above that minimum, the average is always going higher than the minimum because the 21 22 minimum is the entry point. If we had picked all heat 23 pumps installed in our customers' homes this year, 24 1998, you'd certainly have a SEER that's a good bit 25 lower than 12.8. So you always have to pick a

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minimum. We picked 11 because it was higher than the 1 minimum which you can find in the marketplace, which 2 is typically at 10. And it gave us a starting point. 3 It allowed the program to be as inclusive as possible 4 and really got us past the hump of so many people just 5 putting in the minimum requirement of a 10. 6 And the minimum SEER for a heat pump today 7 0 8 under the Building Code is a 10? Yes, sir, for new construction, that's 9 Α correct, is a 10. 10 COMMISSIONER DEASON: I'm sorry, for what 11 12 type of construction? 13 WITNESS SPANGENBERG: New construction. 14 COMMISSIONER CLARK: Let me ask you a question then. You have centers where you sell 15 appliances, don't you? And do you sell heat pumps? 16 WITNESS SPANGENBERG: Commissioner, we do as 17 appliance sales floors. We do not sell what you'd 18 19 call unitary equipment or whole-house central heat pump equipment. We sell some window units, but none 20 that are -- heat pumps that are contemplated by this 21 program. 2.2 COMMISSIONER CLARK: Tell me this: Are you 23 finding in the secondary market that units of less 24 25 than a 10 SEER rating are even available?

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1	WITNESS SPANGENBERG: There are some that
2	are available but they are not predominant.
3	Commissioner, it's my understanding if I
4	remember correctly now there is available units
5	less than 10 but typically those are foreign
6	manufactured and brought into the country. Or you can
7	find some experienced units that might be where
8	someone is remodeling a home and they take out an old
9	two-ton unit that might have been a few years old,
10	maybe a 9 SEER, still has a lot of life left on it,
11	but the customer now needs a larger unit. And they
12	may work with that HVAC dealer to now put in a larger
13	unit, 3 ton unit. The dealer now has a 9 SEER unit
14	that still has a lot of life in it. And there's
15	nothing to preclude that dealer from then reselling it
16	to another customer as long as they clarify that it's
17	an experienced unit.
18	But we find very little of that. I'll tell
19	you that 99% of the units that go in are 10 SEER or
20	higher. But we have a huge block that are in that 10
21	to 11 SEER. That's where the predominant SEER ratings
22	of the air conditioner are, are between 10 and 11.
23	You have a lot that just meet that minimum 10 and
24	that's it. That's as far as they'll go.
25	Q (By Mr. Watson) You must have looked at

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all of the heat pumps installed by your customers in 1 1998 to come up with the 843 that were 11 SEER or 2 higher. What was the total number of heat pumps 3 4 installed by Gulf's customers in 1998? Let me see if I have that. The ones we were 5 Α 6 able to track I know were several thousand in the 7 replacement market. That would not include the new 8 market. I guess I could total those up here also, if 9 you'll give me just a moment. (Pause) 10 I know we tracked over 2000 that were 11 actually installed. And keep in mind that 12 particularly -- and that's just in the existing market -- there were another 8,000 -- excuse me, 6,000 13 installed in the new market. There would have been 14 15 many, many others installed in the existing market that we would not have been aware of because we didn't 16 17 -- you know, didn't have any involvement with the 18 dealer on those particular ones and they went in as 10 SEER units so we would not have been as interested in 19 20 tracking them because they were not higher efficiency 21 units. 22 Q So the 843 that were 11 SEER or higher would 23 have come out of the 2000 replacement units that you 24 knew about? 25 Α That's correct.

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Did Gulf make any study of the customers in 1 0 1998 who replaced existing equipment with a heat pump 2 to determine why they decided to change out their 3 equipment? 4 5 Α No, sir, we did not; not in 1998. Have you made a study since then? 6 Q None since then, no, sir. 7 Α 8 Q You use in your base case a cost of \$3,000 for the replacement heat pump? 9 10 Α Yes, sir, that's correct. Excuse me, that's not replacement heat pump. It's the heat pump that 11 replaces the gas furnace, just so we understand it's 12 the conversion. 13 Gas furnace and central air conditioning. 14 0 Α 15 Yes. Peoples asked in a interrogatory for an 16 Q itemization of all costs comprising \$3,000 initial 17 heat pump used by Gulf in its analysis. And I believe 18 your response was that no such itemization was 19 available? 20 That's correct. We do not have a 21 Α itemization available. 22 Okay. Can you itemize all of the costs 23 Q comprising the \$1300 cost that you use in one of the 24 calculations you made in going from a SEER 10 to a 25

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1 SEER 11?

2	<b>A</b> No, sir, I cannot itemize that. But both of
3	those numbers were based on contacts with an HVAC
4	dealers in terms of quoting a lump sum bid for making
5	the changeout rather than get an itemization. It's
6	unusual working with HVAC dealer for them to provide
7	an itemization of everything. What the customer is
8	looking for is what my total cost is going to be. And
9	so as we talked with HVAC dealers, we asked them about
10	both scenarios.
11	One is to do a replacement of a gas furnace
12	to a heat pump. Then we asked them, let's look at the
13	cost of going from a gas furnace to a new unit, a 10
14	SEER air conditioner with a new gas furnace, and then
15	look at the cost difference, the incremental cost
16	difference to then instead of doing that, how much
17	more would it then cost you to go to a new 11 SEER
18	heat pump and that's where the \$1300 came from.
19	<b>Q</b> Now, if you look at why would the
20	customer in that example already by upgrading to a 10
21	SEER straight air and gas furnace combination?
22	<b>A</b> It could be a variety of reasons. Either
23	their old equipment had failed or they were
24	dissatisfied with the efficiency of their old
25	equipment. They wanted to or were perhaps
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remodeling their home, and -- by the way, the failure 1 could have been from either the unit becoming too old 2 or it could have been struck by lightning, or their 3 teenage daughter or son could have backed into it with 4 5 the family car. You get a variety of reasons why the customers may be changing out their equipment. 6 7 Right. And on the chart that you handed out 0 during your testimony, the 10 to 11 case would be 8 optional base case Nos. 4 and 6 -- excuse me, 4 and 5? 9 10 Α The one that would be most relevant, yes, 11 would be No. 4. 12 0 What would the actual cost to the customer 13 be of installing the 11 SEER heat pump? 14 Α Compared to what? 15 Compared to the \$1300 that you use in your 0 analysis on that case? 16 The actual cost to install it would be 17 Α higher than the 1300. It would probably -- it be the 18 \$3,000, on average. 19 20 Now, are the sensitivities in these studies Q for the change from 10 to 11 SEER, they are shown on 21 your exhibit TSS-1, or Exhibit 1, as well as in base 22 cases 4 and 5 on the sheet you handed out. Are these 23 the only ones were the assumption is that the customer 24 would already being replacing existing equipment 25

1 because of its mechanical failure?

2	<b>A</b> Well, again, there might be other reasons to
3	replace it other than mechanical failure. But I
4	believe Nos. 4 and 5 would be the only ones where they
5	were replacing a gas furnace, or a gas-fired old
6	system, with a new heating system. And, again, for
7	those we used the \$1300 because that's the incremental
8	cost they would now have to now pay, just like we only
9	claim the incremental benefits of putting in that
10	unit.
11	<b>Q</b> What if they had changed for other reasons,
12	would you still use only the incremental benefit? Or
13	doesn't excuse me, the incremental cost. Doesn't
14	using the incremental cost assume that the equipment
15	has failed and they would have to replace it anyway?
16	<b>A</b> Yes. Because that's the scenario that we
17	were asked to analyze in No. 4 and 5. We would say
18	okay, what if the customer is going to be changing
19	their equipment anyway? How much then what is the
20	cost-effectiveness at that point?
21	And so we did this analysis at the
22	request or the suggestion of Commission Staff
23	before we ever filed our program to say, okay, let's
24	look at the scenario of going from a 10 to 11. Let's
25	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?

8 Α No. 1, of course, assumes that they are 9 changing out their equipment. You're taking the total 10 cost -- on the base case, going from the total cost of going from their existing equipment to the new heat 11 pump. No. 6, 7, 9 and 11 would be the same thing. 12 No. 13 is a little bit different in that it assumes 13 that they would otherwise have only gone to a -- they 14 are doing a changeout anyway, that for some reason 15 16 they decided to change out their equipment. But absent this program, they would have only put in a 10 17 SEER heat pump. And so No. 13 assumes that, okay. 18 Let's get them to upgrade. Let's look at the 19 20 situation. Where instead of going with a new 10 SEER 21 heat pump they now go in with an 11 SEER heat pump. And we looked at the incremental cost of that and the 22 incremental benefit in terms of conservation that you 23 24 get out of that.

25 Q Is 13 one of the scenarios that is

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summarized on your Late-filed Exhibit 1 to your 1 deposition? 2 I'll have to look there for a moment and 3 Α see. 4 5 Q Or is it something we've never seen? (Pause) 6 7 I believe it is No. 13 on the late-filed Α exhibit, yes. 8 But the assumption on cases 5 and 6 -- 4 and 9 Q 10 5 on your handout are that the customer's equipment 11 has failed so he's got to replace it anyway? 12 Α No, sir. It's not that the equipment has failed. It's that they were going to replace it 13 14 anyway. The replacement would otherwise have been a new gas furnace and a new air conditioner with a 10 15 SEER. And then our analysis says what would it take 16 for us to get them to upgrade to a more efficient 17 system? 18 Now, that is the \$1300 cost. In all of the 19 Q other cases you used a cost of \$3,000? 20 No, sir, we do not. On the late-filed 21 Α 22 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 23 I we only used 150. 24 25 Okay. But in your base case, the program as Q

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1 originally filed, going from 7 to 11, what is the 2 assumption regarding why the customer is replacing his 3 equipment used in that case?

The base case doesn't really look at why 4 Α they are changing it out except that we know that the 5 program is designed to encourage them to make a 6 7 changeout, to encourage them to go to more efficient 8 equipment. Therefore, we presumed that they would not 9 otherwise immediately be replacing their equipment. 10 Therefore, you pay them a rebate. You encourage them to make a change and you take the full cost of going 11 from the existing equipment to the new equipment. 12 Would you consider those who were going to 13 Q replace their equipment anyway free riders? 14 Only if -- I guess no, sir, I would not. 15 Α 16 Because most of them who are going to replace their equipment anyway only go to 10 SEER equipment. 17 In this case our program requires them to go to 11 SEER 18 equipment. 19 20 What do you consider to be the typical life 0

21 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.

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What is the assumed life of Gulf's avoided 1 0 generating unit using calculating the demand reduction 2 benefits in the cost-effectiveness analysis in your 3 base case? 4 5 Α 30 years. I recognize you don't agree with it, but 6 Q what does the information published by ASHRAE, 7 submitted as an exhibit by Mr. McCormick, indicate is 8 the average life of an air conditioner? 9 10 Α I believe it indicates 15 years. 11 What's your position with respect to the 0 12 average life of this type of equipment? It's certainly much more than 15 years. 13 Α It depends on whether you're talking equipment that was 14 installed ten to 15 years ago or equipment being 15 replaced today. Typically we see something in excess 16 of 20 years and, I believe, in Mr. Shell's testimony 17 we come to a very valid conclusion of 22 years 18 where -- the equipment that our program targets. 19 20 But it would be less than 30 years? Q Yes, sir, it would. 21 Α 22 COMMISSIONER CLARK: And the reason -- but you use 30 years in the cost-effectiveness test? What 23 do you use 30 years for? 24 25 WITNESS SPANGENBERG: Commissioner, we use

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1	that because that is our planning horizon for new
2	generation. And the reason it's still valid to use 30
3	years even though you're putting in equipment that may
4	last only 22 or 24 years is because once a consumer
5	has decided to go with high efficiency equipment, they
6	tend to enjoy the economic benefits of that. What we
7	find is that when that equipment will ultimately fail,
8	they'll go back in with high efficiency equipment. So
9	you could almost say we've perpetually won that
10	consumer over. And so what we see being replaced in
11	is more high efficiency equipment without us you
12	know, unless there's some rebate program in place
13	then, you don't have any additional cost of that.
14	COMMISSIONER CLARK: While I've interrupted,
15	Mr. Watson, your estimate of 33.7 million Btus
16	conserved with this proposed program, how did you come
17	up with that number?
18	WITNESS SPANGENBERG: Okay. What you do is
19	you take all of the electricity that has been
20	conserved, basically the 1030 kilowatt-hours.
21	COMMISSIONER CLARK: Is that per unit or
22	WITNESS SPANGENBERG: Yes, ma'am, that is
23	per participant.
24	COMMISSIONER CLARK: And how many
25	participants do you project, say, for each year of the

1 first three years of the program?

2	WITNESS SPANGENBERG: In our program filing
3	we used as a model a thousand units. We don't know
4	whether that will be somewhere between 500 and 2000.
5	I'd like for it to be 2,000 because we want to get
6	that many. But let me make sure and add that the 33.7
7	million Btus includes the Btu savings we get out of
8	the gas reductions, because you get tremendous gas
9	reductions.
10	COMMISSIONER CLARK: Let me ask you this
11	then. Is that a thousand in addition to the 843 you
12	experienced in the one year you looked at, or does
13	that include the 843?
14	WITNESS SPANGENBERG: Most of that would be
15	additional. Let me clarify the 843.
16	The 843, Commissioner, would have included
17	units that went from a old heat pump to a new heat
18	pump. So most of those would not have been
19	conversions. In fact, if I recall, I think only about
20	300 of those were conversions. Most of those were
21	replacing an old heat pump with a new heat pump.
22	COMMISSIONER CLARK: Okay.
23	WITNESS SPANGENBERG: But it gave us a
24	population in which to assess how much of high
25	efficiency is going in now.

1 COMMISSIONER CLARK: Let me just understand 2 that. So only about 300 of those would have been eligible for this program. 3 4 WITNESS SPANGENBERG: That's correct. 5 COMMISSIONER CLARK: Okay. And when you 6 made your assumptions on savings, did you assume that 7 300 would continue to be made without any incentives? WITNESS SPANGENBERG: We assumed that, in 8 9 fact, those become free riders. And I have to tell 10 you it's really less than --COMMISSIONER CLARK: 11 I'm sorry. They would become free riders? 12 13 WITNESS SPANGENBERG: Yes, ma'am. Because 14 how do you track -- you have no way of knowing what 15 customers would have otherwise, you know, made a 16 conversion and otherwise gone to high efficiency heat 17 pump. And I need to clarify that the 300 is the total 18 number of customers that we track that converted from 19 a gas furnace to a heat pump. Not all of those were 20 high efficiency. In fact, I don't think I have the 21 data on how many of those were 11 SEER or higher. I 22 don't think we just cut the data that way. But you 23 would have had less than 200 of those that were high 24 efficiency and would have qualified for this program. 25 COMMISSIONER CLARK: I'm confused then. Are

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you saying you have not adjusted your data for free 1 riders; you haven't, in effect, subtracted them out 2 because they would have done it anyway. 3 WITNESS SPANGENBERG: That's correct. 4 5 COMMISSIONER CLARK: You've made no assumption on that. 6 7 WITNESS SPANGENBERG: We've not made any assumption. We did make a calculation what if there 8 were as much as 25% free riders. And, of course, we 9 10 believe that's a high number, particularly if I look 11 at less than 150 in 1998 who did it compared to the 2000 upgrades or heat pumps that went in that we know 12 about. And if you look --13 COMMISSIONER CLARK: You've just confused 14 15 me. 16 WITNESS SPANGENBERG: I'm sorry. COMMISSIONER CLARK: Is it 300 or 150? 17 WITNESS SPANGENBERG: It's 150 or less that 18 were actually conversions. 19 COMMISSIONER CLARK: Out of the 843? 20 21 WITNESS SPANGENBERG: Yes, out of the 843 22 that were conversions to high efficiency equipment. And I guess --23 24 COMMISSIONER CLARK: And you're saying the other 150 that converted was not to high efficiency? 25

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WITNESS SPANGENBERG: That's correct. 1 Thev went with the straight 10 SEER equipment. 2 3 But we did file in, I guess, in our Late-filed Exhibit Option No. 1, and unfortunately 4 5 it's not on our big chart here -- but Option No. 1 did take an assumption of 25% free riders, which we felt 6 7 like was conservative. We didn't think it would ever get that high to make sure the program was still 8 cost-effective for our ratepayers if we were to have 9 10 that much free ridership, and the program did still have a very positive, very good RIM of 1.59, even with 11 12 25% free riders. COMMISSIONER CLARK: Okay. Thank you. 13 (By Mr. Watson) Let me follow up before I 14 Q get back to where I was going on something 15 Commissioner Clark mentioned that I think you brought 16 out in your summary. 17 18 In your summary you stated that this program increases the efficiency of natural gas use; is that 19 not correct? 20 Yes, sir, I did. 21 Α What it really does is it eliminates natural 22 0 gas use in a gas combustion furnace? 23 24 Α Yes, sir, it does. I consider that optimum efficiency. 25

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As I understand it, the Commission's rule 1 0 25-17.008, the rule that adopts the cost-effectiveness 2 3 manual spelling out the RIM, TRC and Participant's 4 Test. Are you familiar with that rule? 5 Yes, sir, I am. Α 6 My understanding is that that rule applies Q to all electric utilities whenever an evaluation of a 7 cost-effective new demand-side management program is 8 9 required? 10 Α That sounds right, yes, sir. 11 And if you look at the -- either the Order 0 12 adopting the rule -- and I can give this to you -- but 13 basically in calculating demand reduction benefits for a cost-effectiveness analysis performed under the rule 14 and under the manual, there's a requirement that the 15 normal revenue requirements method is used except in 16 the case where the life of the program is shorter than 17 the life of the avoided unit. And in that case both 18 19 the revenue requirements method and the value of deferral method are to be used. 20 How did Gulf calculate the demand reduction 21 22 benefits in its cost-effectiveness analysis for this 23 program? 24 I suspect, and I don't WITNESS SPANGENBERG: 25 know that I can get a specific citation -- I suspect

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1	we use that normal revenue requirements methods I
2	believe I'm correct in saying that's where the FIRE
3	model is built around. And in that case we believe
4	that's very appropriate because while we don't plan to
5	continue paying rebates forever as you see in our
6	program filing, the benefits of this program will
7	continue on for the full 30 years, so, in effect, the
8	program is still in place because you're still getting
9	the benefits of the program.
10	<b>Q</b> But did you also calculate the
11	cost-effectiveness analysis on a value of deferral
12	basis?
13	<b>A</b> I'm not sure whether we did or not. Again,
14	I'm not the expert in what the internals of the FIRE
15	model I know that it's a model we've used with this
16	Commission on many occasions, and has been thoroughly
17	reviewed, but I don't recall right now.
18	${f Q}$ All right. This gets back to a question
19	that Commissioner Clark asked you. On Page 10 of your
20	Direct Testimony, at Lines 3 to 7, you state that
21	leaving a gas furnace in place and replacing just the
22	7 SEER cooling equipment with 11 SEER equipment would
23	achieve a savings of only 10 million Btus, or only 30%
24	of the 33.7 million Btus you indicate that Gulf's
25	program in this docket would achieve.
	1

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Mr. Spangenberg, even if that statement is 1 true, wouldn't leaving the gas furnace in place result 2 in a lesser increase in winter peak demand? 3 If you leave a gas furnace in place -- I'm 4 Α 5 sorry, we're still putting in the heat pump or not, in your scenario here? 6 7 You're going to leave the gas furnace in Q place and replace the 7 SEER cooling equipment with a 8 11 SEER heat pump. 9 10 Α Okay. Yes, you would still -- to the extent 11 that the -- now the gas furnace is going to provide 12 the supplemental heating that might be required during a portion of the coldest hour during a winter demand. 13 14 To the extent that the gas furnace contributes some of that heating, you're winter demand will not be as high 15 as it otherwise would have been without the gas 16 furnace. 17 And if you didn't operate the heat pump in 18 Q the winter at all, there would be no increase in 19 20 winter peak demand? That's correct. There would be no increase 21 Α 22 in winter demand nor would you have the energy savings you would achieve with this program. 23 24 Wouldn't it also result in less annual kWh Q 25 consumption?

**A** Yes, sir, it would.

2	<b>Q</b> Now, the table on Page 9 of your exhibit
3	TSS-1 that's been identified as Exhibit 1 shows a RIM
4	test value of 2.45 for the case where an 8 SEER air
5	conditioner is replaced by an 11 SEER heat pump. I
6	don't believe you've included that in your handout.
7	<b>A</b> No, sir, I did not. But I have it here and
8	am familiar with what you're talking about.
9	${f Q}$ Isn't it true that the reason you get a
10	better RIM test result in going from 8 SEER to an 11
11	SEER than you do going do going from a less
12	efficient 7 SEER to an 11 SEER, that the energy
13	conservation that occurs for Gulf's program is much
14	less than the energy conservation that occurs in going
15	from the more efficient 8 SEER equipment to 11 SEER
16	equipment? In other words, your base case is 7 to 11.
17	A Correct.
18	<b>Q</b> And your 8 to 11, you get a better RIM test
19	result, but isn't that because there's less
20	conservation associated with that program?
21	<b>A</b> I don't know that I would characterize it as
22	less conservation. You get less revenue erosion under
23	that particular case. And right now when you lose
24	revenue, our ratepayers, you know, lose out. And so
25	to the extent that there are fewer kilowatt-hours

saved, then you might say that there's less 1 2 conservation, yes, sir. And I think you told us in your deposition 3 Q that in the 7 to 11 SEER case, the program as filed, 4 there's a reduction of 1030 kWh per customer, and a kW 5 demand reduction of 1.9; is that correct? 6 7 Yes, sir, that's correct. And that's what's Α shown on the chart here before us. 8 And in the 8 to 11 SEER case, there's a 9 Q 10 reduction of only 21 kWh per customer and only a 1.2 11 kW reduction in demand? 12 Α Yes, sir, that's correct. 13 Q And I think you just pointed it out in one of your earlier answers, but the reason the RIM test 14 result is higher for the 8 to 11 SEER case is that 15 there's not as much lost revenue due to lost 16 electricity sales? 17 Yes, sir, that's correct. 18 Α 19 So doesn't this really show that replacing Q 20 the more efficient 8 SEER equipment with 11 SEER equipment is more cost-effective under the RIM test 21 fthan going from 7 to 11 SEER, but that there would be 22 less energy conservation achieved as a result of the 23 more cost-effective program? 24 25 Yes, sir. That's absolutely correct. Α And

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1	for that reason, of course, 8 SEER units that are
2	replaced are also eligible for our program as are 6
3	SEER units or 5 SEER units. The 7 SEER was used in
4	the base case because we see that as kind of a typical
5	SEER of the vintage units that people are beginning to
6	think about, okay, is this equipment as efficient as
7	it ought to be? Is it really what I ought to have in
8	my home right now? And it's certainly the area that
9	we'll try to be focussing customers on, customers
10	would have equipment that is in vintage. So 7 SEER is
11	eligible, 8 SEER is eligible, and so is 6 SEER or
12	anything anything is eligible.
13	<b>Q</b> So although you've assumed that the
14	equipment being replaced is 7 SEER, equipment with a
15	SEER higher than 7 would be eligible to participate in
16	this program?
17	<b>A</b> Yes, sir, it would, just as equipment with a
18	lower SEER than 7.
19	<b>Q</b> If you look at Page 9 of 9 again of your
20	exhibit TSS-1, couldn't we conclude taking all of the
21	different scenarios that are summarized there, that it
22	would be cost-effective for Gulf to pay allowances for
23	a customer to remove his gas furnace and straight air
24	and replace them with a heat pump, but it would not be
25	cost-effective to pay the customer to remove his strip

heating system and replace it with an energy-efficient 1 2 heat pump? 3 Α Yes, sir, that's correct. 4 If you put aside for the moment the issue of Q cost-effectiveness, which I know the Commission is not 5 6 going to do --7 Α I hope not. -- which of the following would result in 8 0 9 the more favorable impact on Gulf's winter peak demands: Replacing an air conditioner and a gas 10 furnace with a heat pump, or replacing an air 11 12 conditioner and electric strip heat with a heat pump? And the original part of the question was 13 Α 14 what? 15 Aside from cost-effectiveness, under which 0 16 scenario does Gulf get the more favorable impact on its winter peak demand? 17 18 Α There will be a greater winter demand 19 reduction, I think, by going from strip to heat pump than otherwise. 20 21 But that might not prove cost-effectiveness 0 22 under the RIM test? 23 Α In fact, it does not prove cost-effective. Wouldn't replacing the electric strip heat 24 0 also result in the greater reduction in annual  $k \ensuremath{\mathtt{W}} h$ 25

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1	consumption?
2	<b>A</b> Yes, it would. As shown in scenario No. 9,
3	there's a reduction of over 7,000 kilowatt-hours,
4	which is one reason, by the way, why we continue to
5	promote replacement of electric strip heat with heat
6	pumps amongst our customers. But because we want to
7	be good stewards of our ratepayer's money, we don't
8	pay any incentives to do that, but we certainly
9	encourage that in our marketplace and had a number of
10	those occur last year.
11	MR. WATSON: I have no further questions at
12	this time.
13	COMMISSIONER DEASON: Staff.
14	CROSS EXAMINATION
15	BY MS. COLLINS:
16	<b>Q</b> Good morning, Mr. Spangenberg.
17	A Good morning.
18	<b>Q</b> Please refer to Exhibit TSS-1 excuse me,
19	I'm sorry. Before we start questioning, we have
20	already distributed a copy of a set of
21	interrogatories. Have you seen these before? And do
22	you now have a copy?
23	A Yes, I have.
24	MS. COLLINS: I ask they be marked for
25	identification.

COMMISSIONER DEASON: That will be 1 2 identified as Exhibit 2. 3 (Exhibit 2 marked for identification.) 4 MS. COLLINS: Thank you. 5 (By Ms. Collins) Are you familiar with the 0 6 content of this exhibit? 7 Yes, I am. Α 8 0 Did you prepare the responses? 9 Α I assisted in the preparation of the 10 responses, and those that I didn't assist with were 11 prepared under my supervision and direction and with the assistance of Margaret Neyman, whose name is also 12 on here, but I'm the sponsor for all of these answers, 13 14 ves. 15 Okay. Thank you. Q 16 Please refer to exhibit TSS-1, Page 7 of 9 of your Direct Testimony. 17 18 Α Okay. 19 0 And go to Column 12 on this page. What does 20 this column represent? 21 Α This column represents the Cumulative 22 Discounted Net Benefits. In other words, in the FIRE 23 model, the model preferred by the Commission, under 24 the Commission's rules we use to analyze programs, 25 basically you look at all of the costs that you're

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laying out, you look at all of the benefits that come 1 2 in after putting out those costs. You get the net benefits, which is in Column 11, and then you discount 3 all of those net benefits and calculate them up so 4 5 that you get a sense of where you stand throughout the 6 program. Does this column show that Cumulative 7 0 8 Discounted Net Benefits do not qo positive until the year 2012? 9

**A** Yes, that's correct.

10

11 **Q** Does this column then represent that program 12 participants have a 13-year payback period to recoup 13 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.

Does Gulf inform the customers of this fact? 18 0 19 I don't know that we point out the 13 years Α for them. What we do is we take each customer 20 21 individually, and when they say, you know, "I want a better heating system, " or "I'm looking at changing my 22 23 heating system. What would you recommend?" We certainly help them in analyzing the 24 cost-effectiveness for each of their own particular 25

ļ	
1	needs. On average, and what this shows is a typical
2	average, you would wind up, yes, with a 13-year
3	payback. We certainly point that out to the customer.
4	We also point out to the customer the intangible
5	benefits that they might get by making the
6	installation of the high efficiency equipment. Some
7	of those intangibles might be an improved comfort in
8	the home. It might be a contribution to environmental
9	stewardship. There's a lot of the other things that
10	these costs just cannot capture. But we are up-front
11	with them in terms of the direct tangible economic
12	benefits that are captured by this program analysis.
13	<b>Q</b> How would the Commission know that this
14	notification is being done?
15	<b>A</b> I don't know that there's any formal
16	provision for making the Commission aware of this. We
17	certainly encourage Commission staffers to go with us
18	on energy audits, or when we help customers understand
19	what their heating needs are. We've always been very
20	open to Commission or Commission Staff involved in any
21	of those proceedings. And I don't know that this is
22	any different than other conservation programs that
23	the Commission has approved. I mean, there's an
24	oversight issue about how do you know about any of
25	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
8 somewhere around 15 or 16.

9 Q In your experience, what is the minimum SEER 10 rating commercially available on new air-to-air heat 11 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.

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QThen what would be the difference betweenthe value just gave me and the incremental cost thatyou stated as \$1300 in your rebuttal testimony? Couldyou please reconcile the values?

Yes. The bigger difference is in the \$1300. 5 Α You're now having to go with a whole new indoor unit 6 in terms of putting the wiring in place to do that and 7 any flue changes that might need to occur, because 8 you're taking out a gas furnace now and you're having 9 to patch up all the holes you had sticking through the 10 roof, and all of the things that are in place to 11 operate gas. You're capping off gas piping and those 12 types of things. So you have a big difference when 13 14 you're going for a furnace to a heat pump rather than 15 just going to higher efficiency heat pump. When you 16 go to a higher efficiency heat pump, the reason that's only \$150 is you're paying more for the extra 17 efficiency of the compressor unit and that outdoor 18 coil. There may be some slight changes in the indoor 19 coil, and in some cases you may go to multispeed fan 20 units or compressor units, but the \$1300, you know, 21 deals with all the opportunities to, again, patch up 22 the flues and everything else in your roof and other 23 things that are involved in changing out from a gas 24 furnace to a heat pump. 25

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Within that cost, does this only include 1 0 equipment costs or does it also include labor and 2 things of that nature? 3 It would include all costs. Α That is a 4 5 turnkey price from a contractor. The \$1300 cost? 6 0 7 Yes. And remember, that \$1300 cost is Α really a cost difference between two scenarios. One 8 in which they are upgrading their air conditioner from 9 10 a 7 SEER to a 10 SEER, and the difference between that 11 and changing out their gas furnace, a old 7 SEER air 12 conditioner to an 11 SEER heat pump. So you wouldn't get a contractor's quote that says \$1300. What you 13 would have is one contractor's quote that says \$3,000 14 for making the change versus the \$1700 that it might 15 cost you just to upgrade the air conditioning and the 16 old gas furnace to a similar gas furnace. 17 COMMISSIONER JACOBS: Right. I thought I 18 heard you say earlier it was about 3,000 to do the 19 total upgrade, right? 20 WITNESS SPANGENBERG: Yes, sir, that's 21 22 correct. (By Ms. Collins) In response to 23 0 24 one of Mr. Watson's questions you stated the total cost to be \$3,000 to replace existing equipment. 25 Are

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1 you then saying that the Good Cents Conversion Program 2 would cause Gulf's customers to take a \$200 incentive 3 to spend \$3,000 to replace a perfectly good operating 4 air conditioning system?

A Yes, I am.

5

6

**Q** And why is that?

7 Because of the benefits that they will get Α out of that replacement. They'll get a lower energy 8 bill. Not only do they get a lower electric bill 9 because they are now saving over thousand 10 kilowatt-hours a year, they are also saving -- I 11 forgot the exact cost, and it varies, but they are 12 saving the gas bill that goes along with 302 therms of 13 Typically, they are also getting increased 14 usage. comfort and those type of things. They now also have 15 a brand-new unit that's high efficiency. So there's a 16 lot of other benefits that go with that. And so the 17 18 \$200 is there to help them make that decision and go with the higher efficiency equipment. 19

20 **Q** In your opinion, will the customers be 21 willing to wait 13 years for payback of these 22 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
6 through 16 --

7 Α While I'm turning there, I might point out 8 too, of course, we're not forcing customers to do this. If customers want that 13-year payback or their 9 presumed payback with the other benefits they get, 10 they can participate. And if the vast majority of our 11 customers don't feel like that that's a good deal for 12 13 them, then we won't hit the thousand units and we won't be paying out the rebates. 14

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

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1	to be a natural competitive effect that occurs here.
2	Just like it's also going to have a natural
3	competitive effect as we promote higher efficiency
4	heat pumps, we're going to have a carryover effect
5	from those who still have the old strip heat furnaces.
6	They won't get a rebate, but we will have brough to
7	their attention the benefits of a high efficiency heat
8	pump and we'll get conversions there also from strip
9	heat over to a heat pump. But there's no question
10	there's a natural competitive effect.
11	<b>Q</b> Does Gulf currently have a program which
12	gives away free electric water heaters to customers to
13	replace existing natural gas water heaters?
14	A Yes, we do. I might add that that comes
15	with the timer. There's a timer involved that has to
16	come with that.
17	<b>Q</b> And when did this program begin?
18	<b>A</b> It began early, I believe, in 1998.
19	<b>Q</b> In your deposition you testified that one of
20	this program's cost, that being the water heater
21	program, had been recovered through the ECCR clause.
22	Does your answer remain the same today?
23	<b>A</b> I don't believe that's a proper
24	characterization of my answer there. That program was
25	never designed to have any recovery through the ECCR.

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And I don't think if you look now that you'd find any 1 recovery through ECCR for a water heater conversion 2 3 program. 0 Do you have a copy of your -- the transcript 4 5 from your deposition? I would ask you to turn to Page 27, beginning at Line 5, ending on Line 8. 6 7 Yes. Α Would you please read that? 8 0 "I guess I need to add something here. 9 Α As 10 part of an ECCR review audit, we may have found some 11 errors where some -- " I don't think the word is 12 intended to be "order" -- "where some of the heating rebate monies may have inadvertently gotten charged to 13 ECCR, we're in the process of reversing all of those. 14 That was never intentional and I believe there's a 15 separate docket going on that addresses that." 16 17 And I might add that error was later found to be very small and the corrections were made and 18 it's were somebody put out a wrong account number. 19 20 COMMISSIONER DEASON: Was that as a result of an internal audit or was that the PSC auditors 21 which found that? 22 WITNESS SPANGENBERG: I can't remember which 23 found it first, Commissioner. I think Commission 24 auditing may have found it first. But as it turns 25

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out, as the Commission auditors looked at it, we found 1 through another process that our folks had already --2 had found it also and were already in the process of 3 4 making the correction. (By Ms. Collins) Has any of this program's 5 Q cost been recovered through base rates or surveillance 6 purposes during 1998 or 1999? 7 8 Α Yes. 9 Q Could you clarify for which years? For both years or one or the other? 10 11 They were -- for surveillance purposes, I Α believe they were included in what we called the base 12 13 rate of jurisdictional cost for 1999, but I don't believe they were for 1998. 14 Why for 1999 and not 1998? 15 0 16 In 1998 as we launched the program we had Α looked at the balance of benefits to those and looked 17 And, basically, 18 at where we should make the charges. when we looked at the stockholder benefits, we wanted 19 20 to move ahead and do the program, so we lost the 21 program, if you will, on a pilot basis. And then as 22 we began to look at the benefits that came from that 23 to the ratepayers, we decided that in 1999, because it passed RIM test, was a good program, that there's no 24 reason not to have it be included in base rates for 25

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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 annual7 consumers of natural gas in the home?

8 A Based on the typical home that has gas 9 appliances, if you assume that everything that could 10 be gas is gas, the two largest would be a gas furnace 11 and a water heater.

12 **Q** Therefore, if a customer were encouraged to 13 participate in the Good Cents Conversion Program, how 14 could the Commission be assured that Gulf was not also 15 marketing the free electric water heater program to 16 that same customer?

I don't know that the Commission could be 17 Α assured, nor do I know that they would need to be 18 assured. We would be working with a customer who 19 wants to change out a gas furnace to a high efficiency 20 heat pump. We would work with them to do that. If as 21 22 part of that they were aware of our water heater 23 program, we might even mention it to them because of 24 the positive benefits it would give to the customers and the benefits it would give to our ratepayers. 25 We

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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.

6 Q But then wouldn't that cause the two 7 programs in combination to eliminate natural gas 8 appliances?

No, not necessarily. Oftentimes, we'll also 9 Α 10 find the customer has a gas range or gas dryer or gas fireplace. And if it did -- if that happened to be 11 12 the only two, then, yes, those two have been removed. Our ratepayers have been benefitted and we kind of 13 have to say so what if that removes the gas appliances 14 in the home? The customer has been benefited. Our 15 16 ratepayers have been benefited. It looks like a 17 win-win game all the way around for what our interests 18 should be.

19 Q In your deposition you testified that Gulf's 20 Electric Water Heater Conversion Program encourages 21 electricity to compete with natural gas. Does your 22 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

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

A Yes, it does.

4

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

I believe it's consistent because winter 8 Α peak demand is not Gulf's peak demand. Gulf's peak 9 10 demand is a summer demand. We're different from the 11 rest of Florida in that regard. And I'd say largely 12 because we have been successful in having heat pumps 13 go in in Northwest Florida rather than resistant strip 14 heat, which we see in the rest of Florida. That's 15 what causes the winter peaking situation in the rest of Florida. 16

We have been very successful with energy 17 efficiency through heat pumps. It has kept our winter 18 demand much less than our summer demand. We do not 19 20 plan additional generation based on a winter peak. We plan it based on a need to meet a summer peak. And I 21 believe that's consistent with FEECA, because FEECA, 22 particularly at the time it was passed, was trying to 23 deal with need for new electric generating capacity in 24 25 the state. And some of that generation, particularly

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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.

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

11 WITNESS SPANGENBERG: Yes, sir, in terms of 12 balance, I guess I would agree with you. I think it's particularly true if the gas consumption can help 13 14 avoid new electrical generation in those areas of the 15 state where that's the issue. And I wouldn't at all 16 ever question that type of balance. But it's pretty clear from what we see in our planning requirements in 17 18 Northwest Florida that as this program calculates 19 out -- in our case, it's much more -- it's much better 20 for our ratepayers, as shown by the cost-effectiveness 21 calculations, to promote heat pumps in lieu of gas 22 That's why we have a concern with gas furnaces. 23 distributors in Northwest Florida who promote gas 24 furnaces instead of heat pumps because, you know, that 25 doesn't calculate out to be good for the citizens of

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1 Florida.

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2	COMMISSIONER JACOBS: In a instance where
3	I guess you don't have probably this, but I'm thinking
4	in an area where you'd have a lot of new construction,
5	and there's an option to do something like a gas
6	fireplace, you'd have to do a different analysis in
7	that instance as opposed to an instance in this case
8	where you were replacing old inefficient equipment.
9	There you have pretty much a clean slate and you can
10	look at how to best balance those two types of
11	sources.
12	WITNESS SPANGENBERG: Yes, sir. You could
12 13	WITNESS SPANGENBERG: Yes, sir. You could look at those on a case-by-case basis, or really kind
13	look at those on a case-by-case basis, or really kind
13 14	look at those on a case-by-case basis, or really kind of a generic basis, and you could have a situation
13 14 15	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
13 14 15 16	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
13 14 15 16 17	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
13 14 15 16 17 18	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
13 14 15 16 17 18 19	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.

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,

way that increasing on-peak demand is okay?

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peak demand is our summer demand. And that's why 1 2 we're very certain, of course, this program achieves that aim because as you see, a 1.9 kW reduction per 3 participant at the meter -- of course, that's even 4 5 higher at the generator -- there's no question that 6 this program accomplishes that aim of FEECA. 7 0 I believe FEECA states seasonal peak demand, does that not mean just one season, not just the 8 9 utility's one weather-sensitive peak, but also summer 10 as well as winter? I'm sorry. Would you point that out to me? 11 Α I have FEECA here in front of me. 12 13 Q Okay. 14 I wouldn't want to admit to something if I Α 15 wasn't sure that was the case. I know I have 16 references to weather-sensitive peak demand and for Gulf that's certainly our summer demand. 17 18 I'm focussing particularly on the portion 0 that reads "to reduce the growth rates of 19 weather-sensitive peak demand." I guess my question 20 21 was not clear. In your opinion, do you think that 22 that means only one season; is it just summer, winter 23 or both based on your interpretation of the statute? 24 Α Well, my interpretation of the statute I 25 think you take a plain reading. You take what is that

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utility's weather-sensitive peak demand. And that 1 plain reading says that Gulf's weather-sensitive peak 2 demand for us is a summer demand. 3 Are you aware of any other DSM programs 4 0 5 approved by the Commission for ECCR recovery which increase seasonal peak demand? 6 7 I'm sorry. You said any other one. Α I don't know that this one increases our weather-sensitive 8 peak demand, but no I'm not. 9 10 Q Are you aware of any other -- excuse me. Are you aware of any DSM programs approved by the 11 12 Commission for ECCR recovery which increase any peak demand? 13 No, I'm not. Again, DSM programs are, as by 14 Α definition -- are demand-side management programs and 15 so they specifically target the utility's peak demand. 16 So I'm not aware of the Commission having come across, 17 or anyone else having filed, a program that would 18 increase a demand; certainly not one that would 19 20 increase, you know, weather-sensitive peak demand nor does this one increase our weather-sensitive peak 21 22 demand. You mentioned earlier to Commissioner Clark 23 0 that Gulf's appliance sales operation does not sell 24 whole-house HVAC units. Is there anything preventing 25

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1	Gulf from selling these units in the future?
2	<b>A</b> No, I don't know of anything that would
3	prevent us from doing that. Appliance sales is a
4	common practice. You do get into some different
5	skills when you start talking about whole-house stuff.
6	Most of our appliance sales operations are
7	basically I'll use the term "cash and carry." You
8	can come in with your pickup truck or in the back seat
9	of your car, you load up a window air contioner or you
10	can have a range or refrigerator delivered to your
11	home and it rolls in and it plugs in. It's that type
12	of consumer-based or I guess a package-type of
13	installation.
14	When you go to a heat pump system, a central
15	HVAC heat pump system, you've got to think about the
16	wiring in the home; you've got to usually redo the
17	duct system. If you're replacing a gas furnace,
18	again, there's patching up of the gas flues, and
19	capping off gas pipelines and all that type of stuff.
20	And it's just a very different operation.
21	I don't know of anything that legally
22	precludes us from doing that, just like there's
23	nothing that precludes us right now from selling
24	refrigerators as long as we, you know, do the proper
25	thing in terms of treating that as a separate business

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entity and keeping all those costs separated from our 1 2 regulated business; just like there's gas companies in 3 Northwest Florida that sell gas equipment, you know, 4 and, again, hopefully they are keeping those books 5 separated. Doesn't Gulf sell electric water heaters 6 Q 7 through its appliance stores? Yes, we do. 8 Α 9 MS. COLLINS: That's all we have. No 10 further questions. 11 **COMMISSIONER DEASON:** Commissioners? 12 **COMMISSIONER CLARK:** I just wanted to 13 clarify something. Did you answer the question that -- the Staff asked about demand-side management. 14 I would like you to answer do you know of any other 15 conservation program that we have approved but for 16 17 ECCR recovery where it has the effect of increasing 18 the demand in a particular season, even if that's not 19 your peak demand time. Do you know of any program 20 we've approved? 21 WITNESS SPANGENBERG: Commissioner, I do There are some programs where you might create 22 not. some secondary peak demands. Any of your direct load 23 24 control programs might focus on the peak demand, you 25 know, that is your focus, what you're building

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1	generation for. And even a program like that, for
2	instance, will add annual energy. So to the extent
3	that it's everything else other than that peak time
4	you are increasing some other demands, now whether
5	that carries over to the next seasonal demand or
6	whatever, I doubt it but there are clearly programs
7	that this Commission has approved that look at
8	reducing the company's peak demand, utility's peak
9	than, and because of that, adds energy or adds hourly
10	demands at other times.
11	COMMISSIONER CLARK: Okay. Thanks.
12	COMMISSIONER DEASON: Let me follow up.
13	Does an increase in winter peak demand for Gulf Power
14	increase Gulf Power's cost of providing service?
15	WITNESS SPANGENBERG: That's really one,
16	Commissioner I'm not trying to be evasive but
17	you really can't answer that yes or no. I could
18	contrive you some scenarios where it would, and I can
19	certainly contrive some where it would not. So
20	there's not really a generic answer that can be given
21	to that. A lot of that depends on each year, you
22	know, what happens to be the marginal, you know, cost
23	of generation at any particular hour.
24	On the whole, I would say no, there's no
25	significant increase in the cost to Gulf's customers.
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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.

7 COMMISSIONER DEASON: I have a question 8 about the Participants' Test's and Page 7 of your 9 Exhibit 1.

10

WITNESS SPANGENBERG: Yes, sir.

11 COMMISSIONER DEASON: I'm looking at Columns 12 2 and 3. Column 2 is the customer equipment cost and 13 Column 3 is customer O&M cost. Can you explain to me 14 what those represent and why the pattern exists as far 15 as the magnitude of those amounts from year to year?

16 WITNESS SPANGENBERG: Yes, sir, I can. Ιf you look, for instance, at 1999, we hoped we would 17 have this program approved by mid-year so that our 18 ratepayers could go ahead and capture benefits in 19 1999. So what you had there is assume that it got 20 approved halfway through, there was 500 units in the 21 You take those 500 units times \$3,000 of 22 program. 23 installation cost, and so your customer equipment cost there comes out 1.5 million, or \$3,000 per customer. 24 The O&M costs, then, are largely the reduction in 25

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their energy bill, both their electric bill and their 1 gas bill. Then as you step to Year 2, the 2000, that 2 comes out 3,092 per customer rather than 3,000, 3 because you have assumed some inflation in the 4 equipment cost. So you have inflation. That's why 5 those climb gradually; 3,092, 3,187, et cetera. 6 7 Going to the year 2004 where, again, you assume that's the last half of the year because it 8 assumes, I quess, a full five-year program. And, 9 again, in those customer O&M costs, as you have more 10 customers who are now on line with this higher 11 efficiency equipment, each year you have greater and 12 greater energy cost savings, both in the electric bill 13 because of the conservation of kilowatt-hours, and in 14 the gas bill because of the conservation of gas cost. 15 COMMISSIONER DEASON: Okay. And you're 16 assuming how many installations per year? 17 WITNESS SPANGENBERG: The first full year, 18 year 2000, would be 1,000 installations. And I 19 believe we keep that 1,000 for each of those years, 20 2000, 2001, '2 and '3, and then in year 2004 you have 21 that other half of year that you didn't have in 1999. 22 So you have, in effect, a full five years. You have 23 the four full years and the half year on each end of 24 25 it.

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COMMISSIONER DEASON: So if we go to Column 1 12, the cumulative discounted net benefits do not turn 2 positive for the program as a whole until year 2012, 3 which is the 13th year. 4 WITNESS SPANGENBERG: Yes, sir. I think if 5 you took --6 COMMISSIONER DEASON: Well, just let me ask 7 my questions, okay? 8 WITNESS SPANGENBERG: I'm sorry. 9 COMMISSIONER DEASON: Now, I think there 10 were some questions that characterized that for a 11 customer, that a customer would not see a benefit 12 until the 13th year. But this is for the program as a 13 whole. And my question is for just one customer, and 14 15 if he's one of those initial 500 in the year 1999 he would see -- or she -- would see net benefits, 16 positive benefits before the year 2012, would they 17 18 not? 19 WITNESS SPANGENBERG: Yes, sir, they would. I may have misunderstood her question. I was looking 20 at the program in a whole. 21 But, yes the individual payback -- and I 22 don't know if we have that calculation -- I may be 23 able to check and find that. Certainly for an 24 individual customer that made the investment, their 25

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particular payback might be less than that. And 1 that's why it so important, as I responded to 2 Ms. Collins' question, it's important that each 3 individual customer say "Okay. What is my scenario? 4 What am I paying for my electricity? What am I paying 5 for my gas? What is it going to cost me to make the 6 conversion?" Their home may only be 2000. And it may 7 be 4,000. And then look at my individual payback. 8 Typically, yes, we would expect the payback 9 to be less than the 13 years that characterizes the 10 program as a whole. 11 COMMISSIONER DEASON: Redirect. 12 MR. BADDERS: Yes, we have one question. 13 REDIRECT EXAMINATION 14 BY MR. BADDERS: 15 Earlier you were asked -- or actually you Q 16 made the statement that replacing a gas furnace 17 reaches optimal efficiency. Would you please explain 18 why? 19 Because if you look at the information that 20 Α we filed here, there's no question that when you take 21 out a gas furnace and replace it with a heat pump, not 22 only have we saved annual kilowatt-hours, not only 23 have we saved energy costs combining electricity and 24 gas, we've also reduced ground source Btus for the 25

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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.

6 MR. BADDERS: Thank you. We have no further 7 questions.

8 **COMMISSIONER JACOBS:** You've looked at the 9 potential market for this, and you've determined that 10 your projections for hookups per year is a reasonable 11 projection?

WITNESS SPANGENBERG: Yes, sir, we have, 12 Commissioner. If you look at -- there are several 13 thousand every year of equipment changeouts that are 14 occurring, and as we pointed out earlier, we're only 15 16 getting a very few of those that are converting from, you know, gas furnaces to high efficiency heat pumps. 17 18 So I have no doubt that when we properly implement 19 this program, we can achieve these numbers.

20 **COMMISSIONER JACOBS:** Now, if I recall the 21 maximum benefits will be obtained by a customer who 22 has both the inefficient heat pump and the gas 23 furnace; is that correct?

24WITNESS SPANGENBERG:Yes, sir, I believe.25And so we don't confuse terms, it's where the gas

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furnace and inefficient air conditioner that would go 1 with that as kind of a combined package. 2 COMMISSIONER JACOBS: I understand. 3 WITNESS SPANGENBERG: Yes, that is where get 4 the most benefit. 5 6 COMMISSIONER JACOBS: Do you have an idea of what portion of the population you're looking to 7 convert fits that profile? 8 WITNESS SPANGENBERG: That's an excellent 9 question, Commissioner. 10 No, I don't, not in terms of our entire 11 population. We have 313,000 residential customers. 12 We know that about 90,000 of those operate inefficient 13 gas furnaces. Now, how many of those are going to be 14 open to a change every year, you know, could be 15 debateable and part of why we do marketing. But with 16 a 90,000 population out there, we feel like there's 17 some wonderful opportunities for the state of Florida 18 in terms of rolling this program out. 19 COMMISSIONER JACOBS: Thank you. 20 COMMISSIONER DEASON: Exhibits? 21 MR. BADDERS: Yes. We'd like to move TSS-1 22 into the record. 23 COMMISSIONER DEASON: That's Exhibit 1. 24 Without objection, Exhibit 1 is admitted. 25

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MS. COLLINS: We'd like to move the Staff 1 interrogatories into the record. 2 COMMISSIONER DEASON: That was Exhibit 2. 3 Without objection, show then Exhibit 2 is admitted. 4 (Exhibits 1 and 2 received in evidence.) 5 We will take a 15-minute recess at this 6 7 time. 8 (Brief recess taken.) 9 10 COMMISSIONER DEASON: Call the hearing back 11 to order. Mr. Watson. 12 JOSEPH W. McCORMICK 13 was called as a witness on behalf of TECO Energy, Inc. 14 and, having been duly sworn, testified as follows: 15 16 DIRECT EXAMINATION BY MR. WATSON: 17 Would you state your name and business Q 18 address? 19 My name is Joseph W. McCormick. Business 20 А address is TECO Energy, Incorporated, P. O. Box 111, 21 Tampa, Florida 33601. 22 What is your position with TECO Energy, 23 Q Incorporated? 24 A I'm Director of Regulatory Policy Analysis. 25

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Mr. McCormick, did you prefile Direct 1 Q 2 Testimony consisting of 11 pages in this docket to which you later filed a revised Page 1? 3 Yes, I did. Α 4 Do you have any corrections to that 5 Q testimony? 6 7 Yes, I have one. On Page 9, Line 18, after Α the sentence that ends "or approximately 28%" insert 8 the following, "To indicate the magnitude of the 9 impact of the customer charge, I simply used the 74.2 10 cents per therm shown on Gulf's exhibit filed with its 11 response to Staff's Interrogatory No. 7. Peoples 12 Gas's actual average rate for 1998, however, was 72.74 13 cents per therm. When using the actual average rate 14 the impact is 22.3 cents per therm or 31%." 15 Thank you. As corrected, do you adopt your 16 Q prefiled testimony as your own for this proceeding 17 18 today? А I do. 19 20 MR. WATSON: Mr. Chairman, we would ask that 21 Mr. McCormick's prefiled Direct Testimony as corrected be inserted into the record as though read. 22 COMMISSIONER DEASON: Without objection, it 23 shall be so inserted. 24 (By Mr. Watson) Mr. McCormick, did you 25 Q

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also prepare and prefile an exhibit entitled JWM-1? Yes, I did. Α Do you have any corrections to make to that exhibit? А 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.) 

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Here with	1	Q.	Please state your name and business address.
Ň	2	A.	My name is Joseph W. McCormick. My business address is 702 North Franklin
	3		Street, Tampa, Florida 33602.
	4		
	5	Q.	By whom are you employed, and in what capacity?
	6	A.	I am employed by TECO Energy, Inc. as Director of Regulatory Policy Analysis. My
	7		responsibilities include identification and analysis of emerging regulatory policy
	8		trends in Congress, in state legislatures and in federal and state administrative
	9		agencies, advising TECO Energy companies on potential impacts, and coordinating
	10		corporate responses.
	11		
	12	Q.	Please summarize your educational background and experience.
	13	A.	I hold a Bachelor of Science in Psychology from Viterbo College and a Master of
	14		Business Administration from the University of Wisconsin-LaCrosse. I served in the
	15		United States Army for five years, attaining the rank of Captain before being retired
	16		for service-related disability. After completing my degrees, I taught business and
	17		management at the University of Wisconsin-LaCrosse for two years. From 1981 to
	18		1995, I served on the staff of the Florida Public Service Commission (Commission).
	19		From 1982 to 1986, I held various positions in the Commission's System Planning
	20		and Conservation group, including Planning and Research Economist, Economic
	21		Analyst and various supervisory roles in which I supervised energy analysts,
	22		economists and engineers. In those positions, I was involved in initial rulemaking to
	23		establish the Commission's Conservation Cost Recovery Cost Effectiveness Test. I

1	also analyzed and supervised the analyses of electric and gas utility filings of
2	proposed conservation plans and programs and made recommendations to the
3	Commission regarding program approval. I participated in numerous rulemaking and
4	other dockets regarding electric and gas utility energy conservation and demand side
5	management activities, including establishment of conservation goals, review of
6	electric utility ten-year site plans and Energy Conservation Cost Recovery Hearings.
7	On behalf of the Commission, I testified on Florida energy conservation actions
8	before the United States Congress House of Representatives Committee on Energy
9	and served as technical advisor to the Florida Legislature on issues related to energy
10	and energy code when requested to do so by the chairs of various legislative
11	committees.
10	
12	
12	In 1986, I was appointed as Bureau Chief of the newly formed Bureau of Gas
	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
13	
13 14	Regulation, and remained in that position until leaving the Commission in March
13 14 15	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
13 14 15 16	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
13 14 15 16 17	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
13 14 15 16 17 18	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
13 14 15 16 17 18 19	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
13 14 15 16 17 18 19 20	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.

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3	Q.	Do you have any exhibits to which you will refer in your testimony?
4	А.	Yes. I have one composite exhibit, Exhibit No (JWM-1). The exhibit includes
5		pertinent pages from several reference documents: 1. Air Conditioning and
6		Refrigeration Institute (ARI) consumer information brochure: "Keep Your Cool and
7		Save Cold Cash: Here are answers to 42 questions that consumers often ask the Air-
8		Conditioning & Refrigeration Institute"; 2. 1999 American Society of Heating,
9		Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) Handbook: Heating,
10		Ventilating and Air-Conditioning Applications; 3. State of Florida Energy Efficiency
11		Code for Building Construction, 1997 Edition; 4. Copy of Gulf's Water Heating
12		Conversion materials for free water heater or \$140 incentive; 5. Gulf's response to
13		Staff Interrogatory No 18, and; 6. Gulf's response to Staff Interrogatory No. 7.
14		
15	Q.	Have you reviewed the Commission's Proposed Agency Action Order No. PSC-99-
16		0684-FOF-EG, issued on April 7, 1999, and Gulf Power Company's (Gulf's) Petition
17		for Formal Proceeding on Proposed Agency Action filed in this docket on April 28,
18		1999?
19	A.	Yes, I have.
20		
21	Q.	Have you reviewed the direct testimony and Exhibit / (TSS-1) submitted by Mr.
22		Ted S. Spangenberg on July 22, 1999 in support of Gulf's petition?
23	A.	Yes. I am familiar with Mr. Spangenberg's direct testimony and the exhibit he has

1 sponsored on behalf of Gulf. 2 3 Q. Do you agree with the assumptions used by Gulf in analyzing the cost effectiveness of 4 its proposed Good Cents Conversion Program? 5 А. No. There are several assumptions used by Gulf with which I disagree, and which – 6 if corrected – would result in the program's failure to meet the Commission's tests for 7 approval of the program for cost recovery through the energy conservation cost recovery ("ECCR") clause. 8 9 10 **O**. Please identify the assumptions used by Gulf which you believe are incorrect. 11 A. First, the benefits of the proposed conversion program are overstated due to Gulf's 12 assumed reductions in summer peak demand and annual kWh consumption resulting 13 from replacing an electric air conditioning unit with an effective Seasonal Energy 14 Efficiency Ratio ("SEER") of 7.0 with a heat pump with a SEER of 11.0. 15 16 Second, the benefits of the proposed conversion program are overstated due to the 17 apparent lack of recognition in Gulf's analysis that the replacement heat pump's 18 average life is only 15 years. 19 20 Third, Gulf's inclusion of the monthly customer charge in the average gas price used 21 in its cost effectiveness analysis overstates the cost of gas used in that analysis. 22 23 Finally, Gulf's analysis assumes a decrease in summer peak demand. For reasons I

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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.

6

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
- 17 (NAECA), which establishes the national minimum standard efficiency as 10.0 for
- 18 heat pumps. (See Exhibit JWM-1, p. 10-12.)
- 19

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

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1	average SEER for all units shipped by manufacturers in the U.S. improved to 10.61
2	for central air conditioners and 10.94 for central heat pumps." For cooling load,
3	which affects summer peak kW demand and kWh consumption, the analysis should
4	then be limited to, at most, the difference between the SEER 10.0 and 11.0 cooling
5	unit. Even that difference is conservative, based on the ARI data indicating that the
6	average efficiency of all heat pumps shipped by manufacturers five years ago was a
7	SEER of approximately 11.0.
8	
9	On the heating side, Gulf's proposed program provides an incentive to discard non-
10	electric heating systems coincident with the end of the electric air conditioning
11	systems' normal useful lives. The proposed program would replace them with heat
12	pumps that have back up resistance heating coils, adding significant winter peak
13	demand and significant electric energy consumption for heating.
14	
15	The Commission was correct in its order in stating:
16	" [I]n reality, Gulf's Program will capture only the demand and energy
17	savings associated with upgrading from 10.0 SEER to 11.0 SEER. Based
18	on this realistic assumption, Gulf estimates that the Program will decrease
19	total summer peak demand by 1.5MW (0.3 kW per participant). Total
20	annual energy consumption under this scenario, however is estimated to
21	increase by 6950 MWh (1,390 kWh per participant). There would be no
22	change in the forecasted winter peak demand increase under this scenario
23	because it, like Gulf's base case assumption, requires the replacement of

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1		a natural gas heating system with an electric heat pump." (Order PSC-99-
2		0684-FOF-EG, page 3)
3		
4	Q.	Please explain why you disagree with Gulf's assumed 30-year life for the replacement
5		heat pump envisioned by its conversion program.
6	А.	I disagree with that assumption because ARI and ASHRAE data indicate the average
7		life of a heat pump to be only 14 to 15 years. Gulf has calculated the cost
8		effectiveness of its proposed program using an average life of twice that indicated by
9		ARI as useful life. If ARI's average life of the replacement heat pump is to be used,
10		the cost effectiveness analysis must include a benefit stream of only 15 years.
11		Correcting the cost effectiveness analysis in this way would significantly reduce the
12		savings assumed by Gulf in its analysis.
13		
14	Q.	What is the impact on the cost effectiveness results calculated by Gulf for this
15		program if the correct assumptions are used?
16	A.	Gulf has provided these calculations. As shown on page 9 of Exhibit $($ TSS-1), if
17		the program life is reduced to 15 years, and the assumed change in the efficiency of
18		the cooling equipment is correctly stated as increasing only from a 10.0 SEER to a
19		SEER of 11.0, the proposed program fails both the Participant Test and the Total
20		Resource Cost (TRC) Test with results of 0.80 and 0.75, respectively, both of which
21		are well below the desired result of 1.0 or greater. This proposed program fails two of
22		the three cost effectiveness tests. The RIM test result drops to 1.19. (Spangenberg
23		Exhibit TSS-1, Page 9 of 9.) The positive RIM test result could be diminished or

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reversed if this program leads to the addition of electric load through replacement of additional gas appliances. It should, therefore, not be approved.

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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 natural gas utility's service rates include a monthly customer charge, which is a flat 7 A. 8 rate the customer pays regardless of the level of gas consumption during a given 9 month, and a delivered rate per therm for gas actually consumed. We believe Gulf's 10 analysis inappropriately includes the customer charge in its calculation of the average 11 gas price of \$0.95 per therm. The customer charge should not be included in the 12 average gas price if the customer – after replacing its gas furnace with a heat pump as 13 envisioned by Gulf – continues to use gas for any other appliances. If the customer 14 charge is not included in the average cost of gas, the appropriate per-therm charge on 15 Peoples' system would be \$0.742 per therm as shown in Gulf's response to Staff's 16 Interrogatory No. 7. (See Exhibit JWM-1, p. 17-18). Thus, at least as to customers 17 on Peoples' system, Gulf's assumed average cost of gas overstates the cost of gas by \*See Page <u>104 A</u> here for additional response. about \$0.21 per therm, or approximately 28 percent. 18 19 20 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 21

- 22 calculated reduction in summer peak demand and could, in fact, increase summer
- 23 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%."

1 0 5 ce. the

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.

7

8 Adding to the likelihood of conversion of other appliances, Gulf currently has a 9 program which gives a customer a free electric resistance water heater (including a 10 timer) if it will replace an existing gas water heater (or provides a \$140 rebate). (See 11 Exhibit JWM-1, p. 13-15). Addition of the demand requirements of the electric 12 resistance water heater (and ultimately the additional electricity required if any other 13 gas appliances are replaced with electric ones) will offset the slim 0.3 kW per 14 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 15 16 11.0 SEER. Replacement of gas water heaters with electric ones will also further 17 increase Gulf's calculated 4.4 kW increase in its winter peak demand and kWh 18 consumption attributable to this proposed program.

19

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

23 of heating and cooling equipment and the Building Code equipment efficiency

1		requirements (SEER 10.0) are used to calculate demand and energy changes, Gulf's
2		proposed program fails both the Participant Test and the TRC Test.
3		
4		The proposed program increases weather sensitive peak demand in the winter,
5		increases annual kWh consumption, and, at best, minimally decreases summer peak
6		demand. When viewed in conjunction with Gulf's water heater program, this
7		proposed program may, in fact, increase summer demand. The proposed program,
8		therefore, appears to violate all Florida Energy Efficiency and Conservation Act
9		(FEECA) requirements.
10		
11		Regardless of whether summer peak demand increases with further increases in kWh
12		consumption in the event all gas appliances are replaced, this proposed program
13		would undeniably increase winter peak demand and annual kWh consumption. The
14		Commission must consider that, absent this proposed program, the additional of 4.4
15		kW of winter peak demand per participating customer (22 MW total system) would
16		not exist. Stated conversely, if the Commission approves this program, it will result
17		in a 22 MW increase in winter peak demand and significantly increased electricity
18		consumption that would not otherwise occur absent the program. Approval of the
19		proposed program would be inconsistent with the plain language contained in the
20		FEECA. The Commission, therefore, should not approve Gulf's proposed program.
21		
22	Q.	Does this conclude your testimony?
23	A.	Yes.

•

My prefiled testimony shows that the 1 Α Commission should, once again, deny Gulf's proposed 2 program based on several interrelated points. 3 These points taken together indicate that Gulf's evaluation 4 of the program's cost-effectiveness is questionable, 5 and that the program does not meet the objectives of 6 7 the Florida Energy Efficiency and Conservation Act, or FEECA. 8

9 My testimony supports the Commission's 10 original decision to deny approval of the program for 11 cost recovery through the Energy Conservation Cost 12 Recovery Clause.

Gulf believes the program qualifies for cost 13 recovery since it believes the program meets the 14 Commission's cost-effectiveness test. However, 15 16 Peoples believes Gulf has overstated the programs cost-effectiveness, and that if it is determined to be 17 cost-effective, this program is still not appropriate. 18 First, Gulf credits this program with 19 causing customers to replace a combination of older, 20 less efficient air conditioners, having an average 21 seasonal energy efficiency rating, or SEER, of 7, 0 22 and existing combustion furnaces with new electric 23 heat having a SEER of 11. 24

25

Most of the credit for that efficiency gain

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1 should go for the state's building code, the Florida 2 Energy Efficiency Codes for building and construction 3 and to the National Energy Efficiency Standards, which 4 require air conditioning equipment to be at least 10.0 5 SEER.

6 American Refrigerator, or ARI data --7 American Refrigeration Institute, ARI, data show that 8 five years ago, in 1994, the average efficiency of 9 heat pumps being shipped by manufacturers was 10.94. 10 So the rest of the credit should go to the market, 11 leaving the true benefit of this program at nearly 12 zero.

13 The equipment Gulf has targeted for 14 replacement is 10 to 15 years old, or near the average 15 age of replacement of air conditioners. According to 16 data made available to the public by both the ARI and 17 the American Society of Heating Refrigerating and Air 18 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 1 conditioning load. 2 Second, Gulf has assumed 30-year benefit 3 stream for this program, although according to ARI and 4 ASHRAE, heat pumps have an average life of 15 years. 5 Third, Gulf has overstated the gas rate paid 6 7 by Peoples customers which overstates the Participants' Test result in People's service 8 territory. 9 Finally, this proposed program will not 10 operate in isolation but in conjunction with Gulf's 11 non-ECCR programs. The Commission, therefore, should 12 not consider the proposed program's approval in 13 isolation. 14 If approved and successfully implemented by 15 Gulf Power, this program will cause a removal of a gas 16 furnace from the homes of Peoples Gas customers. 17 18 Peoples has a monthly service charge of \$7 a month. Without on furnace, the monthly service charge 19 will be spread over fewer therms, effectively 20 increasing the price per therm. 21 If the only other appliance in the house, 22 gas appliance, is a water heater, and customers could 23 remove their gas water heater and replace it with an 24 electric resistance water heater, they might choose to 25

do so except for the cost of replacement. This would 1 completely remove gas from the home. 2 Gulf operates a program to replace gas water 3 heaters with electric resistance water heaters at 4 little or no cost to the customer. The Commission 5 should consider the effect of the two programs 6 together because they will, in reality, function 7 together to remove gas from customer's homes and 8 increase reliance on electricity. 9 In my testimony I assert that Gulf's 10 proposed program does not meet the standards of FEECA. 11 This proposed program considered alone needlessly 12 increases winter-sensitive winter peak demand by 13 causing the removal of functioning natural gas 14 furnaces. 15 Gas furnaces place no demand on the electric 16 system except for a small fan load. By Gulf's own 17 18 analysis, the program causes an increase to winter peak demand of 4.4 kW for participating customer. 19 20 The program also increases annual electricity consumption beyond that which would occur 21

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.

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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.

7 If Gulf's program causes customers to remove 8 their gas furnaces, and the resulting increase in the per-unit cost of gas resulting from Peoples' \$7 9 per-month customer charge being spread over fewer 10 therms causes additional or all gas appliances to be 11 removed, which Peoples believes is likely, the end 12 result will be additional increases to electric peak 13 14 demands, both winter and summer, and increases to 15 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. 1 This completes my summary. 2 MR. WATSON: Tender the witness for cross, 3 and subject to cross examination, move the admission 4 of Exhibit 3. 5 COMMISSIONER DEASON: Okay. I'll take up 6 7 your motion after the conclusion of cross examination to move the exhibit. 8 Gulf. 9 CROSS EXAMINATION 10 BY MR. BADDERS: 11 Good morning, Mr. McCormick. Actually, I 12 0 can't see you so I can't maintain eye contact. 13 Let me move over one. 14 Α (Witness McCormick changes seats.) 15 Thank you. 16 Q Please turn to Page 9 of your testimony. 17 Yes. I'm there. 18 А At Page 9 of your testimony you indicate 19 0 your opinion that Gulf's Cost-Effectiveness Analysis 20 overstates the cost of gas; is that correct? 21 For Peoples Gas customers, yes, that's 22 Α correct. 23 And your basis is because it includes a 24 0 monthly customer charge? 25

1	<b>A</b> I didn't know what it included. It was
2	simply 95 cents per therm shown on the spreadsheet
3	that Gulf had attached, and our rate is not 95 cents.
4	I didn't know what was included in the 95 cents.
5	<b>Q</b> Okay. But you were not Peoples is not
6	the only gas utility who serves customers in Gulf's
7	service territory is it?
8	<b>A</b> No. My response was only with Peoples Gas
9	price.
10	<b>Q</b> Okay. Thank you.
11	Looking at the same page you discuss a Table
12	of Equipment Service Life.
13	<b>A</b> I'm sorry, I didn't hear the
14	<b>Q</b> At Page 9 you discuss actually it's
15	Page 9 of your exhibit you have a Table of Equipment
16	Life?
17	A Yes.
18	${f Q}$ And this table is the basis for the 15-year
19	service life that you reference in your testimony,
20	correct?
21	<b>A</b> Yes, it is. I think there's some confusion.
22	Because I'm not an engineer, I think I picked up a
23	term of art and used it incorrectly. And I think
24	there's a lot of testimony about that issue.
25	The term that I was referring to in the

service life of appliances is the average age of 1 replacement or the average service life of an 2 appliance, and that's what is represented in the ARI 3 table, or the ASHRAE, whichever one you are referring 4 to there. 5 Okay. Actually this table is based on a 6 Q survey that was conducted in 1986, wasn't it? 7 Yes. 8 Α And that survey used units that were 9 0 manufactured during the 1970s and 1980s? 10 Yes. It was the latest data that I found. 11 Α 12 Q If you turn to Page 2 of your exhibit, it's the ARI Q-and-A, No. 5. 13 14 Α Yes. Doesn't this question answer indicate that 15 Q units newer than those installed in the 1970s and '80s 16 were expected to last even longer that the 15 years --17 Yes. But they didn't give an expectation. 18 Α Okay. But it's longer? 19 0 20 Α Yes. I think it would be reasonable to expect 21 Q 22 that HVAC systems being installed today would have a life expectency or -- a service life well in excess of 23 15 years? 24 I think the ARI statement would be 25 Α

Does Peoples Gas offer any rebates to 2 Q customers for replacement of electric heating 3 equipment with natural gas fueled equipment? 4 5 Α Yes, we do. And you receive ECCR dollars for those 6 0 programs? 7 Those are to replace electric Α Yes. 8 resistance heating. 9 Okay. Can I have just a second? 10 0 (Pause) 11 Under these programs, you do pay rebates to 12 replace heat pumps with a gas furnace? 13 No, we do not. 14 Α You do not. 15 0 No. 16 Α Are you familiar with the Builder Program? 17 0 18 Yes. Α In that program do you pay rebates for that, 19 Q for the replacement of heat pumps with a gas furnace? 20 There's no replacement in the Builder А 21 There are incentives to the home builder to 22 Program. use gas appliances in the home as initially installed 23 appliances. There's no replacement involved. 24 But it would replace what would have Q 25

interpreted that way, yes.

1

otherwise gone in? 1 You can't replace something that doesn't 2 Α It would go in in place of a different exist. 3 appliance, yes. 4 Q Okay. 5 MR. BADDERS: We have no further questions. 6 Staff. 7 COMMISSIONER DEASON: MS. COLLINS: We have no questions. 8 COMMISSIONER DEASON: Commissioners. 9 COMMISSIONER CLARK: Mr. Chairman, I have 10 two questions, but they are questions regarding 11 Mr. Spangenberg's rebuttal testimony that I wanted 12 Mr. McCormick to respond to. And I guess I would ask 13 Gulf Power if that would be appropriate and give 14 Mr. Spangenberg, when he gets back on the stand, the 15 opportunity to respond. 16 MR. BADDERS: That would be fine. 17 18 COMMISSIONER CLARK: And I'll be happy to 19 tell you what they are. 20 I wanted Joe to respond to the change from 3,000 to 1,300 on Page 7, I think, of the Rebuttal 21 22 Testimony. I guess I would ask you to comment on that 23 24 change with respect to the equipment cost. WITNESS McCORMICK: The dollars are real but 25

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it seems that the difference in the 1300 has more to 1 do with the increase in the electric efficiency side 2 and is more of an electric-to-an-electric allowance. 3 The customer is still going to face a \$3,000 cost to 4 change out their system, and that whole decision 5 6 process is more or less one decision process. 7 Give me just a moment to think about an analogy as to how that plays out. 8 9 COMMISSIONER CLARK: Well, do you understand this to be relevant to the Participants' Test? 10 11 WITNESS McCORMICK: Yes. But -- yes. But when you're looking at the RIM test, I believe, all of 12 those costs go in there also, and that would be 13 subject to clarification by Mr. Spangenberg. 14 It would be hard to tell where in the 15 decision process the customer makes the decision to go 16 from a SEER 10 air conditioner, leaving their gas 17 furnace in place, and where they are influenced by the 18 decision to go to an 11 SEER or higher heat pump. And 19 I think it would always be questionable whether that 20 was a customer's call or whether the incentive was 21 22 paid. And you're looking at just that portion, that 23 incremental portion of the \$1300, or whether the 24 entire customer's decision was based on the incentive 25 and under Gulf's program, and replaced the whole

1 system all at once.

2	It's a situation we have if we were going to
3	replace a if a utility has a program in which they
4	replace a heat pump but not electric resistance heat,
5	and the customer said, "Well, I'm going to replace my
6	old broken heat pump. I'm just going to put in strip
7	heat." So instead, the utility goes in and gives an
8	incentive for a heat pump. That would not be
9	appropriate because you're replacing heat pump with
10	heat pump. I think it becomes difficult to find where
11	the decision process is made and I don't think the
12	\$1300 is the appropriate amount to calculate.
13	COMMISSIONER CLARK: With respect to Page 14
14	where Mr. Spangenberg indicates that he thinks the
15	savings would be greater in Northwest Florida than New
16	Jersey, Ohio and Illinois because of their heat pumps'
17	higher average heating efficiency. Do you agree with
18	that observation?
19	WITNESS McCORMICK: That heat pumps in
20	Florida would have a higher operating efficiency than
21	they would on a national average. I agree with that
22	piece, yes.
23	COMMISSIONER CLARK: Okay.
24	WITNESS McCORMICK: There's another portion
25	that says gas furnaces would have a lower efficiency.

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I believe that's based upon assumptions of sizing of 1 gas furnaces that are -- are not correct. 2 Gas furnaces are sized appropriately to 3 Florida's loads now. They were not several years ago. 4 But they are now sized appropriately. So I think the 5 6 efficiency of gas appliances is not lower than would be reported by GAMA. GAMA is the Gas Appliance 7 Manufacturers Association. 8 9 COMMISSIONER CLARK: Thank you. COMMISSIONER JACOBS: I have a brief 10 question. If I understand your line of reasoning, 11 part of the driving factor in replacement of the gas 12 water heaters is that the price of gas would be 13 escalating, and ultimately result in a very logical 14 decision by the customer to replace that; is that 15 correct? 16 WITNESS McCORMICK: The application of the 17 \$7-a-month customer charge across fewer therm sales, 18 19 on an annual basis, if you removed the furnace, your effective rate per therm -- or price per therm is 20 going to go up. And, therefore, I think the customer 21 22 will look at -- if you have only a gas water heater 23 left, that whole \$7 customer charge goes to that water 24 heater every month, and makes your effective per unit 25 cost of fuel for the water heater more expensive, and,

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therefore, you would look at replacing that, 1 especially when you can get another one for free. 2 COMMISSIONER JACOBS: And the overall 3 effectiveness -- the overall impact on 4 cost-effectiveness would be? 5 WITNESS McCORMICK: The overall 6 cost-effectiveness on Gulf's customers has to take 7 into account that an electric water heater is going to 8 increase summer peak, winter peak and annual energy 9 usage, even if the water heater has a timer on it. 10 The timers are only as good as the last time they were 11 set. And as soon as they are off for whatever reason, 12 13 outages or whatever, the electric water heater will 14 put a summer demand on the electric system. And so 15 that's not calculated anywhere in the cost-effectiveness. We don't have any numbers 16 calculated in the cost-effectiveness of a water heater 17 changeout program. 18 COMMISSIONER JACOBS: I see. Thank you. 19 COMMISSIONER DEASON: Redirect. I'm 20 sorry -- I'm looking at the wrong individual. 21 Redirect. 22 MR. WATSON: I have no redirect and we move 23 the admission of Exhibit 3. 24 COMMISSIONER DEASON: Without objection, 25

Exhibit 3 is admitted. 1 (Exhibit 3 received.) 2 3 Thank you, Mr. McCormick. You may be 4 excused. 5 Gulf. 6 (Witness McCormick excused.) 7 MR. BADDERS: We'd like to call our next 8 witness; that would be David Shell. 9 10 DAVID A. SHELL 11 was called as a rebuttal witness on behalf of Gulf 12 Power Company and, having been duly sworn, testified 13 as follows: 14 DIRECT EXAMINATION 15 BY MR. BADDERS: 16 Mr. Shell, have you been sworn? 17 Q Yes, sir, I have. 18 Α Please state your name and your business 19 Q address for the record. 20 My name is David A. Shell. My business 21 Α 22 address is One Energy Place, Pensacola, Florida 32520. Are you the same David Shell who prefiled 15 23 Q pages of Rebuttal Testimony? 24 25 Α Yes, sir, I am.

1 **Q** Do you have any changes or corrections to 2 that testimony? No, I don't. 3 Α If I were to ask you the same questions 0 4 today, would your answers be the same? 5 Yes, sir. 6 Α MR. BADDERS: We ask that the prefiled 7 testimony of David Shell be inserted into the record 8 as though read. 9 COMMISSIONER DEASON: Without objection, it 10 shall be so inserted. 11 (By Mr. Badders) Mr. Shell, did you have 12 Q one exhibit attached to your testimony? 13 A Yes, sir, I did. 14 Do you have any changes or corrections to 15 Q that exhibit? 16 17 Α No. 18 MR. BADDERS: We ask that that exhibit be identified for record, please. 19 COMMISSIONER DEASON: It shall be identified 20 as Exhibit 4. 21 (Exhibit 4 marked for identification.) 22 23 24 25

- 1		<u>Gulf Power Company</u>
2		Before the Florida Public Service Commission
3		Rebuttal Testimony of David A. Shell Docket No. 981591-EG
4		Docket No. 981591-EG Date of Filing: August 26, 1999
5	Q.	Please state your name, business address, and
6		occupation.
7	Α.	My name is David A. Shell. My business address is One
8		Energy Place, Pensacola, Florida 32520. I am employed
9		by Gulf Power Company as a Residential Market
10		Specialist.
11		
12	Q.	Please describe your background, job responsibilities
13		and experience.
14	Α.	I have a Bachelor's degree in Marketing from the
15		University of West Florida. I have been employed by
16		Gulf Power Company for 12 years during which time I
17		have held positions working with residential customers;
18		heating, ventilation, and air conditioning (HVAC)
19		contractors; home builders; and others dealing with
20		energy conservation, home comfort, and efficiency.
21		During my career I have received a substantial amount
22		of training including the following: heating and
23		cooling system operation and diagnostics; residential
24		load calculation; commercial load calculation; HVAC
25		equipment selection; HVAC duct design; and HVAC

performance testing. I have spent considerable time 1 working with HVAC contractors to insure proper HVAC 2 equipment sizing, selection, and operation for our 3 common customers. I have often been called upon by 4 these contractors to provide technical assistance in 5 resolving problems related to HVAC equipment 6 performance, durability, efficiency and homeowner 7 comfort. In my current position as Residential Market 8 Specialist I am responsible for program planning and 9 implementation as well as support of Gulf Power 10 Company's Residential Energy Consultants working with 11 Gulf's residential customers, HVAC contractors and 12 builders. I regularly provide technical assistance to 13 these groups and individuals. 14

- 16 Q. Do you have any exhibits to include with your17 testimony?
- 18 A. Yes. I have one exhibit, Exhibit No.  $\cancel{4}$  (DAS-1). This 19 exhibit contains the following:
- Survey of Residential Air-to-Air Heat Pump Service
   Life and Maintenance Issues referred to herein as
   the Easton study.
- 23 2. <u>A Study of Heat Pump Service Life</u> referred to
  24 herein as the Hiller and Lovvorn study.
- 25 3. Presentation of a method for modeling HVAC units

in service and failure probability by age. 1 2 Have you reviewed the direct testimony and Exhibit JWM-3 0. 1 submitted by Mr. Joseph W. McCormick on August 5, 4 1999 on behalf of Peoples Gas System? 5 6 Yes, I have. Α. 7 What is the purpose of your testimony in this docket? 8 Q. 9 The purpose of my testimony is to provide information Α. that will show that the positions taken in Mr. 10 McCormick's testimony with respect to HVAC systems are 11 flawed. Specifically, I find fault with Mr. McCormick's 12 reliance on the HVAC service life information taken 13 from the ASHRAE and ARI sources discussed in his 14 testimony. It appears that he also believes "service 15 16 life", as presented by the ASHRAE table, to be the same as "useful life" or functional life. 17 18 Please describe the terms "HVAC" and "HVAC system" as 19 Ο. you will use them in your testimony. 20 For the purposes of my testimony, the use of the term 21 Α. "HVAC" or "HVAC system" will refer to a "split system" 22 central air conditioner and combustion furnace 23 combination or heat pump utilizing an outdoor, air-to-24 air condenser or heat exchanger. These are, by far, 25

the most common types of systems utilized for heating and cooling residential dwellings in Northwest Florida.

4 Q. Would you please discuss why you disagree with Mr.
5 McCormick's interpretation and application of ASHRAE
6 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 13 14 the table), was seriously flawed and proposed a 15 point estimate for heat pump service life of 12 16 years. The Easton study utilized simply a survey 17 of HVAC dealers which gueried, through telephone 18 interviews, the age of units removed for any 19 reason, including energy costs, remodeling, etc., 20 not just those that had experienced debilitating 21 mechanical failure. This inclusion of all units, 22 including those removed for operating cost reasons 23 during a period of rapidly increasing energy costs, 24 in addition to the failure to consider units still 25 in service, caused the Easton study to greatly

1 understate useful life. It estimated the average 2 age of units removed from service based on dealer 3 opinions without considering the age of units still 4 in service. It was replete with significant bias 5 in that the data, the interview responses, were only as good as the information the interviewees 6 7 encountered and how well they absorbed and 8 processed it subconsciously.

9 The second, the Hiller and Lovvorn study (also 10 referenced by the table) of 1984, provides much 11 more credible data based upon actual heat pump installations, not opinions. This study tracked 12 13 the history of 1,689 specific units installed in Alabama from 1964 to 1974 and indicates a median 14 15 service life of approximately 20 years. In support 16 of this determination, Hiller and Lovvorn noted two 17 key elements in their conclusion. The first was 18 that "A large percentage of the original known heat 19 pump sample are still in operation, with more than 20 50% of the units 20 years old still in active use, 21 75% of the units 15 years old, and nearly 100% for 22 units 10 years old." And second, they found that 23 nearly 50% of the relatively small number of units 24 that were replaced were still fully operational at 25 the time of replacement. They went on to say "Such

1 replacements appear to have been motivated both by 2 the perception of expected life, and by marketing 3 and promotional efforts of dealer/contractors and 4 the local utility." Pages 17 through 23 of Exhibit 5 DAS-1 contain a copy of the Hiller and Lovvorn 6 study.

7

8 The ASHRAE table, in addition to the previous flaw 9 noted, understates service life for systems in 10 Northwest Florida because it provides data (flawed as 11 it is) for intended application to HVAC systems in 12 service nation-wide. Whereas:

- 13 The NW Florida climate is milder than the national
  14 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.
- 22

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 1 2 actual units manufactured between 1964 and 1974 and the opinions of HVAC dealers in 1985. 3 - HVAC manufacturers have been continuously improving 4 5 service life in addition to efficiency. ARI statements included in Mr. McCormick's exhibit 6 7 support this. On page 2 of Mr. McCormick's Exhibit JWM-1, the ARI Q&A #5 states that "Newer units [than 8 those built in the 1970's and 1980's] are expected 9 to last even longer." 10 - A reasonable estimation of the general trend in 11 12 these improvements would indicate a 10% longer 13 service life for units manufactured from 1985-1990, compared to the population of units used for the 14 preparation of the table. 15 - The general trend in these improvements would also 16 indicate an even longer expected service life for 17 18 units manufactured in 2000 and beyond compared to the population of units used for the preparation of 19

21

20

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

the table.

1 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.

6 Ο. What errors are introduced in Mr. McCormick's testimony 7 by the use of "service" life from the ASHRAE table or 8 the ARI reference as the "normal useful life?" 9 "Service life", as reported by these dated industry Α. 10 sources, was the age at which 50% of the units had been 11 removed from service for any reason. While, in many instances, that reason would have been major mechanical 12 failure, in many other instances the unit would have 13 14 been replaced due to a desire on the part of the 15 homeowner for lower energy costs via higher efficiency 16 equipment, a need for more or less capacity due to remodeling or thermal envelope improvements, or even 17 18 unexpected unit damage (as opposed to "failure") due to such events as lightning. Replacements due to energy 19 20 cost concerns were particularly prevalent during the 21 period relevant to the studies as this was the time 22 when the energy industry was experiencing as much as 23 double digit percentage increases in energy costs each 24 year. In all of these instances the units were 25 replaced for reasons other than an expected actuarial-

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3

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5

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.

6

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?

For HVAC systems manufactured during 1985-1990 and 10 Α. installed and utilized in Northwest Florida, the 20-11 12 year median service life found in the Hiller and Lovvorn study provides the best starting point. That 13 20 years can be increased by 10% as noted earlier for 14 the improvement in service life over time from the 15 vintage of HVAC systems studied by Hiller and Lovvorn 16 17 versus those produced in the late 1980's. While the expected service life could be further increased for 18 applications in Northwest Florida versus the climates 19 considered by Hiller and Lovvorn, I disregarded this 20 factor in order to maintain a clear element of 21 22 conservatism with respect to this issue. The 10% increase for this later vintage, when applied to 20 23 years, yields an expected service life of 22 years for 24 units manufactured in the late 1980's. For HVAC 25

1 systems currently being manufactured, installed, and utilized in Northwest Florida, the 20-year median 2 3 service life found in the Hiller and Lovvorn study 4 should be increased by 15% for the improvement in service life over time and the same nominal 5% for 5 6 applications in Northwest Florida versus the climates 7 considered by Hiller and Lovvorn. This total of a 20% 8 increase, when applied to 20 years, yields an expected service life of 24 years for units currently being 9 manufactured. However, to be conservative in service 10 11 life assumptions, the 22 years could be utilized for 12 all considerations in this particular proceeding.

13

14 Q. How has Mr. McCormick's dependence on the ASHRAE and 15 ARI service life information misguided the positions 16 presented in his testimony?

17 Α. First, it is apparent that Mr. McCormick's presumption of a 15-year service life is the basis for his position 18 that the 10 to 15 year old units targeted by Gulf's 19 20 proposed program are effectively at the end of their 21 "normal useful life." When the proper definition of "service life" and the much more accurate service life 22 23 figure of 22 years are considered, his position that they would otherwise be replaced at the same time 24 25 absent this program is totally without merit. In the

1 year 2000, the systems manufactured and installed in 1985 would have only a 5.0% probability of failure 2 within the following 12 months, as indicated on page 24 3 of Exhibit DAS-1. With a probability of short term 4 failure this low, customers with this vintage equipment 5 contemplating participation in Gulf's proposed program 6 7 would not reasonably consider their HVAC system to be at or near the end of its "normal useful life." 8 Similarly, a customer with a system installed in 1990 9 would have only a 4.0% probability of system failure 10 within the following 12 months and, again, would not 11 reasonably consider their system to be worn out. 12 That's a perspective of the two ends of the spectrum of 13 the 10-15 year age, with all unit vintages in between 14 falling between these two probabilities. Naturally, 15 the continuing improvement in service life would 16 continue for this program's application in 2001, 2002, 17 etc., with the associated decreases in the 18 probabilities of failure. Next, Mr. McCormick's flawed 19 presumption of a 15 year useful life appears to be the 20 basis for his position that Gulf's program analysis 21 period should be limited to 15 years. This clearly 22 would not be a responsible limitation. Any program 23 evaluation for Northwest Florida that is utilizing new-24 unit HVAC service life as an analysis parameter in any 25

1 fashion should, with ample conservatism, use an expected service life of 22 years. Any use of a 2 3 service life less than 22 years is being unreasonably conservative and any life significantly less than that, 4 5 such as the 15 years proposed by Mr. McCormick, is 6 seriously and erroneously understating the capabilities 7 of today's HVAC systems operating in Northwest 8 Florida's climate.

9

10 Q. Would you please explain the development and 11 application of page 24 of Exhibit DAS-1 as referenced 12 in your testimony?

13 Α. That page contains a chart which depicts the creation 14 of a simple linear model that can be used to calculate 15 the portion of HVAC units of a certain vintage that 16 could be expected to remain functional at various ages 17 or years in service. The model development began by 18 taking a plot of the data from the Hiller and Lovvorn 19 study and expanding it for a median service life of 22 20 years as previously explained. That yielded the 21 "Expected results" line of the chart. The "Expected 22 results" line was then modeled as closely as possible, 23 by the dashed straight line labeled "Modeled results". 24 The depiction of the Hiller and Lovvorn based data with 25 the straight lines allows simple calculations of

1 expected HVAC populations and failure probabilities by 2 vintage with excellent accuracy, particularly in the 3 range of 10 years to 34 years of life. In that range, 4 it is reasonable to expect that, for any particular 5 vintage, approximately 3.8% of the original units would fail during each year. At any particular age for that 6 7 vintage, the probability of a unit failing during a 12 month period is simply the 3.8% expected to fail 8 divided by the percentage of the original units still 9 10 in service at that time.

11

12 Q. Is this model usable for unit ages less than 10 years13 old or greater than 33 years?

14 No, it is not. In these ranges of unit life the Α. straight line approximation, the "modeled results", is 15 16 not a close enough fit to the observed data, i.e. the "expected results", to be useful. As an example, at 17 18 age 34 the model would indicate a 100% probability of failure within the next 12 months, however, from a 19 20 purely statistical approach that expectation is 21 unreasonable. In the qualified range of 10 to 33 22 years, however, the model provides an excellent match 23 to observed data and the probabilities it yields are the best available. 24

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?

Again, the presumption of a 15-year service life or 4 Α. utilization of service life for useful life is, in and 5 of itself, not at all responsible. However, if it is 6 presumed, albeit erroneously, this same modeling 7 approach can be used. This is done by, once again, 8 9 setting the departure point from 100% in service point at 9 years, the 50% in service point at 15 years, and 10 the 0% in service point at 21 years. In this case, the 11 model will be reasonably accurate in the range of 10 to 12 19 years. Using the same modeling process and 13 calculations as before, the 12-month probability of 14 failure for a 10-year old unit will be 8.3%, and for a 15 15-year old unit the probability would be 16.7%. 16

Logically, for a 15-year service life the 17 beginning departure point from 100% in service could be 18 set at less than 9 years, e.g. 8 years, with a 19 correspondingly longer time to reach 0% in service, but 20 this would produce even smaller probabilities for 21 failure within 12-months than the figures given above. 22 Once again, we have chosen the more conservative 23 24 approach.

Based on my experience of actually working with 1 residential customers in their considerations of the 2 health of their current HVAC system, these 3 probabilities would still not point to a reasonable 4 conclusion that their unit was at or near the end of 5 its "normal useful life." 6 7 In your past years of field experience have you had 8 Q. occasion to observe the equipment replacement decisions 9 of customers, who, having once made a significant 10 change in their HVAC equipment, years later experience 11 the failure of that equipment? 12 Yes, I have. The vast majority of these customers, 13 Α. after having experienced the energy economies and 14 enhanced comfort of a high-efficiency heat pump, choose 15 to replace that heat pump with the latest and greatest 16 high-efficiency heat pump at that time rather than 17 revert back to their former type of equipment. 18 19 Does that conclude your testimony? 20 Ο. Yes, it does. 21 Α. 2.2 23 24 25

ŧ.

1	<b>Q (By Mr. Badders)</b> Please summarize your
2	testimony?
3	<b>A</b> Yes, thank you.
4	The positions taken in the Intervenors'
5	testimony with respect to HVAC systems are flawed and
6	have resulted in improper conclusions about the
7	service life, and, therefore, the efficiencies that
8	should be utilized in the analyses of this program.
9	The Intervenor relies on HVAC service life
10	information taken from a ASHRAE source, and applies
11	this data to installations in Northwest Florida.
12	The ASHRAE Table understates actual service
13	life for HVAC systems during the study period because
14	of a compromise by a committee divided over two
15	studies. The Easton Study, which utilized the
16	telephone survey of HVAC dealer opinions, was
17	seriously flawed. This study greatly understated
18	useful life of equipment because its service life
19	estimate of 12 years assumed that all equipment
20	replacement was due to mechanical failure.
21	In actuality, this study failed to recognize
22	other reasons for equipment replacement, including
23	remodeling activity and operating costs during a
24	period of rapidly increasing energy costs.
25	Conversely, the Hiller and Lovvorn Study

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1 provides the best service data available. This study 2 is based upon actual heat pump installations, not 3 opinions, and indicates a median service life of 4 approximately 20 years.

The ASHRAE Table further understates service 5 life for HVAC systems in use in Northwest Florida 6 because the data is based upon a nationwide study. 7 The Northwest Florida climate is milder than the 8 9 national average, and equipment should be expected to yield a longer service life in this climate than in 10 the more extreme environments that make up the 11 12 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.

19 The gas company also makes the assumption 20 that service life, as presented by the ASHRAE Table, 21 is the same as useful life or functional life. 22 However, replacement due to reasons other than 23 failure, or the expectation of failure, is a 24 significant component of the ASHRAE Table in its 25 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 5 starting point for determining the service life for 6 systems utilized in Northwest Florida. This study 7 found a 20-year median service life for installations 8 occurring in the state of Alabama from 1964 to 1974. 9 Significant improvements in technology and service by 10 manufacturers for units built in the late 1980s 11 through today have led us to the conclusion that a 12 22-year service life is a very reasonable and 13 conservative assumption for all considerations in this 14 proceeding. 15

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

23 4% probability of failure. In the same manner, a unit 24 that is 15 years old has a 5% probability of failure 25 during the coming year.

1	
1	Based on my experience working with
2	residential customers, in consideration of the health
3	of their current HVAC system, these probabilities of
4	failure for 10- to 15-year old systems would not point
5	to a reasonable conclusion that their unit was at or
6	near the end of its normal useful life. Nor would
7	this failure rate indicate that Gulf Power should be
8	utilizing a 15-year program life for the purposes of
9	calculating the cost-effectiveness of this program.
10	The summary of this automobed time neurical form
10	In support of this extended time period for
10	program analysis, I would also point to the tendency
11	program analysis, I would also point to the tendency
11 12	program analysis, I would also point to the tendency of residential customers to maintain a consistent
11 12 13	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
11 12 13 14	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.
11 12 13 14 15	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
11 12 13 14 15 16	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

20 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,

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the units to be installed as a result of this program 1 should certainly be expected to have a service life of 2 more than 15 years. 3 Gulf Power's assumptions in the development 4 of this program with respect to program life and 5 equipment efficiency are appropriate and correct. 6 And that concludes my testimony. 7 MR. WATSON: I have no questions. 8 COMMISSIONER DEASON: Staff. 9 MS. COLLINS: No questions. 10 COMMISSIONER DEASON: Commissioners. 11 MR. BADDERS: We'd like to move his -- oh, I 12 13 apologize. COMMISSIONER CLARK: I just had a question 14 on Page 5 of your testimony. 15 You allege that the Easton Study had 16 significant bias. Is the bias you're referring to the 17 fact that it was a survey, the reasons listed here? 18 WITNESS SHELL: Yes. 19 COMMISSIONER CLARK: Is that what created 20 the bias? 21 WITNESS SHELL: That's a portion of that 22 bias, correct. 23 COMMISSIONER CLARK: And then another reason 24 why it wasn't a good survey is that because it was a 25

survey, and you could not be sure what information the 1 HVAC dealers may have had in responding to it. 2 WITNESS SHELL: That's correct. The dealers 3 4 were just simply asked their opinions. They were not 5 asked to point to any specific information. 6 COMMISSIONER CLARK: Okay. COMMISSIONER JACOBS: Does it indicate how 7 effective an incentive -- the amount of an incentive, 8 what impact that has on the decision? In other words, 9 would this incentive be effective to convince 10 consumers to do the upgrade? 11 12 WITNESS SHELL: I don't believe either one of the studies, the Easton Study or Hiller and Lovvorn 13 Study, addressed the actual incentive issue and what 14 level of incentive would be appropriate in a case of 15 this matter. 16 COMMISSIONER DEASON: Exhibits. 17 18 MR. BADDERS: We'd like to move Exhibit 4 into the record. 19 20 COMMISSIONER DEASON: Without objection, 21 show Exhibit 4 admitted. You may be excused. 22 (Exhibit 4 received in evidence.) (Witness Shell excused.) 23 WITNESS SHELL: Thank you. 24 COMMISSIONER DEASON: Gulf, you may call 25

your next witness. 1 MR. BADDERS: We call Ted Spangenberg back 2 to the stand for his rebuttal testimony. 3 4 TED S. SPANGENGERG 5 was called as a rebuttal witness on behalf of Gulf 6 | Power Company and, having been duly sworn, testified 7 as follows: 8 DIRECT EXAMINATION 9 BY MR. BADDERS: 10 Please state your name and your business 11 0 address for the record. 12 My name is Ted Spangenberg. My business 13 Α address is Gulf Power Company, One Energy Place, 14 15 || Pensacola, Florida 32520. Are you the same Ted Spangenberg who 16 Q prefiled 23 pages of Rebuttal Testimony? 17 18 Α Yes, I am. Do you have any changes or corrections to 19 Q 20 that testimony? 21 Α No, I do not. Q If I were to ask you the same questions 22 today would your answers be the same? 23 || A Yes, sir, they would. 24 25 MR. BADDERS: We ask that the prefiled

1	Rebuttal Testimony of Ted Spangenberg be inserted into
2	the record as though read.
3	COMMISSIONER DEASON: Without objection it
4	shall be so inserted.
5	Q (By Mr. Badders) Mr. Spangenberg, do you
6	have one exhibit attached to that testimony?
7	A Yes, I do.
8	<b>Q</b> Do you have changes or corrections to that
9	exhibit?
10	<b>A</b> No, I do not.
11	MR. BADDERS: We ask that exhibit be
12	identified.
13	COMMISSIONER DEASON: It shall be identified
14	as Exhibit 5.
15	(Exhibit 5 marked for identification.)
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1		GULF POWER COMPANY
2		Before the Florida Public Service Commission Rebuttal Testimony of
3		T. S. Spangenberg, Jr. Docket No. 981591-EG
4		Date of Filing: August 26, 1999
5	Q.	Please state your name, business address, and
6		occupation.
7	Α.	My name is T. S. (Ted) Spangenberg, Jr. My business
8		address is One Energy Place, Pensacola, Florida
9		32520. I am employed by Gulf Power Company as its
10		Residential Marketing Manager.
11		
12	Q.	Are you the same Ted Spangenberg that presented direct
13		testimony in this Docket?
14	Α.	Yes, I am.
15		
16	Q.	Do you have an exhibit to which you will refer in your
17		testimony?
18	A.	Yes, I have an exhibit consisting of one schedule,
19		(TSS-2). This exhibit consists of two pages and
20		contains the following:
21		1. Table of approved utility conservation programs
22		and analysis life.
23		2. Copy of page 35.2 from the 1999 edition of the
24		ASHRAE HVAC Applications Handbook.
25		

Have you reviewed the direct testimony and Exhibit \_\_\_\_ 1 Ο. (JWM-1) submitted by Mr. Joseph W. McCormick on August 2 5, 1999 on behalf of Peoples Gas System in opposition 3 to Gulf's petition in this Docket? 4 Yes, I have. 5 Α. 6 Do you disagree with any of the positions or statements 7 Q. of Mr. McCormick in that testimony? 8 Yes. Mr. McCormick cites four assumptions used by Gulf 9 Α. with which he disagrees. His claim is that, if these 10 four assumptions are "corrected", the program would 11 fail the Commission's tests for program approval. 12 13 Those assumptions of Gulf are as follows: 1. Basing the electrical impacts on replacing 7 SEER 14 HVAC equipment with 11 SEER equipment. 15 2. Not utilizing a replacement heat pump life of 15 16 17 years. 3. Inclusion of the monthly customer charge in the 18 assumption for the cost of gas. 19 4. The program contributing to a decrease in summer 20 21 demand. In addition to those assumptions, he cites aspects of 22 electrical system impact relative to his understanding 23 of the requirements of FEECA as reasons for rejection 24 of this proposed program by the Commission. It is my 25

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.

8

9 Q. What is your response to his discussions regarding the 10 appropriate equipment efficiency changes for use in 11 Gulf's analysis?

12 A. As noted earlier, Mr. McCormick disagrees with Gulf's 13 basing the expected electrical impacts of its proposed 14 program on replacing 7 SEER HVAC equipment with 11 SEER 15 equipment. He indicates a belief that HVAC equipment 16 in the age range of 10 to 15 years is "at very nearly 17 the end of their useful service lives."

His claim of a 10 to 15 year age correlating to 18 equipment being at the end of its normal life appears 19 to be based totally on an ASHRAE table of service life 20 which he has included in his exhibit. He does not 21 appear to have understood the studies and the data 22 behind the table, nor does his testimony appear to 23 properly consider the concept of "median" service life, 24 the definition of "service life", or the past and 25

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 6 efficiency units which would be candidates for 7 replacement by Gulf's program are not "at very nearly 8 the end of their normal useful lives" and would not be 9 expected, with any reasonable degree of probability, to 10 otherwise be replaced by the customer. Additionally, 11 Gulf expects its program to specifically encourage 12 customers to change out their equipment prior to the 13 end of its functional life. The \$200 customer rebate 14 that will be offered as part of this program, in many 15 cases, will be the very thing that encourages customers 16 to go ahead and make the change to higher efficiency. 17 This is specifically the case for those customers who 18 wish to improve energy efficiency solely for the sake 19 of energy efficiency itself, those who aspire to 20 reduced energy costs, those who want the more uniform 21 heating effect of a heat pump, or those who are 22 concerned about the environment and would consider the 23 change as an act of environmental stewardship. This 24 program will clearly encourage these prospective but 25

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.

6 Gulf took a conservative approach in regard to the 7 SEER assumptions that it used. Participation in Gulf's proposed program requires the installation of a heat 8 9 pump system with a minimum efficiency of 11.0 SEER in 10 the cooling cycle. In fact, although the program 11 requires 11.0 SEER as a minimum, the average SEER 12 installed under the program is expected to be well in excess of this level. For instance, in response to our 13 14 past and current efforts to encourage customers to 15 install high efficiency heat pump equipment, we are 16 aware of 843 heat pumps installed by Gulf's customers 17 in 1998 as a replacement for an existing heat pump or air conditioner, with the new equipment having an 18 19 efficiency of at least 11.0 SEER. The average 20 efficiency of those 843 systems was actually 12.8 SEER. 21 In other words, Gulf could have legitimately used the 22 greater annual kilowatt-hour and demand savings of 23 substituting 12.8 SEER equipment for the old 7.0 SEER 24 equipment, but chose to stay with the 11.0 SEER 25 assumption in order to continue to present a

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1 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.

6 Are there other applications in which you disagree with Ο. 7 Mr. McCormick's use of a 15 year normal useful life for 8 heat pumps?

9 Α. Yes, there are. Mr. McCormick utilizes the 15 year 10 heat pump normal useful life assumption as the sole 11 reason for his contention that the period of Gulf's 12 program analysis should be limited to 15 years. As 13 indicated in Mr. Shell's testimony, a 15 year service life assumption is even more flawed when applied to 14 15 heat pumps currently being installed than it is in its 16 application to previously installed HVAC equipment. 17 These errors are further exacerbated by Mr. McCormick's 18 confusion of "service life" with "useful life". As Mr. Shell points out, analyses using expected service life 19 20 as a parameter should use something more in the order of at least 22 years rather than 15 years. 21 Should the 22 Commission take the position that program analysis life 23 should be limited to initial equipment service life, 24 the utilization of a 22-year analysis period would 25 yield cost effectiveness test results that demonstrate

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that Gulf's program is cost effective from both a
 ratepayer perspective and a participant perspective.

4 Were there any errors in the cost effectiveness data Ο. Gulf originally provided and Mr. McCormick's testimony 5 6 relied upon for recommending rejection of this program? 7 Yes. One set of cost effectiveness numbers on Gulf's Α. Exhibit TSS-1, page 9 of 9, was originally provided by 8 Gulf and have since been found by Gulf to be in error. 9 10 When the cost effectiveness calculation for the assumption of a SEER change from 10 to 11 and a 15 year 11 12 analysis period was initially performed, the customer's 13 expected equipment cost was incorrectly assumed to 14 still be \$3,000 as it was in the 7 SEER to 11 SEER 15 scenario. In fact, under this particular scenario the applicable assumption is that the customer would 16 17 already be upgrading their equipment to a minimum of 10 SEER. The incremental equipment cost to go beyond the 18 19 10 SEER air conditioner and gas furnace to an 11 SEER 20 heat pump is expected to be \$1,300. When this correction is made, as noted on the corrected Page 9 of 21 22 Exhibit TSS-1, the program passes all three of the cost 23 effectiveness tests as follows: RIM = 1.19, Participants = 1.39, TRC = 1.88. Even if Mr. 24 25 McCormick's assumption recommendations are followed,

3

the program still easily passes the Commission's cost
 effectiveness tests.

3

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

7 Α. No. Beginning at line 23 on page 8 Mr. McCormick's testimony cites the RIM test result of 1.19 for his 8 preferred set of assumptions and then indicates that 9 this "positive RIM test result could be diminished or 10 reversed if this program leads to the addition of 11 electric load through replacement of additional gas 12 appliances." I assume that his testimony refers to 13 annual kilowatt-hour consumption, since none of those 14 other loads have any impact on weather sensitive peak 15 demand. It would appear from his testimony that there 16 is a misunderstanding of the economies of today's 17 electric utility industry. During the time when the 18 Commission's cost effectiveness rules were being 19 developed it was likely the case that an addition of 20 kilowatt-hours resulted in a decreased RIM result. 21 That was during a time when the cost of incremental 22 generation tended to exceed the cost of embedded 23 generation. In fact when the set of assumptions noted 24 above is analyzed with the addition of, for example, 25

- 500 kWh per participant with all else remaining equal
   the RIM result <u>increases</u> from 1.19 to 1.32.
- 3

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

That presumption is not consistent with the past 7 Α. NO. practice of this Commission in regard to the approval 8 of other conservation programs of electric utilities in 9 Florida. Page 1 of Exhibit TSS-2 contains a table 10 showing the Docket Number, utility, program name, and 11 program analysis life of several programs that have 12 been approved by the Commission. Several of these are 13 programs focused on HVAC equipment, yet none of them 14 15 uses an analysis period as short as what Mr. McCormick suggests. It is my understanding that all of these 16 programs utilized a program life related to an avoided 17 18 or deferred utility resource, not the participant's expected equipment life. 19

20 An HVAC program analysis related to a program that 21 defers or avoids utility facilities might be very 22 conservatively limited to the expected useful life of 23 the HVAC equipment in only one scenario. That is if 24 there is a clear showing that the initial equipment is 25 not likely to be replaced with similar advanced

1 technology once it ultimately fails but, instead, is 2 most likely to be replaced by equipment that reverts back to the former technology that the subject 3 equipment originally replaced. As discussed by Mr. 4 Shell's testimony, that scenario is just not a 5 6 reasonable expectation given the preponderant 7 characteristic of customers to stick with a particular type of advanced (or even further advanced) technology 8 9 once the switch has been made.

10 In making his recommendation for using HVAC service life Mr. McCormick not only ignored the past 11 12 practice of the Commission, he also ignored the ASHRAE Handbook's reference to the very table that he relied 13 14upon for his 15 year contention. A copy of page 35.2 15 of the Handbook is included as page 2 of Exhibit TSS-2. 16 It specifically addresses analysis periods for analyses 17 of HVAC equipment and further indicates that "... the 18 analysis period is often unrelated to the [HVAC] 19 equipment depreciation period or service life ... ". It 20 goes on to state that these [depreciation life or 21 service life] may be important in the analysis, but, as 22 Mr. Shell points out in his testimony, once a 23 participant has installed a high-efficiency heat pump, 24 there is a very high probability that he will replace 25 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.

10

Do you have any observations with regard to that 11 Q. 12 portion of Mr. McCormick's testimony that discusses the 13 cost of gas that Gulf used in its program analysis? 14 Α. Yes. Mr. McCormick states that "We believe Gulf's 15 analysis inappropriately includes the customer charge 16 in its calculation of the average gas price of \$0.95 17 therm." He goes on to indicate that this overstates 18 the cost of gas, particularly for those customers who 19 have other gas appliances in addition to a gas furnace. 20 Because there are many gas furnace customers who also 21 have other gas appliances, the inclusion of the 22 customer charge results in some liberalism in the gas cost assumption. 23

24 Gulf's gas cost assumption was intended to focus 25 on all combustion furnace applications throughout

1 Northwest Florida, or, more specifically, any Gulf Power customer who was currently utilizing an older, 2 inefficient combustion fuel appliance as their primary 3 4 heating source. This presents the greatest opportunity 5 for energy conservation and demand reduction through substitution with a heat pump. There are eight natural 6 7 gas distributors offering residential service in 8 Northwest Florida through the use of 13 different 9 residential rate schedules. The additional rate 10 schedules are due to the practice of some distributors, 11 specifically those owned by a municipality, of offering 12 different pricing to customers inside versus outside of 13 their municipal boundaries. Only four of the eight distributors and six of the 13 rate schedules include a 14 15 customer charge on their monthly billing to residential 16 customers. These charges range from \$4 to \$7 per 17 month. So, to be more precise, Gulf's failure to 18 remove the customer charge from the gas cost only 19 introduced liberalism to the extent of multiple gas 20 appliance customers on those 6 of the 13 rate 21 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. 1 Q. In what ways was Gulf's gas cost assumption

- 2 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.
- 8
- 9 Q. How did the exclusion of propane costs understate the10 weighted average gas cost?
- 11 Α. As noted on page 18 of Mr. McCormick's exhibit, propane 12 costs for the three more populated areas of Northwest 13 Florida range from \$1.089 to \$1.375 per therm. 14 Additionally, propane costs in the smaller towns and 15 rural areas along the I-10 corridor are in this same 16 general range. Inclusion of these costs in the 17 calculation of a Northwest Florida weighted average 18 cost of combustion fuels would, without question, vield 19 a higher figure than what Gulf utilized, all other 20 things being equal.
- 21

22 Q. How did the assumption about the therms of gas to be 23 conserved understate the gas cost savings the typical 24 customer would experience?

In the determination of energy savings, Gulf utilized, 1 Α. as indicated on page 9 of Exhibit TSS-1, an Average 2 Fuel Utilization Efficiency (AFUE) of 68% for the gas 3 heating equipment to be displaced. This AFUE rating is 4 the type of rating used to characterize furnace 5 efficiencies as reported by the Gas Appliance 6 Manufacturers Association (GAMA) and rates the furnace 7 for use in an annual climate with 2,080 heating load 8 hours, in other words, the heating load expected in 9 states like New Jersey, Ohio, and Illinois. Heat pumps 10 will have a higher average heating efficiency than 11 their national rating when used in Northwest Florida, 12 due to the higher average outdoor ambient temperature 13 for heat exchange. Gas furnaces, on the contrary, will 14 15 have a <u>lower</u> efficiency than that reported by GAMA when used in our region. We experience less than half of 16 the rated heating load hours. Our higher average 17 outdoor ambient winter temperatures cause much more 18 cycling on and off and much less average run time for 19 furnaces compared to applications in sustained, colder 20 climates, thus, yielding a significantly lower actual 21 realized furnace efficiency than the rating assigned by 22 GAMA. Once again, in order to be conservative in our 23 analysis of cost effectiveness Gulf chose to ignore the 24

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- resulting understatement of the therms of gas that
   would be conserved.
- 3

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

Yes. However, I have analyzed the effect of removal of 8 Α. the customer charges for these six rate schedules on 9 the average natural gas price in Northwest Florida. 10 Removal of the customer charge results in a reduction 11 in the weighted average cost of natural gas for the 12 eight Northwest Florida distributors from 95.0 cents 13 per therm to 86.4 cents per therm. Although for 14 Peoples Gas the average price per therm would be 1.5 reduced to 74.2 cents per therm as stated in the 16 testimony of Mr. McCormick, it is important to remember 17 that this would only be applicable to Peoples Gas 18 customers and only to those who have other gas 19 appliances in addition to a gas heating device. 20

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

The lower weighted average price would result in slightly lower energy bill savings to a customer

2 slightly lower energy bill savings to a customer converting from a 7.0 SEER A/C and gas furnace to an 3 11.0 SEER heat pump, thereby reducing the benefit/cost 4 ratio of the Participant's test and the TRC test. 5 The three cost effectiveness tests all remain well above 6 1.0 with the precise results as follows: 7 RIM Test = 1.748 Participant's Test = 1.52 9 10 TRC Test = 1.9911 12 Ο. Did you also perform the analysis using Peoples Gas 13 rates? Yes. We analyzed the effect of these calculations with 14 Α. gas cost savings calculated at Peoples Gas price of 15 \$0.724 per therm. Again, the resulting numbers were 16 all above 1.0 and are as follows: 17 18 RIM Test = 1.74Participant's Test = 1.35 19 TRC Test = 1.7220 In other words, even though there are several respects 21 in which a gas price of 86.4 cents, and, even more so, 22 a gas price of 74.2 cents understates the average 23 expected gas fuel cost, when either of these figures is 24 25

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1 2 utilized Gulf's proposed program is still cost effective.

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

To start with, this program is certainly not 8 Α. No. 9 targeted at any other gas uses in the home. 10 Additionally, Mr. McCormick bases his argument on the change in average gas cost when the gas furnace is no 11 12 longer there to help absorb the economic impact of the gas customer charge. He would have us remove the 13 customer charge for the purposes of Gulf's program 14 15 analysis, but wishes it included in a customer's 16 consideration of whether to keep any other gas 17 appliances in the home. His customer charge argument in this particular application is valid only to the 18 extent customers decide to totally and immediately 19 remove all gas uses in their home. In the case of gas 20 cooking and gas drying, rarely was the customer's 21 decision to utilize gas for those applications made 22 solely on the basis of the cost of fuel. The amount of 23 a typical customer's monthly household budget that is 24 25 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.

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7 Q. Does this HVAC program include water heating as a part8 of the program?

Mr. McCormick's testimony references a water 9 Α. No. 10 heating program that Gulf has in place and suggests that a customer converting a water heater from gas to 11 12 electric under that program would offset the demand reductions the proposed GoodCents Conversion program 13 for HVAC equipment. In the first place, the water 14 heater program is not a subject of this docket. 15 In this case we are dealing with an <u>HVAC</u> energy efficiency 16 17 and conservation program that is proposed for ECCR treatment. These two programs do not have any 18 programmatic linkages between them. 19

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 1 heaters Gulf's Residential Energy Consultants make 2 personal inspections of timer settings to ensure they 3 are set so as to avoid being "on" during the normal 4 expected hours of Gulf's summer peak demand. Further, 5 in claiming that the HVAC program's demand reduction 6 will be offset by the addition of more water heaters, 7 Mr. McCormick has presumed the Commission would accept 8 his flawed premise of a 0.3 kW reduction in HVAC demand 9 10 rather than the 1.9 kW reduction it will actually achieve. He inappropriately characterizes a 0.3 kW 11 demand reduction as "slim", and then would have the 12 Commission believe that the coincident demand of a 13 water heater is greater than this 0.3 kW. This is not 14 15 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.

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Q. What elements of Mr. McCormick's discussion of
 electrical system impact relative to FEECA do you

3 believe to be in error?

On line 11 of page 11 of his testimony Mr. McCormick 4 Α. commences a sentence in which he, first, would have the 5 Commission believe that an increase in annual kilowatt-6 7 hour consumption due to this program is undeniable. That simply is not the case. His statement is based 8 9 precariously upon the premise that the Commission would find that Gulf's assumption of a change from 7.0 SEER 10 to 11.0 SEER is incorrect. On the contrary, Mr. 11 Shell's discussion of expected service life and my own 12 13 testimony in that regard indicate that, not only is the assumption of 7 SEER to 11 SEER correct, it has an 14 element of conservatism in it. I believe if the 15 Commission is concerned about the advisability of 16 allowing the assumption of 7 SEER to 11 SEER, it should 17 18 look to its own prior decisions and the "liberally construed" language within FEECA for encouragement in 19 its attempts to make as many cost-effective energy 20 efficiency and conservation programs available to the 21 citizens of Florida as practical. The assumption of 7 22 SEER to 11 SEER should be allowed and the result is a 23 1390 kWh per participant per year decrease in 24

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electrical energy consumption, in addition to the decrease of 302 therms or more of gas consumption.

3 Second, Mr. McCormick's testimony suggests that 4 the Commission should not approve any program that, 5 while reducing peak system demand, either increases off-peak weather sensitive demand and/or annual kWh 6 7 consumption. That approach is contrary to the 8 Commission's past actions in this regard. Typically, 9 any direct load control program involving HVAC systems, 10 including those approved by the Commission and listed 11 on page 1 of Exhibit TSS-2, involve increases in annual 12 energy consumption. These increases tend to be small 13 relative to the demand reduction, are always off-peak, and are believed to be due to the customer's "reactive" 14 15 behavioral response associated with the loss of comfort 16 during the period of load control. Mr. McCormick's interpretation of FEECA would seem to preclude the 17 18 allowance of such programs simply on the basis of a 19 logical and reasonable expectation of some increase in 20 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

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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 5 Commission reject Gulf's program on the basis of an 6 expected increase in Gulf's off-peak weather sensitive 7 demand and/or on the basis of, though falsely presumed, 8 an expected increase in annual kilowatt-hour 9 consumption, while making no acknowledgement of the 10 program's additional benefits of reducing the peak 11 weather-sensitive demand for natural gas or the 12 13 reduction in annual consumption of natural gas and ground-source Btu's. Such rigid and restrictive 14 interpretation, even absent erroneous assertions about 15 the impact of Gulf's program, is not consistent with 16 the stated intent of FEECA. The only restrictive 17 language within FEECA is that pertaining to the 18 requirement that a program be cost effective. The rest 19 of the language in FEECA is structured to be 20 permissive. If a program meets any aspect of FEECA, 21 thereby improving the efficiency of energy utilization 2.2 23 in Florida, it should be approved by this Commission as long as it is cost effective. 24

As noted earlier in my testimony, additional load, 1 though not the focus, purpose, or expected result of 2 Gulf's proposed program, in fact, yields positive 3 results for Gulf's general body of ratepayers as long 4 as it is not accompanied by an inordinate amount, if 5 any, of increased peak demand. The cost of many forms 6 7 of new electrical generation today is often less than the cost of embedded generation. FEECA is still 8 applicable under these conditions because it encourages 9 efficiency programs that put the focus where it should 10 be, on the reduction of system peak demand. This is 11 the case even in instances (e.g. direct load control, 12 thermal energy storage, other off-peak load shifting, 13 etc.) where there might otherwise be a temptation 14 towards accusations of load building or towards 15 complaining because of the natural competitive impact 16 of any efficiency program. 17

18 It is also our belief that FEECA should be fairly 19 applied with respect to electric utilities versus gas 20 utilities. We believe Gulf's proposed program to be at 21 least as consistent with FEECA as the approved ECCR 22 programs of gas utilities such as Peoples Gas.

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24 Q. Does that conclude your testimony?

25 A. Yes, it does.

Q(By Mr. Badders) Mr. Spangenberg, wouldyou 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 9 use of an efficiency of 7 SEER for the replaced 10 That position is based on a equipment was in error. 11 misunderstanding of a concept of service life, a 12 misguided reliance on the ASHRAE Table without 13 understanding its history or development, and a flawed 14 assumption about the applicability of national data to 15 the very different climate of Northwest Florida. 16

My testimony and Mr. Shell's show the errors 17 on each of these points with the responsible 18 19 conclusion that Gulf has used the appropriate SEER assumption for the unit being replaced. Interestingly 20 enough, even if the gas position had merit, Analysis 21 No. 4 in the chart before you indicates that the 22 program would still achieve the aim of a reduction 23 weather-sensitive peak demand and would still meet the 24 requirement of being cost-effective. 25

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Next, the Intervenor purports that Gulf's 1 failure to use a replacement heat pump life of 15 2 years was in error. Again, they were wrong, but again 3 even if the gas company's claims are adopted and are 4 compounded with the earlier errors about equipment 5 efficiencies, the calculations as shown in Analysis 6 No. 5 on the chart clearly indicate the program would 7 still achieve the aim of a reduction of 8 weather-sensitive peak demand, and would still meet 9 the requirement of being cost-effective. 10 The Intervenor also takes issues with Gulf's 11 treatment of a gas customer charge for those few 12 occasions when that is applicable. This liberalism in 13 14 the assumption about gas cost savings is more than balanced out by the general conservatism of the 15 remaining gas assumptions. However, again, even if we 16 make those changes to the gas cost, once again the 17 program still achieves the aims of FEECA and it's 18 still cost-effective. 19

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

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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

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1	program would still lead to a reduction in
2	weather-sensitive peak demand, and that is one of the
3	aims of FEECA. The gas company would have this
4	Commission reach a decision that unless a program
5	meets every single one of the aims of FEECA that it
6	violates FEECA. If that were the case, the prior
7	Commission decision and Commission actions that gave
8	approval of, or support to a program involving direct
9	load control of residential appliances or thermal
10	energy storage, or any other program that all used
11	off-peak energy to help avoid on-peak demand has been
12	in violation of FEECA. A further extension of that
13	approach would mean that a program that reduced energy
14	and demand but didn't encourage cogeneration and
15	conserve fuels was also in violation.
16	I don't believe the Commission has been in
17	violation of FEECA with those earlier actions. I
18	believe the Commission properly, liberally construed
19	FEECA to apply to those types of programs, and it
20	should be consistent in its current actions.
21	Rather than approaching the question is does
22	it meet all of the aims of FEECA? the Commission has
23	properly taken the approach of does it meet any of the
24	aims of FEECA? However, once Intervenors' errors with
25	regard to equipment efficiency and service life are
ł	

recognized, a policy issue about whether electrical 1 energy consumption is the sole supreme mandate of 2 FEECA becomes moot with regard to this program. 3 In conclusion, the assertions of the gas 4 company are clearly in error, and even if they 5 weren't, this program would still achieve multiple 6 aims of FEECA and still meets the requirement to be 7 cost-effective. This program should be approved by 8 the Commission. 9 And that concludes my summary. 10 MR. BADDERS: We tender this witness for 11 cross examination at this time. 12 COMMISSIONER DEASON: Mr. Watson. 13 14 CROSS EXAMINATION BY MR. WATSON: 15 Mr. Spangenberg, you mentioned early on in 16 0 your summary something about Mr. McCormick's opinion 17 with respect to the requirements of FEECA. 18 Would I be correct in assuming that the 19 statements in your Rebuttal Testimony, your Direct 20 Testimony, and in the summary you've just given are 21 also your opinions with respect to the requirements' 22 meaning or interpretation of FEECA? 23 24 Α Yes. Okay. With respect to the heat pumps 25 0

1 installed by Gulf's customers during 1998, did Gulf 2 make any study to determine the SEER of the equipment 3 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.

10 **Q** I'm talking about the equipment that's 11 coming out. Was any study made in the case of a 12 combustion furnace or in the case of a central 13 straight cool air conditioner or a heat pump that was 14 being replaced with respect to the SEER or AFUE of the 15 equipment that was coming out?

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A No, we did not.

17 Q In connection with your non-ECCR, if you 18 want to call it that, water heater replacement 19 program, you stated in your rebuttal testimony and in 20 your summary that this equipment is equipped with 21 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

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also gives the customer some additional energy savings 1 in terms of how they operate their water heater. 2 Do these timers have a battery backup to 3 0 retain correct time during power outages? 4 5 Α No, sir, they do not. Can customers turn the timers off or reset 6 Q them? 7 Yes, sir, they can. It's hard for us to see 8 Α why they would have any incentive to do it because the 9 demand for water heating -- the need for hot water is 10 very low during the time of our system peak. In fact, 11 even without a timer you'd get a very small 12 contribution to our system demand during those times. 13 So there's no incentive for them to do it. As long as 14 long as they are getting plenty of hot water, all of 15 our load research data shows that they have plenty of 16 hot water during that time. The whole water heater 17 does not need to operate, except every now and then it 18 might come on to overcome losses, tank losses. And 19 again the timer helps preclude that. As long as the 20 customer has plenty of hot water, they have no need to 21 override it. 22 But if a timer is turned off, reset or 23 Q 24 indicates the correct time due to a power outage, it's at least possible that that water heater will be 25

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1 || 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.

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

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Yes, they would.

11 Q Would the same be true if the old furnace 12 was left in place and the old air conditioner was 13 replaced with an energy-efficient heat pump?

A Yes, they would.

15 Q Wouldn't both these scenarios also 16 contribute to a reduction in summer peak demand 17 because of the increased efficiency of the new air 18 conditioner or heat pump as the case may be?

A Yes, they would.

20 **Q** And in both scenarios, isn't it true that 21 the customers would not contribute to any increase in 22 winter peak demand as is present in Gulf's proposed 23 program?

AI'm sorry, we're talking about -- in one25case you said they were replacing an air conditioner

1 with a heat pump?

No. They are keeping their gas furnace and 2 Q they are replacing their old inefficient air 3 conditioner with either a new energy-efficient air 4 conditioner or a new energy-efficient heat pump. 5 If they used their furnace to provide their 6 Α heating requirements, then in neither case would you 7 have contribution to winter demand. R Although Gulf's summer peak demand exceeds 9 Q its winter peak demand, and Gulf uses its summer peak 10 demand for planning purposes, Gulf does have a winter 11 peak, does it not? 12 We've a demand in the winter months that's 13 Α higher than the fall and spring months, if you want to 14 define that as peak. But our peak is really the 15 summer demand. 16 But you have a seasonal demand in the 0 17 wintertime? 18 There is a seasonal demand in the А Yes. 19 wintertime. 20 And there is a high point to that? 0 21 Yes, there is. 22 А If the Good Cents Conversion Program is 23 Q approved by the Commission, it's true that Gulf's 24 seasonal high point in the wintertime is going to 25

increase? 1 2 Yes, that's correct. Α Is that seasonal high point in the 3 0 wintertime weather sensitive? 4 5 Α Yes, it is. 6 As I understand your testimony and your 0 rebuttal testimony, Gulf's definition of 7 weather-sensitive peak demand is the summer peak? 8 9 Α Absolutely. Because that's the peak that we plan generation for. It is our peak demand or Gulf 10 Power Company. So the focus of our programs is around 11 12 that summer peak. There is a higher demand that occurs in the wintertime that's weather sensitive. 13 In analyzing this program we said, "Okay. Here's what 14 15 this program does in the winter demand; here's what it does to our peak demand in the summer." The FIRE 16 model analyzes that to the detriment of the customers, 17 of our ratepayers. And we get the results out of that 18 that shows that it's not. 19 20 0 Well, under this definition -- let's take 21 the scenario where a customer removes a gas furnace 22 and a 7 SEER air conditioner and replaces them with a 23 11 SEER air conditioner and electric resistance furnace. Would that increase or reduce Gulf's summer 24 25 peak?

1 Α I guess it would decrease -- if it takes out 2 the furnace and the old inefficient air conditioner 3 and replaces it with an 11 SEER air conditioner and an 4 electric furnace --Excuse me --5 0 6 Α -- it would decrease the summer peak demand. 7 But we never see that occurring. We just don't have 8 electric furnaces going in anymore, to speak of. 9 Q Well, I'm talking about strip heat. 10 Sure. Strip heat. I understand. Strip heat Α doesn't operate during Gulf's peak demand. 11 12 Would this scenario increase or reduce 0 Gulf's annual kWh sales? 13 I'm not sure. I haven't done that 14 Α calculation. Again, it's so odd for someone to 15 16 install an electric resistance furnace these days. Ι don't know that we've done the actual calculations. 17 Ι 18 don't have the numbers here at my disposal to say whether or not annual consumption actually goes up or 19 20 goes down. I know you get a tremendous kilowatt-hour reduction through taking out the old air conditioner 21 22 and putting in high efficiency air conditioning in the 23 summertime. I don't know exactly how that balances out with their heating requirements out of an electric 24 furnace, strip --25

1 But you'd have strip heat versus a gas 0 2 furnace in the wintertime for heating? 3 Α Yes, you would. You would also have a higher efficiency air conditioner in the summer 4 instead of the old inefficient 7 SEER air conditioner. 5 6 And, again, I don't know what the balance of those two 7 would be on an annual electricity consumption. It's just so improbable. 8 9 Q Would this scenario increase or reduce Gulf's winter peak? 10 It would increase our winter demand. 11 Α 12 0 Okay. But under your definition of 13 weather-sensitive peak demand as the summer peak Gulf 14 uses for planning purposes, wouldn't it be correct to 15 say that you would not consider the increase in winter peak demand relevant under FEECA? 16 17 Α That's correct. I would. And we don't have any reason to consider it because those scenarios just 18 19 don't occur. We don't see that happening in today's marketplace, nor would we ever encourage such a thing 20 to incur. 21 22 As pointed out by this program, our 23 encouragement focuses the customer on high efficiency 24 heat pumps because that is the most efficient heating and cooling system available on the market today. 25 And

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

3 Q In modeling the cost-effectiveness of this 4 scenario, would you include any incremental cost of 5 generation or transmission or distribution in your 6 cost-effectiveness analysis?

7 Α Not that I know of. I know we would input the winter demand of such an odd scenario into the 8 9 FIRE model, and the FIRE model takes that into I guess the only time that would occur, if account. 10you had so many thousands of those types of situations 11 occurring that you caused Gulf's peak to shift, be a 12 winter peaking scenario, then you would obviously, you 13 know, factor that in and see whether or not you had a 14 cost-effective system. And at that point that becomes 15 our system peak demand, and in my interpretation of 16 FEECA, something we would certainly avoid. 17

18 Q And even in the base case for the program as 19 filed, there was no consideration given in the 20 cost-effectiveness analysis to the increase in winter 21 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

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1	calculate cost-effectiveness. So we did it per the
2	Commission's rules, applied it as it should be applied
3	and the numbers all show that it's cost-effective for
4	our customers, you know, our ratepayers, and so that's
5	why we filed the program.
6	MR. WATSON: I have no further questions.
7	COMMISSIONER DEASON: Staff.
8	CROSS EXAMINATION
9	BY MS. COLLINS:
10	<b>Q</b> In response to a question from Mr. Watson
11	you testified that Gulf's summer peak demand is
12	greater than Gulf's winter peak demand. What is the
13	megawatt difference?
14	<b>A</b> First, let me say I don't think I ever
15	testified that it was greater than our winter peak
16	demand. I think it's greater than our winter demand.
17	And I do make the distinction on what's our peak.
18	I don't have those numbers off the top of my
19	head but it's in the order of many megawatts; it's in
20	the order or somewhere between 50 and 100 megawatts.
21	I can dig that out if you'd like, but it's in that
22	order of magnitude. It's tens of megawatts.
23	${f Q}$ We'd like you to find that if you have that
24	information with you. Thank you.
25	<b>A</b> Okay. (Pause) We're looking for that.

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1	In the meantime, let me give you an answer
2	that I hope maybe will satisfy the need here.
3	What we did is if we assumed we did the
4	analysis. Took our winter demand as it currently is.
5	We took our summer peak demand. And then we said what
6	if we are totally successful with this program, and
7	had these numbers of conversions and looked at what
8	that did in terms of adding to our winter demand and
9	we looked to see did that ever increase Gulf's winter
10	demand above our summer peak, and that never occurred.
11	And that was without giving any consideration in terms
12	of how we're tied into the Southern electric system
13	and the rest of the generators and the rest of the
14	Southern Company system being very much summer
15	peaking; more so than Gulf Power is. But at no point
16	did that winter demand ever go higher than the summer
17	peak demand.
18	And I'm sorry, I don't it appears we may
19	not have that with us. We'd be happy to provide that
20	as a late-filed exhibit. It may be available in our
21	Ten Year Site Planning stuff that's filed recently. I
22	don't know.
23	MS. COLLINS: That's fine.
24	Could we get an exhibit number for that
25	late-filed exhibit?
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COMMISSIONER DEASON: Yes. It would be 1 2 Exhibit 6. 3 MS. COLLINS: Thank you. (Late-Filed Exhibit 6 identified.) 4 5 Α And as I understand, you want what our current winter demand is versus our summer peak 6 7 demand? **Q** For each year. 8 Of what time frame? 9 Α The ten year planning. 10 Q Okay. We'll certainly do that. 11 Α 12 I guess I need to ask one other clarifier. Would you like that with or without this program 13 approved? 14 15 Without the program being approved with the Q third column. Summer without, winter without. 16 17 Α Okay. 18 Q And the megawatts from the program. 19 Α Certainly. MS. COLLINS: That's all we have, 20 21 Commissioner Deason. 22 COMMISSIONER DEASON: Commissioners? Redirect? 23 2.4 MR. BADDERS: We have no redirect. COMMISSIONER DEASON: Exhibits. 25

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MR. BADDERS: We'd like to move Exhibit 5 1 2 into the record. COMMISSIONER DEASON: Without objection, 3 Exhibit 5 is admitted. 4 (Exhibit 5 received in evidence.) 5 COMMISSIONER DEASON: Thank you. You may be 6 7 excused. That's the last witness, correct? 8 MR. BADDERS: Actually, moving back, I 9 believe there was a question that Commissioner Clark 10 had asked that she wanted to also ask of this witness 11 dealing the 1300 to 3,000. 12 COMMISSIONER CLARK: No. If he cared to 13 respond to what Mr. McCormick said, that would be 14 fine. 15 WITNESS SPANGENBERG: I think I would, 16 because I think that left a lot of mud in the water. 17 18 We used the \$3,000 -- and I won't try to 19 clear that up. If it cost you a total of \$3,000 to go 20 from the gas furnace and an old air conditioner to a brand-new high efficiency heat pump, any other 21 scenario that says what if the customers otherwise are 22 going to spend money for this, you're always going to 23 have a cost for that other scenario. It's going to be 24 less than \$3,000. And if you look at all of the 25

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1	improvements that have been made, \$1300 is a very
2	reasonable estimate. And we got that from the HVAC
3	dealers, from what they would have otherwise spent to
4	get a new furnace, a new air conditioner, compared to
5	what they are now going to spend to go to a new heat
6	pump. \$1300 is a very reasonable number. We
7	certainly have not heard any other numbers offered
8	here that would tell us, you know, that there's
9	anything wrong with that number. But that's the
10	distinction there between those costs. You always
11	know that cost is going to be \$3,000. And given the
12	other things you've got to do, you actually know if
13	you have any knowledge of HVAC market, you know it's
14	going to be significantly less than the \$3,000.
15	COMMISSIONER DEASON: Any further questions
16	by any party? You may now be excused.
17	(Witness Spangenberg excused.)
18	
19	Is there a briefing schedule?
20	MS. COLLINS: Yes, Commissioner Deason. The
21	parties' briefs are due November 9th, 1999.
22	Transcripts of this proceeding are due October 26th,
23	1999. The Staff recommendation is due December 9th,
24	1999. The agenda is set for December 21st, 1999. The
25	Order is due January 14th, 2000. And the close of

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

STATE OF FLORIDA) 1 CERTIFICATE OF REPORTER 2 COUNTY OF LEON ) 3 I, JOY KELLY, CSR, RPR, Chief, Bureau of Reporting, Official Commission Reporter, 4 DO HEREBY CERTIFY that the Hearing in Docket No. 981591-EG was heard by the Florida Public Service 5 || Commission at the time and place herein stated; it is further 6 7 CERTIFIED that I stenographically reported the said proceedings; that the same has been transcribed by me; and that this transcript, 8 consisting of 187 pages, constitutes a true transcription of my notes of said proceedings. 9 , and the insertion of the prescribed prefiled testimony of the witnesses. 10 DATED this 15th day of October, 1999. 11 12 13 14 JO R ₽Ŕ CSR, 15 Bureau of Reporting Official Commission Reporter (850) 413-67/32 16 17 18 19 20 21 22 23 24 25

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# **GoodCents**<sup>®</sup> Conversion Program

## **Program Description**

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The objective of the **GoodCents**<sup>®</sup> 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**<sup>®</sup> 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.

FLORIDA PUBLIC SERVICE COMMISSIO	)N'
DOCKET NO. 981591-EG EXHIBIT NO.	1
WITNESS: <u>Dangenberg</u> DATE: <u>10-12-90</u>	
WITNESS: HPangenhua	
UATE:	

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Participa Rescan in The Good DN 12738-99 Gulf Pow of heating work for t

s available to all residential customers within xisting combustion furnace as the primary source nd heating equipment contractors performing

# **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.

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Gulf Power Company
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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.

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# **GoodCents**<sup>®</sup> Conversion Program

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# **\$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

PSC Form CE 1.1 Page 1 of 1 10-Nov+98 Run Date: 09:12 AM Filename: gthp\_1

### INPUT DATA - PART 1

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

	ogram Demand Impacts and Line Losses			I IV.	Incr	emental Generation, Transmission, & Distributio	n Costs	
(1)	Change in Peak kW Customer at meter	-1.90	kW/Cus			Base Year	1999	
(2)	Change in Peak kW per Customer at generator	-2.46	kW Gen/Cui	I .	(2)	In-Service Year For Incremental Generation	2001	**
(3)	kW Line Loss Percentage	12.60%		té a c	(3)	In-Service Year For Incremental T & D	2000	•
(4)	Change in KWh per Customer at generator	(1,109)	kWh/Cus/Yr	F	(4)	Base Year Incremental Generation Cost	\$234.85	\$/kW
(5)	kWh Line Loss Percentage	7.70%		1.0	(5)	Base Year Incremental Transmission Cost	\$58.75	\$/kW
(6)	Group Line Loss Multiplier	1.0014		t in the	(6)	Base Year Incremental Distribution Cost	\$33.00	\$/kW
(7)	Annual Change in Customer kWh at Meter	(1,030)	kWh/Cus/Yr	¥	(7)	Gen, Tran, & Dist Cost Escalation Rate	2.56%	
* (8)	Change in Winter kW per Cust at meter	4.40	kW/Cus	t i	(8)	Generator Fixed O & M Cost	\$2.77	\$/kW/Yr
				1 I.	(9)	Generator Fixed O&M Escalation Rate	2.99%	
				J	(10)	Transmission Fixed O & M Cost	\$0.73	\$/kW/Yr
	•			1	(11)	Distribution Fixed O & M Cost	\$0.84	\$/kW/Yr
II. Éc	conomic Life and K-Factors			1	(12)	T&D Fixed O&M Escalation Rate	2.56%	
	DSM Program Study Period		Years	F .		Incremental Gen Variable O & M Costs		\$/kW/Yr
	Economic Life of Incremental Generation	40		I I		Incre Gen Variable O&M Cost Esc Rate	3.84%	
(3)	Economic Life of Incremental T&D	30	Years	1 · · · ·		Incremental Gen Capacity Factor	3.40%	
(4)	K-Factor for Generation	1.4493	11.17	L. E.		Incremental Generating Unit Fuel Cost	\$0.0356	\$/kWh
	K-Factor for T&D	1.4394	ta na sa	1****	(17)	Incremental Gen Unit Fuel Esc Rate	3.00%	
* (6)	Switch: Rev Req (0) or Val-of-Def (1)	0		1 🔆 📜		Incremental Purchased Capacity Cost	\$20.70	\$/KW/YR
			كالالالحاد فاللار	1	(19)	Incremental Capacity Cost Esc Rate	2.56%	
	ility & Customer Costs			1				
	Utility Nonrecurring Cost Per Customer	\$150.00		1-11-1	Sto	p Revenue Loss at In-Service Year? (Y=1, N=0)	0	
(2)	Utility Recurring Cost Per Customer	\$0.00	\$/Cus/Year	ļ				-
(3)	Utility Cost Escalation Rate	3.06%	i utela.	j . V.	(1)	Non-Fuel Cost in Customer Bill (Base Year)		
(4)	Customer Equipment Cost	\$3,000.00	\$/Cus	)	()	Non-Fuel Cost In Customer Bill (Base Year)	\$0.0352	\$/kWh
(5)	Customer Equpiment Cost Escalation Rate	3.06%		1	(2)	Non-Fuel Escalation Rate	Per Table	
(6)	Customer O&M Cost	(\$287.00)	\$/Cus/Year	1	(3)	Cüstomer Demand Charge Per kW (Base Year)	\$0.0000	\$/kW/Mo
(7)	Customer O&M Cost Escalation Rate	3.06%		1	(4)	Demand Charge Escalation Rate	Per Table	•
* (8)	Customer Tax Credit Per Installation	\$0.00	\$/Cus	1 *	(5)/	werage Annual Change in Monthly Billing kW	0	kW/Mo.
• (9)	Customer Tax Credit Escalation Rate	3.06%		1	्र	tadde ne extra fina anti-		•
• (1)	Q) Change in Supply Costs	\$0.00	\$/Cus/Year	1	• · • • • • • • •	······································		
•(1	1) Supply Costs Escalation Rate	3.06%		<b>)</b>	; '			
	2) Utility Discount Rate	8.97%		1	191	Summary Results for This Analys	sis	
	3) Utility AFUDC Rate	10.30%	-	1			RIM	Participants'
	4) Utility Nonrecurring Rebate/Incentive	\$200.00	\$/Cus	1		NPV Benefits(\$000s)	\$7,153	\$21.592
	5) Utility Recurring Rebate/Incentive		\$/Cus/Year	id s		NPV Costs (\$000s)	\$4,114	\$13.094
	6) Utility Rebate/Incentive Escalation Rate	0.00%		$ \mathbf{i}  > 1$	14 M.C.	NPV Net Benefits (\$000s)	\$3,039	\$8,498

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 Supplemental Information Not Specifically Specified in Cost Effectiveness Manual
 The relevant avoidable generation unit is a combustion turbine peaking unit.
 Since the kilowatt eavinge cover of the time of the second secon 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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			C	ost-Effective		urce Cost-Effective Is per Rule 25-1			Code			
1)	(2) Change in	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)``	(12) Total	(13)
	Electric	Utility's	Participants'	Other	Other	Generation	Incremental T&D	Incremental Prog induced	Total	Total	Net	Cumulat
	Supply Costs	Program Costs	Program Costa	Costs	Benefits	Cap Costs	Cap Costs	Fuel Costs	Costs	Benefits	Benefits	Net Bene
ear	(\$000s) \$0	(\$0003)	(\$000s)	(\$000s) \$0	(\$000s)	(\$000s)	(\$000s)	(\$000s)	(\$000s)	(\$000s)	(\$000s)	(\$000s
)00	\$0 \$0	\$75 \$155	\$1,357 \$2,648	\$0 \$0	\$0 \$0	(\$35) (\$106)	(\$79)	(\$11)		\$46 \$221	(\$1,385) (\$2,582)	(\$1 (\$3
001	\$0	\$159	\$2,424	\$0	\$0	(\$185)	(\$126)			\$371	(\$2,212)	(\$4
)02	\$0	\$164	\$2,184	\$0	\$0	(\$263)	(\$169)	(\$86	\$2,349	\$518	(\$1,830)	(\$7
E0(	\$0	\$169	\$1,928	\$0	\$0	(\$348)	(\$209)	(\$112		\$669	(\$1,428)	(\$8
104 105	\$0 \$0	\$87 \$0	\$76 (\$1,720)	\$0 \$0	\$0 \$0	(\$400) (\$413)	(\$222)	(\$126		\$748 \$2,475	\$585 \$2,475	(\$7 (\$6
106	\$0	\$0	(\$1,772)	\$0	\$0	(\$422)	(\$205)			\$2,530	\$2,530	(\$4
107	\$0	\$0	(\$1,827)	\$0	\$0	(\$431)	(\$197)	(\$135		\$2,590	\$2,590	(\$3
800	\$0	\$0	(\$1,883)	\$0	\$0	(\$441)	(\$189)			\$2,652	\$2,652	(\$2
009 010	\$0 \$0	\$0 \$0	(\$1,940)	\$0 \$0	\$0	(\$454)	(\$181)			\$2,717	\$2,717	(\$1
710 211	\$0 \$0	50 \$0	(\$2,000) (\$2,061)	50 50	\$0 \$0	(\$467) (\$480)	(\$173) (\$165)			\$2,783 \$2,854	\$2,783 \$2,854	:
)12	\$0	\$0	(\$2,124)	\$0	\$0	(\$494)	(\$157)			\$2,928	\$2,928	\$
13	\$0	50	(\$2,189)	\$0	\$0	(\$507)	(\$148)	(\$156		\$3,000	\$3,000	\$2
)14	\$0	\$0	(\$2,256)	\$0	\$0	(\$521)	(\$140)			\$3,071	\$3,071	\$3
015 016	\$0 \$0	\$0 \$0	(\$2,325) (\$2,396)	\$0 \$0	\$0 \$0	(\$535) (\$549)	(\$133) (\$129)			\$3,147 \$3,225	\$3,147 \$3,225	\$4 \$1
17	\$0 \$0	\$0 \$0	(\$2,398) (\$2,470)	\$0	\$0	(\$564)	(\$126)			\$3,225 \$3,309	\$3,225 \$3,309	34 \$1
18	\$0	\$0	(\$2,545)	\$0	\$0	(\$580)	(\$122)	(\$159		\$3,406	\$3,406	ŝ
19	\$0	\$0	(\$2,623)	\$0	\$0	(\$603)	(\$119)			\$3,508	\$3,508	\$
)20	\$0 \$0	\$0 \$0	(\$2,703)	\$0 \$0	\$0 \$0	(\$627) (\$652)	(\$115)			\$3,614	\$3,614	\$7
)21 )22	\$0 \$0	\$0 \$0	(\$2,788) (\$2,872)	\$0 \$0	\$0 \$0	(\$672)	(\$112)			\$3,724 \$3,831	\$3,724 \$3,831	\$8 \$8
023	\$0	\$0	(\$2,959)	\$0	\$0	(\$692)	(\$106)			\$3,942	\$3,942	\$9
024	\$0	\$0	(\$3,050)	\$0	\$0	(\$713)	(\$102)	(\$190	) \$0	\$4,056	\$4,056	\$9
025	\$0	\$0	(\$3,144)	\$0	\$0	(\$735)	(\$99)			\$4,173	\$4,173	\$10
)26 )27	\$0 \$0		(\$3,240) (\$3,339)	\$0 \$0	\$0 \$0	(\$757) (\$780)	· (\$96) (\$93)			\$4,294	\$4,294	\$10
28	· \$0			\$0 \$0	\$0	(\$803)	(\$90)			\$4,420 \$4,549	\$4,420 \$4,549	\$11 \$11
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minal		\$810	(\$49,047)			(\$15,228)	(C4 404)	(\$4,355	811 Ana	600 074	A71 017	
NPV		\$655				(\$4,280)	(\$4,124) (\$1,613)			\$83,371 \$21,124	\$71,945 \$11,538	
	Discount Rate =	8.97%							c			
	fit/Cost Ratio =	2.20										

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# File

Participants' Cost-Effectiveness Measure

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(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
			}i		Change in	مىيە مەربەي م	Utility Paid			Total	Cumulativ
	Customer	Customer	Other	Other	Participants'	Tax	Rebates &	Total	Total	Net	Discounte
	Equip Costs	O&M Costs	Costa	Benefits		Credits 👘	Incentives	Costs	Benefits	Benefits	Net Benefi
Year	(\$000s)	(\$000s)	(\$000s)	(\$000s)		\$000s)	(\$000s)	(\$000s)	(\$000s)	(\$000s)	(\$000s)
999	\$1,500	(\$144)	\$0	\$0	(\$29)	\$0	\$100	\$1,500	\$272	(\$1,228)	(\$1,2
2000	\$3,092	(\$444)	\$0	\$0	(\$85)	\$0	\$200	\$3,092	\$728	(\$2,364)	(\$3,3
2001	\$3,187	(\$762)	\$0	\$0	(\$135)	<b>\$0</b>	\$200	\$3,187	\$1,097	(\$2,089)	(\$5,1
2002	\$3,284	(\$1,100)	\$0 \$0	\$0 \$0	(\$195)	\$0 \$0	\$200 \$200	\$3,284 \$3,385	\$1,495 \$1,901	(\$1,789) (\$1,484)	(\$6,5 (\$7,5
2003	\$3,385 \$1.744	(\$1,457) (\$1,669)	\$0 \$0	\$0 \$0	(\$244) (\$278)	\$0. \$0.	- \$100	\$1,744	\$2,047	\$303	(\$7,3 (\$7,3
2005	\$0	(\$1,000)	\$0 \$0	\$0 \$0	(\$278)	\$0		\$0	\$1,998	\$1,998	(\$6,2
2006	\$0	(\$1,772)	\$0	ŝõ	(\$281)	\$0	\$0	<b>\$</b> 0	\$2,053	\$2.053	(\$5,0
2007	\$0	(\$1,827)	\$0	\$0	(\$288)	\$0	\$0	\$0	\$2,114	\$2,114	(\$4,0
8008	\$0	(\$1,883)	\$0	\$0	(\$287)	\$0	\$0	\$0	\$2,169	\$2,169	(\$3,0
009	\$0	(\$1,940)	\$0	\$0	(\$290)	\$0	\$0	\$0	\$2,230	\$2,230	(\$2,0
2010	\$0	(\$2,000)	\$0	\$0	(\$293)	\$0	<b>\$0</b>	\$0	\$2,292	\$2,292	(\$1,1
2011	\$0	(\$2,061)	\$0	\$0	(\$296)	\$0	<b>\$0</b>	\$0	\$2,357	\$2,357	(\$3
2012	\$0	(\$2,124)	\$0	\$0	(\$299)	\$0	\$0	\$0	\$2,423	\$2,423	\$
2013	\$0	(\$2,189)	\$0	\$0	(\$302)	\$0	. <b>\$0</b>	\$0	\$2,491	\$2,491	\$1,
2014	\$0	(\$2,256)	\$0	\$0	(\$306)	\$0		\$0	\$2,562	\$2,562	\$1,
2015	\$0	(\$2,325)	\$0	\$0	(\$309)	\$0	\$0	\$0	\$2,634	\$2,634	\$2,
2016	\$0	(\$2,396)	\$0	\$0		allow, h <b>SO</b> b	s	\$0	\$2,709	\$2,709	\$3,
2017	\$0	(\$2,470)	\$0	\$0	(\$316)	\$0 \$0	\$0 5 5 <b>\$0</b>	<b>\$0</b>	\$2,786	\$2,786	\$3,
2018	\$0	(\$2,545)	\$0	\$0	(\$320)		₩	\$0 \$0	\$2,865 \$2,947	\$2,865 \$2,947	\$4, \$4,
2019	\$0 \$0	(\$2,623)	\$D \$0	\$0 \$0	(\$324)		\$0 \$0	\$0 \$0	\$3,031	\$3,031	\$5,
2020 2021	\$0 \$0	(\$2,703) (\$2,786)	\$0 \$0	\$0	(\$328) (\$332)	50. \$0	\$0	\$0	\$3,118	\$3,118	\$5,
2022	\$0	(\$2,872)	\$0 \$0	\$0		Gruena <b>\$0</b> . Nata ena <b>\$0</b> .	\$0	\$0	\$3,208	\$3,208	\$6,
2023	\$0	(\$2,959)	\$0	\$0	(\$341)	<b>\$</b> 0	.\$0	\$0	\$3,300	\$3,300	\$6,
2024	\$0	(\$3,050)	\$0	\$0	(\$346)	\$0	50	\$0	\$3,396	\$3,396	\$7,
2025	\$0	(\$3,144)	\$0	\$0		\$0	\$0	. \$0	\$3,494	\$3,494	\$7,
2026	\$0	(\$3,240)	\$0	\$0	(\$356)		\$0	\$0	\$3,596	\$3,596	\$7,
2027	\$0	(\$3,339)	\$0	ŚO	(\$361)	\$0	\$0	\$0	\$3,700	\$3,700	\$8,
2028	\$0	(\$3,441)	\$0	\$0		\$0	\$0	\$0	\$3,806	\$3,808	\$8,
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ominal NPV	\$16,191 \$13,094	(\$65,239) (\$18,132)			(\$8,584) (\$2,646)		\$1,000	\$16,191 \$13,094	\$74,822 \$21,592	\$58,631	
	sis,use Iscount Flate =	8.97%		· · · - ·		ديريدا لأمستخب	\$813	\$13,U84		\$8,498	· ····
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Ratepayers' impact Co	st-Effectivenes	Nessure	
Cost-Effectiveness Analysis per Rule	25-17.008 Flor	ida Administrative Code	

(1)	/2)	(3)	(4)		Analysia po (6)		OB Florida Adr			- 711	(12)	(19)	(14)
<u></u>	(2) Change in	Utility's	Utility Paid	(5) Change in	incremental	(7) Incremental	(8) Incremental	(9)	(10)	(11)	(12)	(13) Total Net	Cumulative
	Electric	Program	Rebates &	Electric	Generation	T&D	Prog Induced	Other	Other	Total	Total	Benefits to	Discounted
	Supply Costs	Costs	Incentives	Revenues	Cap Costs	Cap Costs	Fuel Costs	Costs	Benefits	Costs	Benefits	All Customers	Net Benefits
Year	(\$000s)	(\$000s)	(\$000s)	(\$000)	(\$000s)	(\$000s)	(\$000s)	(\$000s)	(\$000s)	(\$000s)	(\$000s)	(\$000s)	(\$000s)
1999	\$0	\$75	\$100	(\$29)	(\$35)	\$0	(\$11)	\$0	\$0	\$204	\$46	(\$158)	(\$15
2000	\$0	\$155	\$200	(\$85)	(\$106)	(\$79)		<b>\$0</b>	\$0	\$439	\$221	(\$218)	(\$35
2001	\$0	\$159	\$200	(\$135)	(\$185)	(\$126)		\$0	\$0	\$495	\$371	(\$123)	(\$46
2002	\$0	\$164	\$200	(\$195)	(\$263)			\$0	\$0	\$559	\$518	(\$41)	(\$49
2003	\$0	\$189	\$200	(\$244)	(\$348)	(\$209)		<b>\$0</b>	· \$0	\$813	\$669	\$56	(\$45
2004	\$0 \$0	\$87	\$100	(\$278)	(\$400)	(\$222)		\$0	\$0	\$466	\$748	\$282	(\$27
2005 2006	\$0 \$0	\$0 \$0	\$0 \$0	(\$278) (\$281)	(\$413) (\$422)	(\$214) (\$205)		\$0 \$0	50 \$0	\$276 \$261	\$758 \$758	\$478 \$477	\$1 \$27
2006	\$0	\$0	\$0 \$0	(\$288)	(\$431)			\$0	\$0	\$288	\$763	\$476	\$51
2008	\$0	\$0	\$0	(\$287)	(\$441)	(\$189)		SQ 50	\$0 \$0	\$287	\$770	\$483	\$73
2009	\$0	\$0	\$0	(\$290)				\$0	\$0	\$290	\$777	\$487	\$94
2010	\$0	\$0	\$0	(\$293)	(\$467)	(\$173		50	\$0	\$293	\$784	\$491	\$1,13
2011	\$0	\$0	\$0	(\$296)	(\$480)			\$0	\$0	\$296	\$793	\$497	\$1,31
2012	\$0	\$0	\$0	(\$299)	(\$494)	(\$157)	(\$154)	÷ . \$0	· \$0	\$299	\$804	\$505	\$1,47
2013	\$0	- \$0	\$0	(\$302)	(\$507)	(\$148)		\$0	\$0	\$302	\$812	\$509	\$1,63
2014	\$0	\$0	\$0	(\$306)	(\$521)			\$0	\$0	\$306	\$815	\$509	\$1,77
2015	\$0	\$0	\$0	(\$309)	(\$535)			\$0	\$0	\$309	\$822	\$512	\$1,9
2016	\$0	\$0	\$0 \$0	(\$313)				;- \$0 .: 50	\$0 \$0	\$313 \$316	\$829 \$840	\$516	\$2,0
2017 2018	\$0 \$0	\$0 \$0	\$0 \$0	(\$316) (\$320)	(\$564) (\$580)			\$0		\$320	\$861	\$523 \$541	\$2,1: \$2,2:
2019	\$0	\$0	\$0	(\$324)	(\$603)			50	\$0	\$324	\$885	\$561	\$2,3
2020	\$0	\$0	\$0	(\$328)	(\$627)				\$0	\$328	\$911	\$583	\$2,4
2021	\$0	\$0	\$0	(\$332)	(\$652)		an in the second second second	<b>SO</b>	s <b>\$0</b>	\$332	\$937	\$606	\$2,5
2022	\$0	\$0	\$0	(\$336)	(\$672)	(\$109)	(\$179)		\$0	\$336	\$960	\$624	\$2,6
2023	\$0	\$0	\$0	(\$341)	(\$692)	(\$106)	) <b>(\$184</b> )	\$0	\$0	\$341	\$982	<b>\$</b> 641	\$2,6
2024	\$0	\$0	\$0	(\$346)					· \$0	\$346	\$1,005	\$660	\$2,7
2025	\$0	\$0	\$0	(\$351)				\$0	\$0	\$351	\$1,030	\$679	\$2,8
2026	\$0	\$0	\$0	(\$356)				\$0	\$0	\$356	\$1,055	\$699	\$2,9
2027	\$0	\$0	\$0	(\$361)				\$0		\$361	\$1,081	\$719	\$2,9
2028	\$0	\$0	\$0	(\$367)	(\$803)	(\$90		<b>\$0</b>	\$0	\$367	\$1,107	\$741	\$3,0
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ominal NEX/		\$810	\$1,000	(\$8,584)	(\$15,228)			1999 - 1999 1997 - 1999		\$10,393	\$23,707	\$13,314	
	iscount Rete -	A 07%	3013	(\$2,646)	(\$4,260)			<u> - 10 - 10</u>	•. <del></del>	\$4,114	\$7,153	\$3,039	
		1.74											
		2412	I										
NPV Di	iscount Rate = it/Cost Ratio =	\$855 8.97% 1.74	\$813	(\$2,646		(\$1,613	<b>)</b> (\$1,280)			\$4,114	\$7,153	\$3,039	

Florida Public Service Commission
Docket No. 981591-EG
Gulf Power Company
Witness: T.S.Spangenberg
Exhibit No. \_\_\_\_\_ (TSS-1)
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# Cost Effectiveness Analysis Cooling and Heating Efficiency Enhancement Program

Existing	System		New Sy	Cost Effectiveness			
Heating	Cooling		<u>Heating</u>	Cooling	<u>RIM</u>	PART	<u>TRC</u>
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

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# Cost Effectiveness Analysis Cooling and Heating Efficiency Enhancement Program

Existing System			New System		Cost Effectiveness		
<u>Heating</u>	<u>Cooling</u>		Heating	<u>Cooling</u>	<u>RIM</u>	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	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 Resistance Heat	7 SEER A/C 8 SEER A/C		7.4 HSPF Heat Pump 7.4 HSPF Heat Pump	11 SEER Heat Pump 11 SEER Heat Pump	0.75 0.66	1.46 1.26	1.07 0.82

DOCUMENT NUMBER-DATE

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

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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. <u>98/59/-EG</u>EXHIBIT NO 2 COMPANY/ WITNESS: \_Z Danach 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

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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

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Staff's First Set of Interrogatories Docket 981591-EG GULF POWER COMPANY January 11, 1999 Item No. 1 Page 1 of 1

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.

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Staff's First Set of Interrogatories Docket 981591-EG GULF POWER COMPANY January 11, 1999 Item No. 2 Page 1 of 1

- 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.

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Staff's First Set of Interrogatories Docket 991591-EG GULF POWER COMPANY January 11, 1999 Item No. 3 Page 1 of 1

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 costeffectiveness 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.

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Staff's First Set of Interrogatories Docket 981591-EG GULF POWER COMPANY January 11, 1999 Item No. 4 Page 1 of 1

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.

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# GROUND SOURCE EFFICIENCIES HEAT PUMP VS GAS FURNACE Guif Power Company

At house Btu consumption:

Heat Pump Savings: Heat Pump % Btu savings:	13,254,327 38.8%	
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 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 = 10436 btu's/kwh thermal efficiency, Dec. 1997 Operating Report, Gulf Power		Btu input by heat pump
Ground Source Btu consumption:		
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
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

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, ILLINDIS, NEBRASKA ETC. IN FLORIDA, THE HEAT PUMP OPERATES MORE EFFICIENTLY IN OUR ZONE 2 AND ZONE 1 AREAS. ZONE 4 HAS 2000 TO 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 33 DEGREES F.

### **GROUND SOURCE EFFICIENCY ACCORDING TO AMERICAN GAS ASSOCIATION(1)**

#### HEAT PUMP BTU USAGE:

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

#### NATURAL GAS FURNACE BTU USAGE:

302 therms used by 68% AFUE furnace x 100,000 btu/the	m X .912 efficiency = 33,114,035 Btu's	
Heat Pumj Heat Pun	o Savings: 7,554,740 np % 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 66% efficient gas furnace vs. a typical 11.0 SEER, 7.4 HSPF, 3.2 COP electric heat pump.

Staff's First Set of Interrogatories Docket 981591-EG GULF POWER COMPANY January 11, 1999 Item No. 5 Page 1 of 1

- 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.

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Staff's First Set of Interrogatories Docket 981591-EG GULF POWER COMPANY January 11, 1999 Item No. 6 Page 1 of 1

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.

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Staff's First Set of Interrogatories Docket 981591-EG GULF POWER COMPANY January 11, 1999 Item No. 7 Page 1 of 1

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".

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Attachment "B" Page 1 of 2

		\$/1000CUFT	S/CUFT	S/THERM	VE TO FUEL COST #/THERM		
ALL CU FT	ALL THERMS	\$7.42	\$0.00742	\$0,7423	74.2	\$0.924	34.1
				HARGE EVER			
Normal weather rate. Do	es not include Weather N						
CHIPLEY - CHPGA	SOT (OUTSIDE CIT THERMS	Y) \$/1000CUFT	\$/CUFT	\$/THERM	¢/THERM		
UNDER 2,500 CU F		\$10.59	\$0.01059	\$1.0587	105.9		
OVER 2,500 CU FT		\$10.45	\$0.01045	\$1.0450	104.5	\$1.052	52.6
0721(2,000 0011			VINIMUM BILL				
CHIPLEY - CHPGA		\$/1000CUFT	\$/CUFT	\$/THERM	¢/THERM		
UNDER 2,500 CU F		\$7.70	\$0.00770	\$0.7700	77.0		
OVER 2,500 CU FT		\$7.60	\$0.00760	\$0.7600	76.0	\$0.765	11.0
		\$1.00 N	<b>HINIMUM BILL</b>				
			<b>CTD</b> 0				
DE FUNIAK SPRIN	GS - DFUNKOUT.R						
Cu FT		V1000CUFT	SCUFT	S/THERM	¢/THERM		
ALL CU FT	ALL THERMS	\$7.13	\$0.00713	\$0.7130	71.3	\$0.827	20.15
							- <u>-</u>
		\$4.40 C	CUSTOMER C	HARGE EVER	MONTH	······································	
DE FUNIAK SPRIN	GS - DFUNKIN.RAT	INSIDE CITY	า				
(MAY CHANGE MO						······································	
Cu FT		V1000CUFT	\$/CUFT	\$/THERM	¢/THERM		
ALL CU FT	ALL THERMS	\$6.48	\$0.00648	\$0.6482	64.8	\$0.752	9.2
_ <del></del>	<u></u>			HARGE EVER			
NATIONAL AVERAC	GE NATURAL GAS I (1996 avg. =	PRICE PER TH \$0.634 )	HERM (DOE/E	IA est. 1997: (Yellow Energ	y Guide  = \$.604)	\$0.689	
	ALL ONG AND THE	:DMQ				PER/THERM	
LP GAS PRICES - G	GALLONS AND THE		PER GALLON			PER/THERM \$1.089	
PENSACOLA	SALLONS AND THE	\$0.99000 F	PER GALLON PER GALLON			+	
		\$0.99000 F \$1.25000 F \$0.99000 F	PER GALLON			\$1.089 \$1.375 \$1.089	
PENSACOLA PANAMA CITY	н	\$0.99000 F \$1.25000 F \$0.99000 F	PER GALLON			\$1.089 \$1.375	
PENSACOLA PANAMA CITY FT WALTON BEACH NATIONAL AVERAC	H 3E (DOE/FTC/Gan	\$0.99000 F \$1.25000 F \$0.99000 F \$0.98300 F	PER GALLON PER GALLON PER GALLON	7.	arica ner KWH	\$1.089 \$1.375 \$1.089 \$1.081	
PENSACOLA PANAMA CITY FT WALTON BEACH	H 3E (DOE/FTC/Gan 3E ELECTRIC PRIC	\$0.99000 F \$1.25000 F \$0.99000 F \$0.98300 F	PER GALLON PER GALLON PER GALLON DOE/EIA) 1993		nice per KWH nice per KWH	\$1.089 \$1.375 \$1.089	-25.57
PENSACOLA PANAMA CITY FT WALTON BEACH NATIONAL AVERAC	H 3E (DOE/FTC/Gan GE ELECTRIC PRIC RAGE ANNUAL ELE	\$0.99000 F \$1.25000 F \$0.99000 F \$0.98300 F E PER KWH (1 ECTRIC PRICE	PER GALLON PER GALLON PER GALLON DOE/EIA) 1997 E 1997:	1	price per KWH price per KWH price per KWH	\$1.089 \$1.375 \$1.089 \$1.081 \$0.0846	-25.57
PENSACOLA PANAMA CITY FT WALTON BEACH NATIONAL AVERAC NATIONAL AVERAC GULF POWER AVE GULF POWER MAR	H 3E (DOE/FTC/Gan GE ELECTRIC PRIC RAGE ANNUAL ELE	\$0.99000 F \$1.25000 F \$0.99000 F \$0.98300 F E PER KWH (1 ECTRIC PRICE PRICE April, 19	PER GALLON PER GALLON PER GALLON DOE/EIA) 1997 E 1997: 998:	1	orice per KWH orice per KWH	\$1.089 \$1.375 \$1.089 \$1.081 \$0.0846 \$0.0674 \$0.0538	-25.57
PENSACOLA PANAMA CITY FT WALTON BEACH NATIONAL AVERAC NATIONAL AVERAC GULF POWER AVE	H 3E (DOE/FTC/Gan GE ELECTRIC PRIC RAGE ANNUAL ELE	\$0.99000 F \$1.25000 F \$0.99000 F \$0.98300 F E PER KWH (1 ECTRIC PRICE PRICE April, 19	PER GALLON PER GALLON PER GALLON DOE/EIA) 1997 E 1997: 998:	1	orice per KWH orice per KWH	\$1.089 \$1.375 \$1.089 \$1.081 \$0.0846 \$0.0674	-25.57
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Attachment "B" Page 2 of 2

# 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 PERCENT Therm for Heating ABOVE THE and Water Heating NATIONAL in an Efficient Home AVERAGE

19.2%

## PENSACOLA FLORIDA - PGASOUT (OUTSIDE CITY) Cu FT THERMS \$/1000CUFT \$/CUFT

Curi	IMERMS	\$1000CUF1	ACOLI	<b>WILLERW</b>	E I NERM		
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%
- <u>-</u> -		\$3.99 N	<b>MINIMUM BILL</b>	,,			

P/TUEDM

ATHERAL

## PENSACOLA FLORIDA - PGASIN (INSIDE CITY)

Cu FT	THERMS	\$/1000CUFT	\$/CUFT	\$/THERM	¢/THERM		
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 N	<b>MINIMUM BILL</b>	· · · · · · · · · · · · · · · · · · ·	-		

<b>CENTURY - CENTGAS</b>		(	MAY CHANG	E MONTHLY D	UE TO FUEL COSTS)	
Cu FT	THERMS	\$/1000CUFT	\$/CUFT	\$/THERM	¢/THERM	
FIRST 500 CU FT	5.4	A	\$6.50	charge for first		
Over 5 Cu FT	over 5.4	\$7.50	\$0.00750	\$0.7500	75.0	

# \$0.821

## \$6.50 MINIMUM BILL

<b>GULF BREEZE - GBGA</b>	SOUT (OUTS	DE CITY)	(MAY CHANGE	MONTHLY D	JE TO FUEL COSTS)		
Cu FT	THERMS	\$/1000CUFT	\$/CUFT	\$/THERM	¢/THERM		
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 CI	HARGE EVERY	MONTH		

<b>GULF BREEZE - GBGA</b>	SIN (INSIDE C	XITY)	(MAY CHANGE	E MONTHLY D	UE TO FUEL COSTS)		
Cu FT	THERMS	\$/1000CUFT	\$/CUFT	\$/THERM	¢/THERM		
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 C	HARGE EVER	Y MONTH		

MILTON - MILGASC	DT (OUTSIDE CIT	<b>n</b> (	MAY CHANG		TO FUEL COSTS)		
Cu FT	THERMS	\$/1000CUFT	\$/CUFT		/THERM		
First 5 Cu Ft	First 5	A \$7.46	charge for fi	rst 5 therms			
Over 5 Cu FT	over 5	\$10.12	\$0.01012		101.2	\$1.190	<u> </u>
	Plus BTU charge o	f 1.075, and a F	PGA of \$.035	91 per therm(can ch	nange monthly)		
Ex. for 40 cuft: (((\$7	.46+(35*\$1.012))**	.075)+(40*.0359	1)) = \$46.24	/40 therms = \$1.188	per therm for month.		
		\$7.48 N	HNIMUM BIL	Ļ			

MILTON - MILG	ASIN (INSIDE CITY)	(	MAY CHANG	E MONTHLY D	UE TO FUEL COSTS)		
Cu FT	THERMS	\$/1000CUFT	\$/CUFT	\$/THERM	¢/THERM		
First 5 Cu Ft	First 5	A \$6.38	charge for fi	st 5 therms			
Over 5 Cu FT	over 5	\$8.58	\$0.00858	\$0.8580	85.8	\$1.015	<u> </u>
	Plus BTU charge (	of 1.075, and a	PGA of \$.035	91 per therm(ca	n change monthly)		
Ex. for 40 cu ft	(((\$8.38+(35*\$.858))*1	1.075)+(40*.0359	1)) = \$39.28/4	40 therms = \$1.0	1 per therm for month.		
			<b>AINIMUM BIL</b>				<u></u>

OKALOOSA GA	S - OKGAS						
Cu FT		1000CUFT	\$/CUFT	\$/THERM	¢/THERM		
ALL CU FT	ALL THERMS	\$7.19	\$0.00719	\$0.7192	71.9	\$0.901	30.8%
		\$7.00 C	USTOMER CI	HARGE EVERY	MONTH		<u> </u>

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Staff's First Set of Interrogatories Docket 981591-EG GULF POWER COMPANY January 11, 1999 Item No. 8 Page 1 of 1

- 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.

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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.

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- 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.

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Staff's First Set of Interrogatories Docket 981591-EG GULF POWER COMPANY January 11, 1999 Item No. 11 Page 1 of 1

11. In the Participants' Cost-Effectiveness analysis provided on page 6 of Guif'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.

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Staff's First Set of Interrogatories Docket 981591-EG GULF POWER COMPANY January 11, 1999 Item No. 12 Page 1 of 1

- 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 14<sup>th</sup> 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.

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Staff's First Set of Interrogatories Docket 981591-EG GULF POWER COMPANY January 11, 1999 Item No. 13 Page 1 of 1

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.

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Staff's First Set of Interrogatories Docket 981591-EG GULF POWER COMPANY January 11, 1999 Item No. 14 Page 1 of 1

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".

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### Ratepayers' impect Cost-Effectiveness Measure Cost-Effectiveness Analysis per Rule 25-17.005 Florida Administrative Code

(4)			Cos				<b>65 Floride Adr</b>						
(1)	(2)	(3)	(4) Utility Paid	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	Change in Electric	Utilitys Program	Rebetas &	Change in Electric	Incremental Generation	Incremental T&D	Incremental Prog Induced	Other	Other	Total	Total	Total Net	Cumulativ
	Supply Costs	Costs	Incentives	Revenues	Cap Costa	Cap Costs	Fuel Costs	Costs	Benefits	Costs	Benefits	Benefits to All Customers	Discounts
Year	(\$000s)	(\$0006)	(\$000s)	(\$000)	(\$000s)	(\$000e)	(\$000s)	(\$000s)	(\$000s)	(\$000s)	(\$000a)	(\$000s)	Net Banell (\$000s)
1999	\$0	\$75	\$100	(\$171)	(\$22)	\$0	(\$66)	\$0	\$0	\$346	\$68	(\$257)	(\$0,008)
2000	\$0	\$155	\$200	(\$502)	(\$67)	(\$50)		\$0	\$0	\$857	\$332	(\$525)	(\$
2001	\$0	\$159	\$200	(\$805)	(\$117)	(\$80)		\$0	\$0	\$1,164	\$554	(\$610)	(\$1,
2002	\$0	\$164	\$200	(\$1,160)	(\$166)	(\$107)		\$0	\$0	\$1,524	\$787	(\$737)	(\$1,
2003	\$0	\$169	\$200	(\$1,448)	(\$220)	(\$132)		\$0	\$0	\$1,817	\$1,016	(\$801)	(\$2,
2004	\$0 \$0	\$87	\$100	(\$1,655)	(\$252)	(\$141)		\$0 \$0	\$0	\$1,842	\$1,141	(\$701)	(\$2,
2005 2006	\$0 \$0 \$0	\$0 \$0	\$0 \$0	(\$1,653) (\$1,668)	(\$261) (\$267)	(\$135) (\$130)		\$0 \$0	\$0 \$0	\$1,653	\$1,163	(\$490)	(\$3,
2000	50	\$0	\$0 \$0	(\$1,711)	(\$272)	(\$125)		\$0	30 \$0	\$1,668 \$1,711	\$1,170	(\$498)	(\$3,
2008	\$0	\$0	\$0	(\$1,706)	(\$279)	(\$119)		\$0	\$0	\$1,706	\$1,198 \$1,225	(\$513) (\$480)	(\$3,
2009	\$0	\$0	\$0	(\$1,723)	(\$287)	(\$114)		\$0	\$0	\$1,723	\$1,242	(\$481)	(\$3. (\$4.
2010	\$0	\$0	\$0	(\$1,741)	(\$295)	(\$109)		\$0	\$0	\$1,741	\$1,261	(\$480)	(\$4,
2011	\$0	\$0	\$0	(\$1,758)		(\$104)		\$0	\$0	\$1,759	\$1,292	(\$467)	(\$4,
2012	\$0	\$0	\$0	(\$1,778)	(\$312)	(\$99)	(\$914)	\$0	\$0	\$1,778	\$1,324	(\$454)	(\$4)
2013	\$0	\$0	\$0	(\$1,796)	(\$320)	(\$94)	(\$928)	\$0	\$0	\$1,798	\$1,342	(\$456)	(\$4)
2014	\$0 \$0	\$0	\$0	(\$1,616)	(\$329)	(\$89)		\$0	\$0	\$1,818	\$1,329	(\$469)	(\$4,
2015	<b>\$</b> 0	\$0	\$0	(\$1,838)	(\$338)	(\$84)		\$0	\$0	\$1,838	\$1,335	(\$503)	(\$4,
2016	\$0	\$0	\$0	(\$1,859)	(\$347)	(\$81)		\$0	<b>\$0</b>	\$1,859	\$1,327	(\$532)	(\$5,
2017	\$0	\$0	\$0	(\$1,880)		(\$79)		\$0	\$0	\$1,880	\$1,327	(\$554)	(\$5,
2018	\$0	\$0	\$D \$0	(\$1,903)		(\$77		\$0	\$0	\$1,903	\$1,386	(\$516)	(\$5
2019 2020	\$0	\$0 \$0	50	(\$1,925)				\$0 \$0	\$0	\$1,925	\$1,428	(\$496)	(\$5
2021	\$0 \$0	\$0 \$0	\$0 \$0	(\$1,949) (\$1,973)	•••••			\$0 \$0	\$0 \$0	\$1,949	\$1,470	(\$478)	(\$5
2022	\$0	\$0	\$0	(\$1,997)				\$0	\$0 \$0	\$1,973 \$1,997	\$1,515 \$1,557	(\$458)	(\$5,
2023	\$0	\$0	\$0	(\$2,025)				\$0	\$0	\$2,025	\$1,600	(\$440) (\$425)	(\$5,
2024	\$0	\$0	\$0	(\$2,055)				\$0	\$0	\$2,055	\$1,645	(\$410)	(\$5, (\$5,
2025	\$0	\$0	\$0	(\$2,085)				\$0	\$0	\$2,085	\$1,691	(\$393)	(\$5,
2026	\$0	50	\$0	(\$2,115)				\$0	\$0	\$2,115	\$1,739	(\$377)	(\$5,
2027	\$0	\$0	\$0	(\$2,147)				\$0	\$0	\$2,147	\$1,768	(\$359)	(\$5,
2028	\$0	\$0	\$0	(\$2,180)	(\$507)				\$0	\$2,180	\$1,839	(\$341)	(\$5)
	•	,	•										
			ŧ										
ominal NPV	iscount Rate =	\$810 \$655 8.97%	\$813	(\$51,026) (\$15,729)					<u> </u>	\$52,836 \$17,197	\$38,111 \$11,318	(\$14,725) (\$5,879)	

Attachment "C" Page 1 of 38

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Page 1 of 1 Page 1 of 1 Run Date: 23-Jul-98 03:17 PM F#ename: gthp 8

### (2) (3) (4) (1) (5) (6) (7) (8) (9) (10) (11) (12) Litility Paid Change in Total Cumulative Customer Customer Other Other Participants' Tax Rebates & Total Total Net Discounted Equip Costs **O&M Costs** Costs Benefits Credits **Electric Bills** Incentives Costs Benefits Benefits Net Benefits (\$000s) Year (\$000s) (\$000s) (\$000s) (\$000s) (\$000a) (\$000s) (\$000s) (\$000s) (\$000s) (\$000s) 1999 \$1,500 \$0 \$0 ŝô (\$171) \$0 \$100 \$1,500 \$271 (\$1,229) (\$1,229) \$0 2000 \$3.092 \$0 Ŝ0 \$0 \$200 (\$502) \$3.092 \$702 (\$2,389) (\$3,422) \$0 \$0 **\$**0 2001 \$3,187 **\$**0 (\$805) \$200 \$3,187 \$1.005 (\$2,182) (\$5.259 \$3,284 ŝ \$O ŚŌ \$0 \$200 2002 (\$1,160) \$3,284 \$1.360 (\$1,924) (\$8.747 \$3,385 ŝ \$0 \$0 \$0 2003 (\$1.448) \$200 \$3,385 \$1.648 (\$7.978) (\$1,737) ŝõ **\$**0 2004 \$1,744 \$O Ŝ0 \$100 (\$1.655) \$1.744 \$1,755 \$10 (\$7.972 \$0 \$0 2005 **\$**0 \$0 (\$1.653) \$O \$0 **S**0 \$1.653 \$1,653 (\$6.984) \$0 \$0 \$0 2006 **S**0 \$0 (\$1,668) **\$**0 \$0 \$1.668 \$1.668 (\$8.070) \$0 \$0 \$0 \$0 \$0 **\$**0 \$0 2007 (\$1.711) \$0 \$1.711 (\$5.209) \$1.711 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 Ŝ0 \$O 2008 (\$1,706) \$0 \$1.706 \$1,706 (\$4.422 \$0 \$O \$0 Ś0 \$0 2009 (\$1,723) \$1.723 \$1.723 (\$3.692 \$0 \$0 \$0 \$0 \$0 \$0 2010 (\$1.741) \$1,741 \$1.741 (\$3.016) Š0 \$0 **\$**0 \$O \$O \$0 2011 (\$1.759) (\$2,388) \$1.759 \$1,759 \$0 **\$**0 \$0 \$0 \$0 2012 **\$**0 (\$1,778) \$0 \$1,778 (\$1.806) \$1,778 \$0 \$0 \$0 \$0 \$0 \$O Ś0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 ŝ 2013 (\$1,798) (\$1,266) \$1,798 \$1.798 \$0 ŝõ \$0 Š0 2014 (\$1,818) \$1.818 \$1.818 (\$765 \$0 \$0 **\$**0 \$0 Š0 ŝō \$0 \$0 \$0 \$0 \$0 \$0 \$0 2015 (\$1.838) \$1.838 (\$300 \$1.838 \$0 \$0 \$Ö Ś0 2016 (\$1,859) \$1,659 \$1.859 \$131 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$O 2017 (\$1.880) \$532 \$1,880 \$1.880 \$0 ŝō 2018 (\$1,903) \$1.903 \$1,903 \$904 \$0 \$0 \$0 ŝō \$0 \$0 (\$1.925) ŝō 2019 \$1.249 \$1.925 \$1,925 \$0 50 \$0 \$O Ŝ0 \$0 2020 (\$1,949) \$1,570 \$1.949 \$1,949 \$0 \$0 \$0 \$0 \$0 \$0 2021 \$0 \$0 Ś0 \$0 \$1,868 (\$1,973) \$1.973 \$1.973 \$0 \$0 2022 \$0 (\$1.997) \$0 \$1,997 \$1,997 \$2,145 2023 \$0 **\$**0 <u>\$0</u> \$0 Ś0 \$0 \$0 (\$2.025) \$2.025 \$2,025 \$2,403 \$0 \$0 \$0 \$0 \$0 \$0 50 \$0 2024 (\$2.055) \$2.055 \$2,055 \$2.642 \$0 \$0 \$0 \$0 \$O \$0 2025 (\$2,085) \$2.085 \$2,085 \$2,866 \$0 \$0 \$0 \$0 \$0 \$0 \$0 2026 (\$2,115) \$2,115 \$2,115 \$3,074 \$0 \$0 \$0 \$0 \$0 \$0 2027 (\$2,147) \$0 \$2,147 \$2,147 \$3,267 4 \$0 \$0 \$0 2028 \$0 \$0 (\$2,180) \$0 \$0 \$2,180 \$2,180 \$3.448 ¢

(\$51,026)

(\$15,729)

\$1,000

\$813

\$16,191

\$13,094

\$52,026

\$16,542

\$35,835

\$3,448

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

Nominal

NPV

\$16,191

\$13,094

8.97%

1.26

Discount Rate =

Benefit/Cost Ratio =

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

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	dministrative Co (9)	(10)	(11)	(12)	(13)
	Change in			<b>A</b> 11	<b>A</b> 11	Incremental	Incremental	Incremental	<b>T-4-1</b>	<b>T</b> -1-1	Total	Cumulative
	Electric	Utility's	Participants	Other	Other	Generation	T&D	Prog Induced	Total	Total	Net	Discounted
_	Supply Costs	Program Costa		Costs	Benefits (\$000s)	Cap Costs (\$000s)	Cap Costs (\$000s)	Fuel Costs (\$000s)	Costs (\$000s)	Benefits (\$000s)	Benefits	Net Benefit
	(\$000s)	(\$000s)	(\$000s)	(\$000s)			(30006) \$0		\$1,575	(20005) \$88	(\$000e)	(\$000s)
999	\$0	\$75	\$1,500	\$0 \$0	\$0 \$0	(\$22) (\$67)	(\$50)	(\$66) (\$216)	\$3,246	\$332	(\$1,487) (\$2,914)	(\$1,4
000	\$0	\$155	\$3,092 \$3,187	\$0 \$0	\$0 \$0	(\$07) (\$117)	(\$80) (\$80)	(\$357)	\$3,346	\$554	(\$2,792)	(\$4,1 (\$6,5
001	\$0 \$0	\$150	\$3,264	\$0 \$0	\$0	(\$166)	(\$107)	(\$514)	\$3,448	\$787	(\$2,661)	(\$8,5
002	U4 C	\$164 \$169	\$3,365	\$0	\$0	(\$220)	(\$132)	(\$664)	\$3,554	\$1,016	(\$2,538)	(\$10,3
003	\$0 \$0	\$87	\$1,744	\$0	\$0	(\$252)	(\$141)	(\$748)	\$1,831	\$1,141	(\$690)	(\$10,8
004 005	\$0 \$0	\$0	\$0	\$0	\$0	(\$261)	(\$135)	(\$768)	\$0	\$1,163	\$1,163	(\$10,1
006		\$0	\$0	<b>\$</b> 0	\$0	(\$267)	(\$130)	(\$774)	\$0	\$1,170	\$1,170	(\$9,4
007	\$0 \$0 \$0	\$0	\$0	<b>\$</b> 0	<b>\$</b> 0	(\$272)	(\$125)	(\$801)	\$0	\$1,198	\$1,198	(\$8.8
007	90 80	\$0	40 60	50	\$0	(\$279)	(\$119)	(\$827)	\$0	\$1,225	\$1,225	(\$8,3
	\$0 \$0	\$0	\$0 \$0	\$0 \$0	<b>5</b> 0	(\$287)	(\$114)	(\$841)	\$0	\$1,242	\$1,242	(\$7,7
009	<b>e</b> u 60	\$0	\$0	\$0	60	(\$295)	(\$109)	(\$857)	\$0	\$1,261	\$1,261	(\$7,2
010 011	\$0 \$0	\$0 \$0		\$0	÷	(\$303)	(\$104)	(\$885)	\$0	\$1,292	\$1,292	(\$6,6
	\$0 \$0	\$0		\$0 \$0	\$0 \$0 \$0 \$0 \$0	(\$312)	(\$99)	(\$914)	\$0	\$1,324	\$1,324	(\$6,4
012	\$0 \$0	\$0	\$0	\$0	50	(\$320)	(\$94)		\$0	\$1,342	\$1,342	(\$6,0
013	\$0 \$0	\$0 \$0	\$0	\$0	\$0	(\$329)	(\$89)	(\$911)	\$0	\$1,329	\$1,329	(\$5,6
014		i \$0 i \$0	\$0	\$0	\$0	(\$338)	(\$84)		\$0	\$1,335	\$1,335	(\$5.2
2015	\$0 \$0	i \$0 i \$0	\$0	\$0	\$0	(\$347)	(\$81)		\$0	\$1,327	\$1,327	(\$4,6
2016	ân ân	su \$0	\$0 \$0	\$0	\$0	(\$356)	(\$79)		\$0	\$1,327	\$1,327	(\$4,7
2017	\$0	; şu ; \$0	\$0	\$0	\$0	(\$366)	(\$77)		\$0	\$1,386	\$1,386	(\$4,4
2018	\$0	i au } \$0	\$0	\$0 \$0	\$0 \$0	(\$381)	(\$75)		\$0	\$1,428	\$1,428	(\$4)
2019	\$0 \$0	, au ) \$0	\$0	50	\$0	(\$396)	(\$73)		\$0	\$1,470	\$1,470	(\$3,1
2020	\$0	\$0	\$0	\$0	\$0	(\$412)	(\$71)		\$0	\$1,515	\$1,515	(\$3,7
2021 2022	\$0	\$0	\$0	ŝõ	\$0	(\$424)	(\$69)		\$0	\$1,557	\$1,557	(\$3,4
2023	\$0	) <b>\$</b> 0	\$0	\$0	\$0	(\$437)	(\$67)		\$0	\$1,600	\$1,600	(\$3,2
2023		50	\$0	\$0	\$0	(\$450)			\$0 \$0	\$1,645	\$1,645	(\$3,0
2025	\$0	) \$0 ) \$0 ) \$0	\$0	\$0	\$0	(\$464)			\$0	\$1,691	\$1,691	(\$2.9
2026	\$0	si si	\$0	\$0		(\$478)			\$0	\$1,739	\$1,739	(\$2,
2027	\$0	\$0	) \$0	\$0					\$0	\$1,788	\$1,788	(\$2,
2028		) <b>Š</b> Č		\$0					\$0	\$1,839	\$1,839	(\$2,
		•										
			۴									
Nomina NP		\$81 \$86				(\$9,617 (\$2,690			\$17,001 \$13,749	\$38,111 \$11,318	\$21,110 (\$2,431)	
	Discount Rate	= 8.97	X									
<b>n</b>	nell/Cost Ratio	= 0.8	2									

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### **INPUT DATA ~ PART 1**

### Cost-Effectiveness Analysis per Rule 25-17.008 Fiorida 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/Cui

   (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)

   \*(8) Change in Winter kW per Cust at meter
   -4.60

H.	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 Reg (0) or Val-of-Def (1)	0	

(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 Equpiment 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%	• -

(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	S/kW
(5) Base Year Incremental Transmission Cost	\$58.75	
(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		\$/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/YF
* (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	
<ul> <li>(5)Average Annual Change in Monthly Billing kW</li> </ul>	0	kW/Mo.

Summary Results for This Analysis	6	
	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

\* Supplemental Information Not Specifically Specified in Cost Effectiveness Manual

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Ratepeyers' impact Cost-Effectiveness Measure Cost-Effectiveness Analysis per Rule 25-17.008 Florida Administ the Code

							08 Florida Ada						
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	Change In	Utility's	<b>Utility</b> Paid	Change in	Incremental	Incremental	Incrementel	<b>o</b>	<b>CR</b>	<b>T</b> -4-1	<b>-</b>	Total Net	Cumulative
	Electric	Program	Rebetes &	Electric	Generation	T&D	Prog induced	Other	Other	Total	Total	Benefits to	Discounted
	Supply Costs	Costs	incentives	Revenues	Cap Costs	Cap Costs (\$000s)	Fuel Costs (\$000s)	Costs (\$000s)	Benelits (\$000s)	Costs	Benefits (\$000s)	All Customers	Net Benefits
Yeer	(\$000a)	(\$000s) \$75	(\$000s) \$100	(\$000) (\$199)	(\$000s) (\$35)		(\$0006)	\$0	\$0	(\$000s) \$374	\$112	(\$000s) (\$262)	(\$000#)
1999	\$0	\$155	\$200	(\$585)	(\$106)	• -		\$0	\$0	\$940	\$436	(\$504)	(\$26 (\$72
2000	\$0		\$200	(\$937)	(\$185)			\$0	50	\$1,297	\$727	(\$569)	(\$1,20
2001	\$0 \$0	\$159 \$164	\$200	(\$1,351)	(\$263)	(\$ 169)		\$0	\$0	\$1,715	\$1,031	(\$684)	(\$1,20
2002	\$0 \$0	\$169	\$200	(\$1,686)	(\$348)			\$0	\$0	\$2,055	\$1,331	(\$724)	(\$1,73
2003	\$0	\$87	\$100	(\$1,927)	(\$400)				\$0	\$2,114	\$1,493	(\$621)	(\$2,66
2004 2005	90 60	÷07 \$0	\$0	(\$1,926)	(\$413)			\$0 \$0	\$0	\$1,926	\$1,521	(\$405)	(\$2,8
2005	\$0 \$0	\$0	\$0	(\$1,943)	(\$422)			\$0	\$0	\$1,943	\$1,529	(\$414)	(\$3,1
2000	\$0	\$0	\$0	(\$1,993)	(\$431)			50	\$0	\$1,993	\$1,562	(\$431)	(\$3,3
2008	\$0	\$0	\$0	(\$1,987)	(\$441)			\$0 \$0 \$0	\$0	\$1,987	\$1,594	(\$393)	(\$3,5)
2009	50	\$0	\$0	(\$2,007)	(\$454)			50	\$0	\$2,007	\$1,615	(\$393)	(\$3,6
2010	50	\$0	\$0	(\$2,028)	· · ·	•••••••••••••••••••••••••••••••••••••••		50	\$0	\$2,028	\$1,637	(\$391)	(\$3,8
2011	\$0 \$0 \$0	\$0	\$0	(\$2,049)	(\$480)			\$0 \$0	\$0	\$2,049	\$1,675	(\$374)	(\$3,9
2012	\$0	\$0	\$0 \$0 \$0 \$0	(\$2,071)				\$0	\$0	\$2,071	\$1,714	(\$357)	(\$4,0
2013	\$0	\$0	\$0	(\$2,094)				\$0	\$0	\$2,094	\$1,738	(\$358)	(\$4,1
2014	\$0	\$0	\$0	(\$2,117)				\$0	\$0	\$2,117	\$1,723	(\$394)	(\$4,3
2015	50	\$0	\$0	(\$2,141)				\$0	\$0	\$2,141	\$1,731	(\$410)	(\$4,4
2016	\$0	\$0	\$0	(\$2,165)		(\$129	) (\$1,047)	so	\$0	\$2,165	\$1,725	(\$440)	(\$4,5
2017	\$0 \$0	\$0	\$0	(\$2,190)	(\$564)	) (\$126	) (\$1,038)	\$0	\$0	\$2,190	\$1,728	(\$463)	(\$4,6
2018	\$0 \$0	\$0	\$0	(\$2,216)	(\$580)				\$0	\$2,216	\$1,801	(\$415)	(\$4,6
2019	\$0	\$0	SO 50	(\$2,243)				\$0	\$0	\$2,243	\$1,854	(\$389)	(\$4,7
2020	\$0	\$0	<b>\$0</b>	(\$2,270)	(\$627)	) (\$115		<b>\$0</b>	\$0	\$2,270	\$1,909	(\$361)	(\$4,8
2021	\$0	\$0	so \$0	(\$2,296)				\$0	\$0	\$2,298	\$1,966	(\$332)	(\$4,8
2022	50	\$0	\$0	(\$2,326)					\$0	\$2,326	\$2,020	(\$306)	(\$4,9
2023	\$0	\$0	i \$0	(\$2,359)	) (\$692)	) (\$108	) (\$1,277)			\$2,359	\$2,075	(\$284)	(\$4,9
2024	50	\$0	i <b>\$0</b>	(\$2,393)					50	\$2,393	\$2,132	(\$262)	(\$4,9
2025	\$0	\$0		(\$2,428)	) (\$735)				\$0	\$2,428	\$2,190	(\$238)	(\$5,0
2026	\$0	\$0	) <b>\$</b> 0	(\$2,464)						\$2,464	\$2,251	(\$213)	(\$5,0
2027	\$0	\$0	) <b>\$</b> 0	(\$2,501)						\$2,501	\$2,313	(\$188)	
2028	i <b>\$0</b>	\$0	) <b>\$</b> 0	(\$2,539	) (\$803	) (\$90	) (\$1,485)	) \$0	\$0	\$2,539	\$2,378	(\$162)	(\$5,0
		•,	•										
·			٠										
Nomina		\$81 \$65	- • •							\$61,244 \$19,789	\$49,507 \$14,738	(\$11,737) (\$5,053)	
	Discount Rate =							•			تت فافر في		
	olit/Cost Ratio =												
		0.1	U										

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### gthp\_7 Participants' Cost-Effectiveness Measure Cost-Effectiveness Analysis per Rule 25-17.008 Florida Administrative Code (4) (5) (8) (9) (6) (7) (10) (11) (12) Change in **Utility Paid** Total Cumulative Other Other Participants' Rebates & Total Total Tax Net Discounted Costs Benefits **Electric Bills** Credits Incentives Costs **Benefits Benefits** Net Benefits (\$000s) (\$000s) (\$000s) (\$000s) (\$000s) (\$000s) (\$000s) (\$000s) (\$000s) \$0 \$0 (\$199) \$0 \$1,500 \$100 \$299 (\$1,201) (\$1,201) \$0 \$0 (\$585) \$0 \$200 \$3,092 \$785 (\$2,307) (\$3,318) \$0 \$0 (\$937) \$0 \$200 \$3,187 (\$2,049) (\$5,044) \$1,137 \$0 \$0 (\$1,351) \$0 \$200 \$3,284 \$1,551 (\$1,733) (\$6.383) \$0 \$0 \$0 (\$1,686) \$200 \$3,385 (\$7,446) \$1,886 (\$1,498) \$0 \$0 (\$1,927) \$0 \$100 \$1,744 \$2,027 \$283 (\$7,262) \$0 \$0 \$0 \$0 (\$1,926) \$0 \$1,926 \$1,926 (\$6,111) \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 (\$1,943) \$0 \$1.943 \$1,943 (\$5,046) \$0 (\$1,993) \$0 \$0 \$1,993 \$1,993 (\$4,044) \$0 \$0 (\$1,987) \$0 \$0 \$1,987 \$1,987 (\$3,127) \$0 \$0 \$0 (\$2,007) \$0 \$0 (\$2,277) \$2,007 \$2,007 \$0 (\$2,028) \$0 \$0 \$2,028 \$2,028 (\$1,489) \$0 \$0 \$0 \$0 (\$2,049) \$2,049 \$2,049 (\$758) \$0 \$0 (\$2,071) \$0 \$0 \$2,071 \$2,071 (\$80) \$0 \$0 \$0 \$0 \$0 \$0 \$0 (\$2,094) \$2.094 \$2,094 \$549 \$0 (\$2,117) \$0 \$0 \$2,117 \$2,117 \$1,133 \$0 \$0 \$0 (\$2,141) \$0 \$0 \$2,141 \$2,141 \$1,674 177 543 )77 179 353 200 522 822 102 362

NPV	ount Rate =	8.97%									
Nominal	\$16,191 \$13,094				(\$59,435) (\$18,321)		\$1,000 \$813	\$16,191 \$13,094	\$60,435 \$19,134	\$44,243 \$6,040	
	•										
2028	<b>\$0</b>	<b>\$</b> 0	<b>\$</b> 0	<b>\$</b> 0	(\$2,539)	\$0	\$0	<b>\$</b> 0	\$2,539	\$2,539	\$
2026 2027	\$0 + \$0	\$0 \$0	\$0 \$0	\$0 \$0	(\$2,464) (\$2,501)	\$0 \$0	\$0 \$0	\$0 \$0	\$2,464 \$2,501	\$2,464 \$2,501	\$
2024 2025,	\$0 \$0	\$0 \$0	\$0 \$0	\$0 \$0	(\$2,393) (\$2,428)	\$0 \$0	\$0 \$0	\$0 \$0	\$2,393 \$2,428	\$2,393 \$2,428	1
2023	\$0	\$0	\$0	\$0	(\$2,359)	\$0	\$0	\$0	\$2,359	\$2,359	1
2021 2022	\$0 \$0	\$0 \$0	\$0 \$0	\$0 \$0	(\$2,298) (\$2,326)	\$0 \$0	\$0 \$0	\$0 \$0	\$2,298 \$2,326	\$2,298 \$2,326	\$
2020	\$0	\$0	<b>\$</b> 0	\$0	(\$2,270)	<b>\$</b> 0	<b>\$</b> 0	\$0	\$2,270	\$2,270	1
2019	\$0	\$0	\$0	\$0	(\$2,243)	\$0	\$0	\$0	\$2,243	\$2,243	5
2016	\$0 \$0	\$0 \$0	\$0 \$0	\$0 \$0	(\$2,190) (\$2,216)	\$0 \$0	\$0 \$0	\$0 \$0	\$2,190 \$2,216	\$2,190 \$2,216	\$ \$
2017 2018											

(1)

Year

1999

2000

2001

2002

2003

2004

2005

2006

2007

2008

2009

2010

2011

2012

2013

2014

2015

(2)

Customer

Equip Costs

(\$000s)

\$1,500

\$3,092

\$3,187

\$3,284

\$3,385

\$1,744

\$0

\$0

\$0

\$0

\$0

\$0

\$0

\$0

\$0

\$0

\$0

(3)

Customer

**O&M Costs** 

(\$000s)

\$0

\$0

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# Total Resource Cost-Effectiveness Measure

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	dministrative Co (9)	(10)	(11)	(12)	(13)
	Change in		<b>.</b>			Incremental	incrementel	incremental			Total	Cumulative
	Electric	Utility's	Participants	Other	Other	Generation	T&D	Prog induced	Total	Total	Net	Discounted
	Supply Costs	Program Costs		Costs	Benefits	Cap Costs	Cap Costs	Fuel Costs	Costs	Benefits	Benefits	Net Benefits
fear -	(\$000s)	(\$000s)	(\$000#)	(\$000s)	(\$000s)	(\$000s)	(\$000s)	(\$000s)	(\$000s)	(\$000s)	(\$000s)	(\$000s)
999	\$0		\$1,500	\$0	\$0	(\$35)	\$0	(\$77)	\$1,575	\$112	(\$1,463)	(\$1,46
000	\$0	\$155	\$3,092	\$0	\$0	(\$106)	(\$79)	(\$251)	\$3,246	\$436	(\$2,811)	(\$4,04
001	\$0	\$159	\$3,187	\$0	\$0	(\$185)	(\$126)	(\$416)	\$3,346	\$727	(\$2,619)	(\$8,24
002	\$0	\$164	\$3,264	\$0	\$0	(\$263)	(\$169)	(\$599)	\$3,448	\$1,031	(\$2,418)	(\$8,11
003	\$0	\$169	\$3,385	\$0	\$0	(\$348)	(\$209)	(\$774)	\$3,554	\$1,331	(\$2,223)	(\$9,61
004	\$0	\$87	\$1,744	\$0	\$0 \$0	(\$400)	(\$222)	(\$871)	\$1,831	\$1,493	(\$338)	(\$9,91
005	\$0		\$0	\$0	\$0	(\$413)	(\$214)		\$0	\$1,521	\$1,521	(\$9,00
006	\$0	\$0	\$0	\$0	\$0	(\$422)	(\$205)	(\$901)	\$0	\$1,529	\$1,529	(\$8,16
007	\$0	\$0		\$0	\$0		(#200)					
		<b>2</b> 0	\$0		\$0 \$0	(\$431)	(\$197)		<b>\$</b> 0	\$1,562	\$1,562	(\$7,3
800	\$0	\$0	\$0	\$0	au au	(\$441)	(\$189)	(\$964)	\$0	\$1,594	\$1,594	(\$6,64
009	\$0	\$0	\$0	\$0	\$0	(\$454)	(\$181)		\$0	\$1,615	\$1,615	(\$5,96
1010	\$0		\$0	\$0	\$0	(\$467)	(\$173)		\$0	\$1,637	\$1,637	(\$5,32
2011	\$0	\$0	\$0	\$0	\$0	(\$460)	(\$165)		\$0	\$1,675	\$1,675	(\$4,7)
012	\$0	<b>\$0</b>	\$0	\$0	\$0	(\$494)	(\$157)	(\$1,064)	\$0	\$1,714	\$1,714	(\$4,10
013	\$0	\$0	\$0	\$0	\$0	(\$507)	(\$148)		\$0	\$1,736	\$1,736	(\$3,64
014	\$0	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$0	\$0	\$0	(\$521)	(\$140)		\$0	\$1,723	\$1,723	(\$3,17
015	\$0	\$0	\$0	\$0	\$0	(\$535)	(\$133)		\$0	\$1,731	\$1,731	(\$2,73
016	\$0		\$0	\$0	\$0	(\$549)	(\$129)	(\$1,047)	\$0	\$1,725	\$1,725	(\$2.3
017	\$0		\$0	50	\$0	(\$564)	(\$128)		\$0	\$1,728	\$1,728	(\$1,9
			<b>P</b> U		\$0				\$0			
2018	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0		\$0 \$0 \$0 \$0	\$0	9U	(\$580)	(\$122)			\$1,801	\$1,801	(\$1,6
2019	9U	<b>ŞU</b>	20	\$0	\$0	(\$603)	(\$119)		\$0	\$1,854	\$1,854	(\$1,2)
2020	50	\$0	20	\$0	\$0	(\$627)	(\$115)		\$0	\$1,909	\$1,909	(\$9
2021	ŞQ	\$0	\$0	\$0	\$0	(\$652)	(\$112)		\$0	\$1,966	\$1,966	(\$6
2022	\$0	\$0 \$0	\$0	\$0	\$0	(\$672)	(\$109)		\$0	\$2,020	\$2,020	(\$3)
2023	\$0	) \$0	\$0	\$0	\$0	(\$692)			\$0	\$2,075	\$2,075	(\$1)
2024	\$0 \$0	) <b>\$</b> 0	\$0	\$0	\$0	(\$713)	(\$102)	) (\$1,316)	\$0	\$2,132	\$2,132	\$1;
2025	\$0	\$0	\$0	\$0	\$0	(\$735)	(\$99)	) (\$1,356)	\$0	\$2,190	\$2,190	\$3
2026	\$0	\$0	<b>\$0</b>	<b>\$</b> 0	\$0	(\$757)	(\$96)	) (\$1,396)	\$0	\$2,251	\$2,251	\$5
2027	\$0			\$0	\$0	(\$780)	(\$93)	(\$1,441)	\$0	\$2,313	\$2,313	\$7
2028	\$0	\$0		\$0	<b>\$</b> 0				\$0	\$2,378	\$2,378	\$9
	•,	•										
			ŧ									
omina NPV	,	\$81( \$855	5 \$13,094		<del></del>	(\$15,228) (\$4,260)			\$17,001 \$13,749	\$49,507 \$14,736	\$32,508 \$987	
_	Discount Rate											
Bei	nelit/Cost Ratio	- 1.07	7									

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1999 2001 2000 \$234.85 \$/kW \$58.75 \$/kW \$33.00 \$/kW 2.56%

2.99%

\$2.77 \$/kW/Yr

\$0.73 \$AW/Yr \$0.84 \$/kW/Yr 2.56% \$0.433 \$/kW/Yr 3.84% 3.40% \$0.0356 \$/kWh 3.00%

\$20.70 \$/KW/YR

2.56%

Per Table

\$14,736 \$19,789

(\$5,053)

0.745

0

\$0.0352 \$/kWh Per Table

\$0.0000 \$/kW/Mo

0 kW/Mo.

Participants' \$19,134

\$13,094

\$6,040

1.461

### **INPUT DATA - PART 1**

## Cost-Effectiveness Analysis per Rule 25-17.038 Florida Administrative Code .

1	Program Demand Impacts and Line Losses		1	IV. Incremental Generation, Transmission, & Distribution Co	sta
	(1) Change in Peak kW Customer at meter	-1.90	kW/Cus	(1) Base Year	1
	(2) Change in Peak kW per Customer at generator	-2.46	kW Gen/Cut	(2) In-Service Year For Incremental Generation	2
	(3) kW Line Loss Percentage	12.60%		(3) In-Service Year For Incremental T & D	_
	(4) Change in KWh per Customer at generator	(7,681)	kWh/Cus/Yr	(4) Base Year Incremental Generation Cost	\$234
	(5) kWh Line Loss Percentage	7.70%		(5) Base Year Incremental Transmission Cost	\$58
	(6) Group Line Loss Multiplier	1.0014		(6) Base Year Incremental Distribution Cost	\$33
	(7) Annual Change in Customer kWh at Meter	(7,132)	kWh/Cus/Yr	(7) Gen, Tran, & Dist Cost Escalation Rate	2.5
	*(8) Change in Winter kW per Cust at meter	-4.60	kW/Cus	(8) Generator Fixed O & M Cost	\$
			, I	(9) Generator Fixed O&M Escalation Rate	2.8
				(10) Transmission Fixed O & M Cost	\$0
				(11) Distribution Fixed O & M Cost	\$0
H.	Economic Life and K-Factors			(12) T&D Fixed O&M Escalation Rate	2.5
	(1) DSM Program Study Period		Years	(13) Incremental Gen Variable O & M Costs	\$0.
	(2) Economic Life of Incremental Generation		Years	(14) Incre Gen Variable O&M Cost Esc Rate	3.6
	(3) Economic Life of Incremental T&D		Years	(15) Incremental Gen Capacity Factor	3.4
	(4) K-Factor for Generation	1.4493	-	(16) Incremental Generating Unit Fuel Cost	\$0.0
	(5) K-Factor for T&D	1.4394		(17) Incremental Gen Unit Fuel Esc. Rate	3.0
	*(6) Switch: Rev Req (0) or Val-of-Def (1)	0	_	* (18) Incremental Purchased Capacity Cost	\$2
$\sim$			-	* (19) Incremental Capacity Cost Esc Rate	2.
ວວ <b>#</b>	Utility & Customer Costs				
	(1) Utility Nonrecurring Cost Per Customer	\$150.00		Stop Revenue Loss at In-Service Year? (Y=1, N=0)	
	(2) Utility Recurring Cost Per Customer		\$/Cus/Year		
	(3) Utility Cost Escalation Rate	3.06%		V. (1) Non-Fuel Cost in Customer Bill (Base Year)	
	(4) Customer Equipment Cost	\$3,000.00	\$/Cus	(1) Non-Fuel Cost In Customer Bill (Base Year)	\$0.0
	(5) Customer Equpiment Cost Escalation Rate	3.06%	_		Per T
	(6) Customer O&M Cost		\$/Cus/Year	(3) Customer Demand Charge Per kW (Base Year)	\$0.0
	(7) Customer O&M Cost Escalation Rate	3.06%			Per T
	* (8) Customer Tax Credit Per Installation		\$/Cus	* (5)Average Annual Change in Monthly Billing kW	
	*(9) Customer Tax Credit Escalation Rate	3.06%	-	1	
	* (10) Change in Supply Costs		\$/Cus/Year	1	
	* (11) Supply Costs Escalation Rate	3.06%		1	
	* (12) Utility Discount Rate	8.97%		Summary Results for This Analysis	
	* (13) Utility AFUDC Rate	10.30%			RIM
	* (14) Utility Nonrecurring Rebate/incentive		\$/Cus	NPV Benefits(\$000s)	\$14
	* (15) Utility Recurring Rebete/Incentive	\$0.00	\$/Cus/Year	NPV Costs (\$000s)	\$19
	* (16) Utility Rebate/Incentive Escalation Rate	0.00%	•	NPV Net Benefits (\$000s)	(\$5
	<u> </u>			Benefit:Cost Ratio	0

\* Supplemental Information Not Specifically Specified in Cost Effectiveness Manual

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(1)         (2)         (3)         (4)         (13)         (14)         (13)         (14)           Change In         UBMP 40         Change In         Incommental I				Cos	Effectivence	e Analysis pe	r Rule 25-17.6	OE Floride Ade	<b>skilutrativ</b>					
Example         Description         Release 8         Example         Description         Concernance Care Costs         Care Costs         Description         Concernance Care Costs         Description         Concernance Care Costs         Description         Concernance Care Costs         Description         Concernance Care Costs         Concernance Care Costs </th <th>(1)</th> <th></th> <th></th> <th></th> <th></th> <th>and the second second</th> <th>and the second secon</th> <th></th> <th>(9)</th> <th>(10)</th> <th>(11)</th> <th>(12)</th> <th></th> <th>(14)</th>	(1)					and the second	and the second secon		(9)	(10)	(11)	(12)		(14)
Supply Costs         Costs         Jonantive         Revenues         Cap Costs         Fuel Costs         Costs         Burnits         All Costs         Fuel Costs         Costs         Burnits         All Costs         Fuel									-					
Year         (2000-)         (200-)         (211-)         (2														
1980         60         875         5100         (\$145)         (\$22)         50         (\$23)         50         \$252         \$43         (\$145)         (\$145)           2000         50         5159         5200         (\$145)         (\$147)         (\$800)         (\$112)         50         504         \$2220         (\$144)         (\$220)         \$60         \$60         \$612         \$3144         (\$220)         (\$147)         \$60         \$612         \$3144         (\$220)         (\$147)         \$60         \$60         \$612         \$3144         \$(\$220)         (\$141)         \$60         \$612         \$6144         \$6220         (\$241)         \$61         \$772         \$6244         \$6271         \$6144         \$6220         \$6171         \$6177         \$6223         \$6171         \$6171         \$6170         \$6223         \$6171         \$6171         \$6171         \$6171         \$6171         \$6171         \$6170         \$6223         \$6171         \$6171         \$6170         \$6223         \$6111         \$61171         \$6170         \$6223         \$6111         \$61171         \$6170         \$6172         \$61716         \$6172         \$61716         \$6172         \$61716         \$6172         \$6171         \$617	Vaar						(\$000a)							
2000         8.0         5155         5200         (\$155)         (\$177)         (\$60)         (\$112)         50         60         512         \$144         (\$233)         (\$177)         (\$60)         (\$112)         50         50         512         \$144         (\$233)         (\$177)           2002         50         \$164         \$200         \$1344         (\$123)         (\$123)         (\$120)         (\$123)         (\$120)         \$132         \$1200         \$10         \$10         \$10         \$10         \$10         \$102         \$1234         \$117														
2001         30         3159         3200         (3233)         (\$117)         (\$40)         (\$112)         50         50         57.6         84.34         (\$224)         (\$57)           2002         50         \$144         \$200         (\$445)         (\$222)         (\$122)         \$10         50         50         57.6         84.34         (\$224)         (\$312)           2003         60         50 <t< th=""><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th>(\$68)</th><th></th><th>\$0</th><th></th><th></th><th></th><th></th></t<>								(\$68)		\$0				
2002         30         5164         3200         (\$445)         (\$107)         (\$122)         (\$123)         (\$200)         50         50         5424         \$124)         (\$244)         (\$244)         (\$31,5)           2004         50         547         \$100         (\$820)         (\$122)         (\$1312)         (\$220)         (\$132)         (\$220)         \$132         (\$230)         50         50         5424         5551         (\$244)         (\$132)         (\$241)         (\$132)         (\$241)         50         50         5224         555         5171         (\$131)           2007         50		<b>Š</b> Ū	• • •		(\$253)	(\$117)								
2003         60         \$16e         \$200         (\$445)         (\$220)         (\$122)         (\$225)         50         50         50         50.77         52.28         (\$77)         52.28         (\$71,27)         (\$12,22)         (\$12,25)         50         50         50.77         52.28         (\$71,27)         (\$12,32)           2005         50         50         50         50         50         50         50.77         52.28         \$81,37         \$117         (\$11,37)           2006         50         50         50         50         50         50         50.85         51.15         (\$12,17)         (\$12,18)         50         50.85         51.11         (\$11,17)         (\$12,18)         50         50         50.75         50.75         51.75         50.75         51.75         50.75         51.75         50.75         51.75		\$0		\$200					\$0	\$0				(\$970
2005         50         60         50         60         50         62300         (6230)         (6243)         (6130)         (6243)         80         80         8237         \$117         (61,137)           2007         50         5124         (50         50         50         5124         (50         50         50         50         50         50         50         50 <th></th> <th>\$0</th> <th>\$169</th> <th>\$200</th> <th></th> <th></th> <th>(\$132)</th> <th></th> <th>\$0</th> <th>\$0</th> <th>\$824</th> <th></th> <th></th> <th>(\$1,157</th>		\$0	\$169	\$200			(\$132)		\$0	\$0	\$824			(\$1,157
2006         50         5		\$0 -							\$0	\$0		\$625	(\$79)	(\$1,208
2007         50         5326         56365         5122         (5111)           2006         50         50         50         50         50         50         50         5124         (5114)           2010         50         50         50         50         50         5124         (5114)           2011         50         50         50         50         50         50         5124         (5812)           2011         50         50         50         50         50         512         (5812)           2013         50         50         50         50         571         5704         513         (582)           2016         50         50         50         50         571         5704         513         (582)           2016         50         50         50         50         50         50         50         50         50         50         50 <th></th> <th>\$0</th> <th></th> <th>\$0</th> <th></th> <th></th> <th></th> <th></th> <th>\$0</th> <th>\$0</th> <th></th> <th></th> <th></th> <th>(\$1,136</th>		\$0		\$0					\$0	\$0				(\$1,136
2006         50         50         50         50         50         50         50         50         5122         (5811)           2010         50         50         50         50         (5547)         (5114)         (5244)         50         5541         5665         5124         (5817)           2011         50         50         50         (5547)         (5285)         (5109)         (5278)         50         563         5863         5865         5132         (5817)           2013         50         50         (5569)         (512)         (5899)         (5271)         50         50         5666         5132         (5891)           2014         50         50         50         (5571)         (5329)         (5894)         50         50         5774         5704         5133         (5862)           2014         50         50         50         (5341)         (5347)         (5814)         (5277)         50         50         50         5133         (5862)           2014         50         50         50         50         50         50         50         50         50         50         50         50		\$0	\$0	\$0	(\$524)	(\$267)			\$0	\$0				(\$1.075
2008         50         50         50         (5541)         (5287)         (5114)         (5289)         50         541         5865         5124         (548           2010         50         50         50         50         50         50         5124         (548           2011         50         50         50         50         50         (5835)         (5303)         (5104)         (5271)         50         50         5668         5668         5668         5132         (586           2013         50         50         50         (5305)         (5320)         (5844)         50         50         5314         (576           2016         50         50         50         (5578)         (538)         (5844)         (5227)         50         50         5374         5704         5133         (586           2016         50         50         50         50         50         513         (5668)         5774         5706         5141         (572         (580         50         50         50         5141         (572         (580           2016         50         50         50         50         50         50		\$0	\$0	50	(\$538)	(\$272)			50	\$0				
2010         50         50         80         (\$249)         60         60         8547         8273         9126         (\$849)           2011         50         50         50         (\$559)         (\$312)         (\$99)         (\$278)         50         50         \$553         \$865         \$132         (\$99)         (\$278)         50         \$0         \$556         \$8665         \$133         (\$571)           2013         50         50         50         50         \$50         \$566         \$8133         (\$572)         \$50         \$50         \$571         \$704         \$133         (\$68)         (\$228)         \$50         \$50         \$571         \$704         \$133         (\$68)         (\$287)         \$50         \$50         \$564         \$711         \$127         (\$622)         \$2016         \$40         \$50         \$		\$0	\$0	\$0										
2011         50         50         50         553         5653         5705         51141         (572)           2013         50         50         50         50         50         50         5573         5700         5131         (566)           2016         50         50         50         50         50         50         50         50         5131         (562)           2016         50         50         50         50         50         50         5564         5711         5122         (582)           2016         50         50         50         (5864)         (5841)         (575)         (5305)         50         50         564         5716         5166         (584)           2016         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         5		\$0	<b>\$</b> 0	<b>\$</b> U					50	<b>2</b> 0				(\$910
2014         50         50         50         50         50         571         \$704         \$133         (\$489)           2015         50         50         50         50         571         \$704         \$133         (\$485)           2016         50         50         50         50         571         \$709         \$131         (\$485)           2017         50         50         50         50         5511         \$711         \$127         (\$420)           2016         50         50         50         50         5511         \$716         \$125         (\$400)           2017         50         50         50         50         564         \$7716         \$125         (\$400)           2018         50         50         50         50         50         50         540         \$142         \$1711         \$132         \$168           2020         50         50         50         50         50         50         \$171         \$1456         \$1572         \$1711         \$1525         \$202         \$0         50         \$405         \$1711         \$1525         \$202         \$1711         \$1525         \$1607		30	30	3U #0					90 60	<b>2</b> 0				
2014         50         50         50         50         50         571         \$704         \$133         (\$489)           2015         50         50         50         50         571         \$704         \$133         (\$485)           2016         50         50         50         50         571         \$709         \$131         (\$485)           2017         50         50         50         50         5511         \$711         \$127         (\$420)           2016         50         50         50         50         5511         \$716         \$125         (\$400)           2017         50         50         50         50         564         \$7716         \$125         (\$400)           2018         50         50         50         50         50         50         540         \$142         \$1711         \$132         \$168           2020         50         50         50         50         50         50         \$171         \$1456         \$1572         \$1711         \$1525         \$202         \$0         50         \$405         \$1711         \$1525         \$202         \$1711         \$1525         \$1607		90 \$0		#V \$0.					60 60	40 40				
2014         50         50         50         50         50         571         \$704         \$133         (\$489)           2015         50         50         50         50         571         \$704         \$133         (\$485)           2016         50         50         50         50         571         \$709         \$131         (\$485)           2017         50         50         50         50         5511         \$711         \$127         (\$420)           2016         50         50         50         50         5511         \$716         \$125         (\$400)           2017         50         50         50         50         564         \$7716         \$125         (\$400)           2018         50         50         50         50         50         50         540         \$142         \$1711         \$132         \$168           2020         50         50         50         50         50         50         \$171         \$1456         \$1572         \$1711         \$1525         \$202         \$0         50         \$405         \$1711         \$1525         \$202         \$1711         \$1525         \$1607		\$0 \$0	50	40 50					50	\$0				
2016         50         50         50         50         50         578         \$709         5131         (\$652)           2016         50         50         50         50         50         50         5544         \$711         \$127         (\$62)           2017         50         50         50         5544         \$711         \$127         (\$62)           2018         50         50         \$5091         (\$280)         \$0         50         \$546         \$740         \$142         (\$577)           2018         50         50         \$50         \$500         \$50         \$501         \$50         \$50         \$513         \$746         \$142         (\$577)           2020         50         50         50         \$50		\$0	\$0	\$0	(\$571)	(\$329)			\$0	50				
2016         50         50         50         (5564)         (5366)         (5776)         (5280)         50         504         5711         \$127         (562)           2017         50         50         50         (5691)         (5366)         (6776)         (5280)         50         500         504         \$1716         \$125         (580)           2018         50         50         50         (5005)         (531)         (675)         (5006)         50         \$805         \$781         \$116         \$125         (522)         \$2020         \$805         \$8112         (573)         (5316)         50         \$8012         \$783         \$171         (557           2021         50         50         50         50         \$80         \$822         \$827         \$187         (584)           2022         50         50         50         50         50         \$80         \$822         \$827         \$200         \$80         \$822         \$827         \$200         \$80         \$80         \$80         \$822         \$827         \$200         \$80         \$80         \$80         \$80         \$80         \$80         \$80         \$80         \$80		50	so	\$0	(\$578)	(\$336)			50	50				
2018         50         50         (8405)         (\$341)         (\$73)         (\$315)         50 <th></th> <th>\$0</th> <th>50</th> <th>\$0</th> <th></th> <th></th> <th></th> <th></th> <th>\$0</th> <th>\$0</th> <th></th> <th>-</th> <th></th> <th>(\$62)</th>		\$0	50	\$0					\$0	\$0		-		(\$62)
2018         50         50         (8405)         (\$341)         (\$73)         (\$315)         50 <th></th> <th>\$0</th> <th>\$0</th> <th>\$0</th> <th>(\$591)</th> <th></th> <th>(\$79</th> <th></th> <th>so \$0</th> <th>\$0</th> <th>\$591</th> <th></th> <th></th> <th>(\$80*</th>		\$0	\$0	\$0	(\$591)		(\$79		so \$0	\$0	\$591			(\$80*
2018         50         50         (8405)         (\$341)         (\$73)         (\$315)         50 <th></th> <th>\$0</th> <th></th> <th><b>\$0</b></th> <th></th> <th></th> <th></th> <th></th> <th>\$0</th> <th>\$0</th> <th></th> <th></th> <th></th> <th></th>		\$0		<b>\$0</b>					\$0	\$0				
2022       \$0       <		\$0		\$0					\$0	50				(\$54
2022       \$0       <		\$0		\$0					<b>\$0</b>	\$0				
2023         \$0         \$0         \$0         \$430         \$646         \$212         \$437         \$677         \$6346         \$646         \$212         \$432           2024         \$0         \$0         \$0         \$646         \$450         \$856         \$50         \$0         \$646         \$870         \$224         \$40           2024         \$0         \$0         \$10         (\$655)         \$4441         \$605)         \$5464         \$870         \$224         \$40           2025         \$0         \$0         \$0         \$655)         \$4441         \$831         \$3360         \$0         \$665         \$652         \$224         \$40           2025         \$0         \$0         \$0         \$6655)         \$4442         \$8316         \$3377         \$0         \$0         \$665         \$652         \$2237         \$33           2027         \$0         \$0         \$665)         \$4422         \$8090         \$0         \$665         \$9465         \$2865         \$280         \$33           2028         \$0         \$0         \$665)         \$4625         \$9465         \$2850         \$33           2028         \$0         \$0         \$6655) <th></th> <th>\$0</th> <th>\$0</th> <th>\$0</th> <th></th> <th></th> <th></th> <th></th> <th>Ş0</th> <th>\$0 \$0</th> <th></th> <th></th> <th></th> <th></th>		\$0	\$0	\$0					Ş0	\$0 \$0				
2026       \$0       \$0       \$0       \$4665)       (\$476)       \$377)       \$0       \$0       \$665       \$916       \$2251       \$3251       \$2352       \$2027       \$0       \$0       \$675       \$\$440       \$2265       \$\$332         2027       \$0       \$0       \$0       \$6055)       \$4492)       \$\$490       \$10       \$0       \$675       \$\$440       \$2265       \$\$332         2028       \$0       \$0       \$0       \$3605)       \$\$307)       \$\$441)       \$0       \$0       \$6855       \$985       \$280       \$\$31         2028       \$0       \$0       \$\$0       \$\$0       \$\$0       \$\$0       \$\$0       \$\$0\$       \$0\$       \$\$0\$       \$\$0\$		\$0	\$0	\$0					) Şü	- <b></b>				
2026       \$0       \$0       \$0       \$4665)       (\$476)       \$377)       \$0       \$0       \$665       \$916       \$2251       \$3251       \$2352       \$2027       \$0       \$0       \$675       \$\$440       \$2265       \$\$332         2027       \$0       \$0       \$0       \$6055)       \$4492)       \$\$490       \$10       \$0       \$675       \$\$440       \$2265       \$\$332         2028       \$0       \$0       \$0       \$3605)       \$\$307)       \$\$441)       \$0       \$0       \$6855       \$985       \$280       \$\$31         2028       \$0       \$0       \$\$0       \$\$0       \$\$0       \$\$0       \$\$0       \$\$0\$       \$0\$       \$\$0\$       \$\$0\$		90 60	an a	50 SU										(\$40
2026       \$0       \$0       \$0       \$4665)       (\$476)       \$377)       \$0       \$0       \$665       \$916       \$2251       \$3251       \$2352       \$2027       \$0       \$0       \$675       \$\$440       \$2265       \$\$332         2027       \$0       \$0       \$0       \$6055)       \$4492)       \$\$490       \$10       \$0       \$675       \$\$440       \$2265       \$\$332         2028       \$0       \$0       \$0       \$3605)       \$\$307)       \$\$441)       \$0       \$0       \$6855       \$985       \$280       \$\$31         2028       \$0       \$0       \$\$0       \$\$0       \$\$0       \$\$0       \$\$0       \$\$0\$       \$0\$       \$\$0\$       \$\$0\$		50	80	\$0					50	50				
2027 \$0 \$0 \$0 (\$675) (\$492) (\$360) \$0 \$0 \$0 \$0 \$0 \$00 \$285 (\$33 2028 \$0 \$0 \$0 (\$665) (\$507) (\$57) (\$401) \$0 \$0 \$685 \$385 \$285 \$280 (\$31 		50	50	50							• · ·			(\$35
2028 \$0 \$0 \$0 (\$665) (\$507) (\$57) (\$401) \$0 \$0 \$685 \$985 \$280 (\$31		\$0	\$0	50										(\$33
* Nominal \$810 \$1,000 (\$16,034) (\$9,617) (\$2,805) (\$8,135) \$17,643 \$20,357 \$2,514 Nerv \$955 \$913 (\$4,942) (\$2,880) (\$1,019) (\$2,391) \$9,411 \$6,100 (\$310) Discourt Rate = 8.97%		\$0												(\$31
¥ Nominal \$810 \$1,000 (\$18,034) (\$9,617) (\$2,805) (\$8,135) \$17,843 \$20,357 \$2,514 NPV \$855 \$813 (\$4,942) (\$2,600) (\$1,019) (\$2,391) \$4,411 \$6,100 (\$310) Discount Rate = 8.97%			•,		·									
Nominal \$810 \$1,000 (\$18,034) (\$9,617) (\$2,605) (\$8,135) \$17,843 \$20,357 \$2,514 NPV \$655 \$813 (\$4,942) (\$2,000) (\$1,019) (\$2,391) \$6,411 \$6,100 (\$310) Discount Rate = 8.97%				•										
Nominal \$810 \$1,000 (\$18,034) (\$9,617) (\$2,605) (\$8,135) \$17,843 \$20,357 \$2,514 NPV \$655 \$813 (\$4,942) (\$2,000) (\$1,019) (\$2,391) \$6,411 \$6,100 (\$310) Discount Rate = 8.97%														
NPV \$655 \$813 (\$4,942) (\$2,980) (\$1,019) (\$2,391) \$6,411 \$6,100 (\$310) Discount Rate = 8.97%				Ŧ										
Discount Rate = 8.97%							) ( <b>\$2,60</b> ) ) (\$1,010	5) ( <b>\$8</b> ,135 2) ( <b>\$2</b> ,341						
									•••••					·
	-			· 1					•					

Attachment "C" Page 9 of 38

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### Cost-Effectiveness Analysis per Rule 25-17.008 Florida Administrative Code (2) (3) (4) (12) (1) (5) (6) (7) (8) (9) (10) (11)Utility Paid Change in Total Cumulative Customer Customer Other Other Participants' **Rebates &** Discounted Tax Total Total Net Equip Costs **O&M Costs** Costs Benefits Electric Bills Credits Incentives Costs Benefits Benefits Net Benefits Year (\$000s) (\$946 \$1,100 50 (\$946) 1999 \$0 \$0 \$0 \$100 \$1,100 \$154 (\$54) 2000 \$2,267 \$0 \$0 \$0 (\$158) \$0 \$200 \$2,267 \$358 (\$1,909)(\$2.699) (\$4,285) \$2.337 \$0 \$0 \$0 \$2.337 2001 \$0 (\$253) \$200 \$453 (\$1.884)2002 \$2,408 \$0 \$0 \$0 (\$364) \$0 \$200 \$2,408 \$564 (\$1,844)(\$5,710) \$0 \$0 \$0 . \$655 2003 \$2,482 \$0 \$200 \$2,482 (\$7,006) (\$455) (\$1,827) \$0 \$0 2004 \$1,279 **\$**0 \$0 (\$520) \$100 \$1,279 \$620 (\$659) (\$7,435) \$0 2005 \$0 \$0 \$0 \$0 (\$520) \$0 \$0 \$520 \$520 (\$7,125) \$0 \$0 2006 \$0 \$0 \$0 (\$524) \$0 \$0 \$524 \$524 (\$6,837 \$0 \$O \$0 **\$**0 **\$0** \$0 \$0 \$538 \$538 (\$6.567 2007 (\$538) \$0 \$0 \$0 2008 \$O (\$536) \$O \$0 **\$**0 \$536 \$536 (\$6,320) 2009 \$0 \$O \$0 \$0 (\$541) \$0 \$0 \$0 \$541 \$541 (\$6,090) 2010 \$0 \$0 \$0 \$0 (\$547) \$0 \$0 **\$**0 \$547 \$547 (\$5,878) \$0 \$0 \$0 **\$**0 \$0 \$0 **\$**0 \$553 \$553 (\$5,680) (\$553) 2011 \$0 \$0 \$0 \$0 (\$559) \$0 \$0 \$0 \$559 \$559 (\$5,498) 2012 \$0 \$0 **\$**0 \$0 \$0 \$0 \$0 \$565 \$565 (\$5,328) 2013 (\$565) \$0 \$0 \$0 \$0 (\$571) \$0 \$0 \$0 \$571 \$571 (\$5,170) 2014 \$0 \$0 \$O \$0 \$0 \$0 \$0 \$578 \$578 (\$5,024) (\$578) 2015 2016 \$0 \$0 \$0 \$0 (\$584) **\$**0 \$0 \$0 \$584 \$584 (\$4,889) \$0 \$0 \$0 \$O \$0 **\$0** \$591 \$591 (\$4,763) \$O 2017 (\$591) (\$4,646 2018 **\$**0 \$0 \$0 \$0 (\$598) \$0 \$0 \$0 \$598 \$598 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$605 \$605 (\$4,538) 2019 (\$605) \$0 \$0 \$0 \$0 \$612 (\$4,437) 2020 \$0 (\$612) \$612 \$0 \$0 \$0 (\$4,343) 2021 \$0 \$0 (\$620) \$0 \$0 \$620 \$620 \$628 \$0 \$0 \$0 \$0 \$628 (\$4,256) 2022 \$0 \$0 \$0 (\$628) 2023 \$0 \$0 \$0 \$0 (\$636) \$0 \$0 \$0 \$636 \$636 (\$4,175) \$0 \$0 \$646 (\$4,100) \$0 \$0 \$0 \$646 2024 \$0 \$0 (\$646) 2025 \$0 \$0 \$0 (\$655) \$0 \$0 \$0 \$655 \$655 (\$4,030) \$0 2026 \$0 \$0 \$0 \$0 (\$665) \$0 \$0 \$0 \$665 \$665 (\$3,964)+ \$O \$0 \$0 \$0 \$0 \$0 \$675 \$675 (\$3,903) 2027 \$0 (\$675) \$0 \$0 \$0 \$0 \$685 (\$3,847 2028 \$0 \$0 (\$685) \$0 \$685 . 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)8.97% Discount Rate =

Participants' Cost-Effectiveness Measure

Benefit/Cost Ratio =

0.60

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### Fliename:

# **Total Resource Cost-Effectiveness Measure**

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	dministrative Co (9)	(10)	(11)	(12)	(13)
	Chenge in			-	•	incremental	Incromental	Incremental			Total	Cumulative
	Electric	Utility's	Participants'	Other	Other	Generation	T&D	Prog Induced	Total	Total	Net	Discounted
		Program Costs	Program Costs	Costs	Benefits	Cap Costs	Cap Costs	Fuel Costs	Costs	Benefits	Banefits	Net Benefits
/ear	(\$000s)	(\$000s)	(\$000s)	(\$000s)	(\$000e)	(\$000s)	(\$000s)	(\$000s)	(\$000a)	(\$000a)	(\$000s)	(\$000s)
999	\$0	\$75		\$0	\$0	(\$22)	\$0	(\$21)	\$1,175	\$43	(\$1,132)	(\$1,13
000	\$0	\$155	\$2,267	\$0	\$0	(\$67)	(\$50)		\$2,422	\$184	(\$2,238)	(\$3,18
001	\$0	\$159	\$2,337	\$0	\$0	(\$117)	(\$80)		\$2,496	\$309	(\$2,187)	(\$5,02
002	\$0		\$2,408	\$0	\$0	(\$166)	(\$107)		\$2,573	\$434	(\$2,138)	(\$6,68
903	\$0		\$2,482	\$0	\$0	(\$220)	(\$132)		\$2,651	\$561	(\$2,091)	(\$6,16
004	- \$0		\$1,279	\$0	\$0	(\$252)	(\$141)		\$1,366	\$628	(\$738)	(\$8,64
005	\$0	\$0	\$0	\$0	\$0	(\$261)	(\$135)		\$0	\$637	\$637	(\$8,20
006	\$0	\$0	\$0	\$0	\$0 \$0	(\$267)	(\$130)		\$0	\$639	\$639	(\$7,91
007	\$0	<b>\$0</b>	\$0	\$0	\$0	(\$272)	(\$125)		\$0	\$649	\$649	(\$7,58
2008	\$0	50	\$0	<b>\$</b> 0	\$0	(\$279)	(\$119)		<b>\$</b> 0	\$658	\$658	(\$7,28
900	\$0	\$0	\$0	\$0	\$0	(\$287)	(\$114)		\$0	\$665	\$665	(\$7,00 (\$6,73
010	\$0 \$0	<b>\$</b> 0	\$0	\$0	\$0	(\$295)	(\$109)		\$0	\$673 \$685	\$673 \$685	(\$6,49
2011	\$0	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0	\$0 \$0	\$0 \$0	(\$303) (\$312)	(\$104) (\$99)		\$0 \$0	3000 \$698	2005 \$698	(\$6,41
012	\$0 \$0 \$0 \$0	su \$0	30	\$0 \$0	\$0 \$0	(\$320)	(\$94)		\$0	\$705	\$705	(\$6,0
013	\$U	\$0 \$0	\$0 \$0	\$0 \$0	\$0 \$0	(\$329)	(\$89)		\$0	\$704	\$704	(\$5,8
2014	\$U	<b>3</b> 0	\$0	\$0 \$0	\$0 \$0	(\$338)	(\$84)		\$0	\$709	\$709	(\$5,6
2015	30	\$0 \$0	\$0	\$0	\$0	(\$347)	(\$81)	(\$283)	\$0	\$711	\$711	(\$5,5
2016	au au	\$0	\$0	\$0	\$0	(\$356)	(\$79)		\$0	\$716	\$716	(\$5,3
2017	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	\$0	\$0	\$0	\$0	(\$366)	(\$77)		\$0	\$740	\$740	(\$5,2
2018 2019			\$0	\$0 \$0	\$0	(\$361)	(\$75)		\$0	\$761	\$761	(\$5,0
2020		\$0 \$0	\$0 \$0 \$0	\$0	\$0	(\$396)	(\$73)		\$0	\$783	\$783	(\$4,9
2021		\$0	50	\$0 \$0	\$0	(\$412)	(\$71)		\$0	\$807	\$807	(\$4,8
2022		\$0	\$0	· \$0	\$0	(\$424)	(\$69)		\$0	\$627	\$827	(\$4,7
2023		5 \$0	\$0	\$0	\$0	(\$437)	(\$67		\$0	\$848	\$848	(\$4,6
2024	ŝ	5 \$0	\$0	\$0	\$0	(\$450)			\$0	\$870	\$870	(\$4,5
2025	\$0	\$0	50	50	\$0	(\$464)	(\$63)		\$0	\$892	\$892	(\$4,4
2026	\$0	<b>\$</b> 0	\$0	\$0	\$0	(\$478)			\$0	\$916	\$916	(\$4,3
2027	\$i			\$0	\$0	(\$492)	(\$59)	(\$389)	\$0	\$940	\$940	(\$4,2
2028	\$C			\$0					\$0	\$965	\$965	(\$4,1
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			_									
			*									
Iomine		\$81				(\$9,617)			\$12,683	\$20,357	\$7,674	
NP		\$85				(\$2,690	) <u>(\$1,019</u>	) (\$2,391)	\$10,257	\$6,100	(\$4,157	<u>)                                    </u>
	<b>Discount Rale</b>	- 8.979	6							-	-	
	nell/Cost Ratio											

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د ده البرجة عدورت و جاجه و Page 1 of 1 23-Jul-98 Run Date: 02:51 PM gthp\_4 Filename:

# INPUT DATA - PART 1

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

and the second line is a second s	1	IV. Incremental Generation, T
L Program Demand Impacts and Line Losses (1) Change in Peak kW Customer at meter	-1.20 kW/Cus	(1) Base Year
(2) Change in Peak kW per Customer at generator	-1.55 kW Gen/Cut	(2) In-Service Year For Inc
(2) Change in Peak KVY per Collection and generative	12.60%	(3) In-Service Year For Inc
(3) kW Line Loss Percentage (4) Change in KWh per Customer at generator	(2,072) kWh/Cue/Yr	(4) Base Year Incremental
(4) Change in Kvin per Customer al generation	7.70%	(5) Base Year Incremental
(5) kWh Line Loss Percentage	1.0014	(6) Base Year Incremental
(6) Group Line Loss Multiplier	(1,924) kWh/Cus/Yr	(7) Gen, Tran, & Dist Cost
(7) Annuel Change in Customer kWh at Meter	0.00 kW/Cus	(8) Generator Fixed O & M
*(8) Change in Winter kW per Cust at mater		(9) Generator Fixed O&M
	i	(10) Transmission Food O
	i	(11) Distribution Fixed O &
ware and the and K England		(12) T&D Fixed O&M Esca
II. Economic Life and K-Factors (1) DSM Program Study Period	30 Years	(13) Incremental Gen Vari
(2) Economic Life of incremental Generation	40 Years	(14) Incre Gen Variable Od
(3) Economic Life of Incremental T&D	30 Years	(15) Incremental Gen Capi
(4) K-Factor for Generation	1.4493	(16) incremental Generatir
(5) K-Factor for T&D	1.4394	(17) Incremental Gen Unit
	0	* (18) incremental Purchase
2 *(6) Switch: Rev Reg (0) or Vie-O-Del (1)		<ul> <li>(19) Incremental Capacity</li> </ul>
III. Utility & Customer Costs	I	
(1) Utility Nonrecurring Cost Per Customer	\$150.00 \$/Cus	Stop Revenue Loss at In-
(2) Utility Recurring Cost Per Customer	\$0.00 \$/Cus/Year	
(3) Utility Cast Escalation Rate	3.06%	V. (1) Non-Fuel Cost in Cut
(4) Customer Equipment Cost	\$2,200.00 \$/Cus	(1) Non-Fuel Cost In Cust
(5) Customer Equipment Cost Escalation Rate	3.06%	(2) Non-Fuel Escalation R
(6) Customer O&M Cost	\$0.00 \$/Cus/Year	(3) Customer Demand Ch
(7) Customer O&M Cost Escalation Rate	3.06%	(4) Demand Charge Esca
*(8) Customer Tax Credit Per Installetign	\$0.00 \$/Cus	* (5)Average Annual Chang
* (9) Customer Tax Credit Escatation Rate	3.06%	1
* (10) Change in Supply Costs	\$0.00 \$/Cue/Year	l .
* (11) Supply Costs Escalation Rate	3.06%	ļ
*(12) Utility Discount Rate	8.97%	5 <u>Sun</u>
*(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%	1
(10) UNRY RODOW INVENTOR CONTRACTOR		1

(1) Base Year	Costs 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) Bees Year Incremental Distribution Cost	\$33.00 \$/kW
7) Gen, Tran, & Dist Cost Escalation Rate	2.58%
8) Generator Fixed O & M Cost	\$2.77 \$/kW/Yr
9) Generator Fixed O&M Escalation Rate	2.99%
10) Transmission Foxed O & M Cost	\$0.73 \$/kW/Yr
(11) Distribution Fixed O & M Cost	\$0.84 \$/kW/Yr
12) T&D Fixed O&M Escelation 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
(1) Non-Fuel Cost In Customer Bill (Base Year)	\$0.0352 \$/kWh
(1) Non-Fuel Cost In Customer Bill (Base Year)	Per Table
(2) Non-Fuel Escalation Rate	\$0.0000 \$/kW/Mg
(3) Customer Demand Charge Per kW (Base Year)	Per Table
(4) Demand Charge Escalation Rate	0 kW/Mo.
(5)Average Annual Change In Monthly Billing KW	V KTUNKJ.

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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Raispayers' Impact Cost-Effectiveness Measure Cost-Effectiveness Analysis per Rule 25-17.005 Fiorida Administrative Code

	Cost-Effectivenes				Ministrative				(4.8)	
(3) (4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Utility's Utility P Program Rebete		Incremental Generation	Incremental T&D	incremental Prog induced	Other	Other	Total	Total	Total Net Benefits to	Cumulative Discounted
Program Rebate Costs Incentiv		Cap Costs	Cap Costs	Fuel Costs	Costs	Senelits	Costs	Benefits	All Customers	Net Benefits
(\$000e) (\$000		(\$000e)	(\$000s)	(\$000s)	(\$000s)	(\$000s)	(\$0006)	(\$000s)	(\$000s)	(\$000s)
	100 (\$82)			(\$32)	\$0	\$0	\$257	\$67	(\$190)	(\$19
	200 (\$241)	(\$106)		(\$103)	\$0	\$0	\$595	\$288	(\$307)	(\$47
\$159	200 (\$385			(\$171)	\$0	\$0	\$745	\$482	(\$262)	(\$65
) \$164 (	200 (\$555		(\$169)	(\$246)	\$0	\$0	\$920	\$678	(\$241)	(\$86
D <b>\$169</b> \$	200 (\$893)	(\$348)	(\$209)		\$0	\$0	\$1,062	\$875	(\$187)	(\$1,01
D/ <b>\$87</b> (	\$100 (\$792)	) (\$400)		(\$358)	\$0	\$0	\$980	\$980	\$1	(\$1,01
<b>\$</b> 0	\$0 (\$792)	(\$413)		(\$368)	\$0	\$0	\$792	\$994	\$202	(\$8)
5 \$0 5 \$0	\$0 (\$799)	(\$422)		(\$371)	\$0	\$0	\$799	\$998	\$199	(\$7)
<b>\$0</b>	\$0 (\$819			(\$384)	\$0	\$0	\$819	\$1,012	\$193	(\$6)
D <b>\$</b> 0	50 (\$817)				\$0 \$0	\$0	\$817	\$1,027	\$210	(\$5)
50 50 50	\$0 (\$825 \$0 (\$834)				\$0 \$0	\$0 \$0	\$825 \$834	\$1,038 \$1,050	\$213 \$216	(\$4) (\$4)
50 50 50	\$0 (\$842)				\$0	\$0	\$642	\$1,068	\$228	(\$33
0 \$0 D \$0	\$0 (\$834) \$0 (\$842) \$0 (\$852) \$0 (\$851)	(\$494)			\$0	\$0	\$852	\$1,087	\$236	(\$2
<b>\$</b> 0	\$0 (\$861				\$0	\$0	\$861	\$1,100	\$239	(\$1)
50 <b>5</b> 0	\$0 (\$870)	(\$521)			\$0	\$0	\$870	\$1,098	\$227	(\$1)
D \$0	\$0 (\$860				\$0	\$0	\$660	\$1,105	\$225	(\$
o <b>\$0</b>	\$0 (\$890				50	\$0	\$890	\$1,108	\$218	(\$1
D \$0	\$0 (\$900			(\$427)	\$0	\$0	\$900	\$1,117	\$216	\$
0 <b>\$0</b>	\$0 (\$911				\$0	\$0	<b>\$911</b>	\$1,154	\$243	\$
0 \$0	\$0 (\$922	) (\$603)			<b>\$</b> 0	\$0	\$922	\$1,187	\$265	\$1
0 <b>\$</b> 0	\$0 (\$933				\$0	\$0	\$933	\$1,222	\$289	\$1
0 \$0	\$0 (\$945				\$0	\$0	\$945	\$1,258	\$313	\$2
0 \$0	\$0 (\$956						\$956	\$1,290	\$334	\$2
0 \$0	\$0 (\$970					\$0	\$970	\$1,323	\$353	\$3 \$3
0 \$0 0 \$0 0 \$0	\$0 (\$984 \$0 (\$988	) (\$713)				\$0 \$0	\$984 \$998	\$1,356 \$1,391	\$373 \$393	\$3
0 \$0	\$0 (\$1,013					\$0	\$1,013	\$1,427	\$414	\$4
0 <b>\$</b> 0	\$0 (\$1,013						\$1,028	\$1,465		\$4
0 <b>\$</b> 0	\$0 (\$1,044						\$1,044	\$1,503		\$5
••										
	ŧ									
\$855	1,000 (\$24,43 \$813 (\$7,53)	l) (\$15,228 2) (\$4,260					\$25,243 \$9,000			
	5 K	5 \$813 (\$7,53) 6	5 \$813 (\$7,532) (\$4,260 6	5 \$813 (\$7,532) (\$4,260) (\$1.613 K	5 \$813 (\$7,532) (\$4,260) (\$1,613) (\$3,644 K	5 \$813 (\$7,532) (\$4,260) (\$1,613) (\$3,644) K	5 \$813 (\$7,532) (\$4,260) (\$1,613) (\$3,644) K	5 \$813 (\$7,532) (\$4,260) (\$1,613) (\$3,644) \$9,000	5 \$813 (\$7,532) (\$4,260) (\$1,613) (\$3,644) \$9,000 \$9,516	5 \$813 (\$7,532) (\$4,260) (\$1,613) (\$3,644) \$9,000 \$9,516 \$517 K

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(11)

\$13,560

(\$1,257)

\$25,434

\$8,345

(12)

### (5) (6) Change in Utility Paid Total Cumulative Other Customer Customer Other Participants' Tax Rebates & Total Total Net Discounted **O&M Costs** Equip Costs Costs Benefits Electric Bills Credits Incentives Costs Benefits **Benefits** Not Benefits (\$000s) (\$000s) (\$000s) (\$000s) (\$000s) (\$000a) Year (\$000s) (\$000s) (\$000s) (\$000s) (\$000s) (\$918) 1999 \$1,100 \$0 \$0 \$0 \$0 \$1,100 (\$918) (\$82) \$100 \$182 2000 \$2,267 \$0 \$0 \$0 \$200 (\$2,595) \$0 (\$241)\$2,267 \$441 (\$1,827) \$0 \$0 (\$4,070) 2001 \$2.337 \$0 \$0 (\$385) \$0 \$200 \$2,337 \$585 (\$1,751) 2002 \$0 **\$**0 \$0 \$2,408 (\$555) \$200 \$2,408 (\$1.653) (\$5,347) \$755 2003 \$2,482 \$0 \$0 \$0 (\$693) \$0 \$200 \$2,482 (\$8,474) \$893 (\$1,589) \$0 2004 \$1,279 \$0 \$0 \$0 (\$8,726) (\$792) \$100 \$1,279 \$892 (\$387) 2005 \$0 \$0 \$0 \$0 (\$792) \$0 \$0 \$0 \$792 \$792 (\$6,253) \$0 \$0 **\$**0 **\$**0 \$0 2006 \$0 \$799 (\$5,815) (\$799) \$0 \$799 2007 \$0 \$0 \$0 \$0 (\$819) \$0 \$0 \$0 \$819 \$819 (\$5,403) \$0 \$0 \$0 \$O \$0 (\$5,026) 2008 \$0 \$0 \$817 \$817 (\$817) \$0 \$0 2009 \$0 \$0 \$0 (\$825) \$0 \$0 \$0 \$825 \$825 (\$4,676) \$0 \$0 \$0 \$0 \$0 \$0 \$834 (\$4,352) 2010 (\$834) \$834 2011 \$0 \$0 \$0 \$0 (\$842) \$0 \$0 \$0 \$842 \$842 (\$4,052) \$0 2012 \$0 \$0 \$0 \$0 (\$852) \$0 \$0 \$852 \$852 (\$3,773) \$0 \$0 2013 \$0 \$0 \$0 (\$861) \$0 \$0 \$861 \$861 (\$3,515) \$0 \$0 2014 **\$**0 \$0 \$0 (\$870) \$0 \$0 \$870 \$870 (\$3,275) \$0 \$0 \$0 \$0 \$0 2015 **\$**0 \$0 (\$880) \$0 \$0 \$880 \$880 (\$3,052) \$0 \$0 \$0 \$0 \$0 \$0 \$890 \$890 (\$2,845) 2016 (\$890)\$0 \$0 \$0 \$0 2017 \$0 (\$900) \$0 \$900 \$900 (\$2,654) \$0 2018 \$0 \$0 \$0 (\$911) \$0 \$0 \$0 \$911 \$911 (\$2,475) \$0 \$0 \$0 \$O \$0 2019 \$0 (\$922) \$0 \$0 \$0 \$922 \$922 (\$2,310) \$0 \$0 \$0 \$0 (\$933) \$0 \$0 \$0 \$933 \$933 (\$2,157) 2020 \$0 \$0 \$0 \$0 \$0 (\$2.014) 2021 (\$945) \$0 \$945 \$945 \$0 \$0 \$0 2022 \$0 \$0 \$0 (\$956) \$0 \$956 \$956 (\$1,881) \$0 \$0 \$0 2023 \$0 \$0 \$0 \$970 \$970 (\$1,758) (\$970) \$0 \$0 \$0 \$0 \$0 2024 \$0 \$0 (\$984) \$0 \$0 \$984 \$984 (\$1,643) \$0 \$0 \$O **\$**0 \$998 (\$1,536 2025 \$0 \$998 (\$998)2026 \$0 \$0 \$0 \$0 (\$1.013) \$0 \$0 \$0 \$1,013 \$1,013 (\$1,436) 2027 a \$0 \$0 \$0 \$0 (\$1,028) \$0 \$0 \$0 \$1,028 \$1,028 (\$1,344 \$0 2028 \$0 \$0 \$0 \$0 \$0 \$0 (\$1,257 (\$1,044) \$1,044 \$1,044 ę

(\$24,434)

(\$7,532)

\$1,000

\$813

\$11,874

\$9,602

(8)

(9)

(10)

(1)

Nominal

NPV

\$11,874

Discount Rate = Benefit/Cost Ratio =

\$9,602

8.97%

0.87

(2)

(3)

(4)

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# Total Resource Cost-Effectiveness Measure

<b>1)</b> <b>60</b> <b>100</b> 100 101	(2) Change in Electric Supply Coets (\$000a)	(3) Utility'e	(4)	(5)	(6)		(8)		(10)	(11)	<u>(12)</u>	(13)
1 <b>99</b> 100 101		Program Costs (\$000s)	Participants' Program Costa (\$000s)	Other Costs (\$000s)	Other Benefits (\$000e)	incremental Generation Cép Costs (\$000s)	Incremental T&D Cap Costs (\$000a)	Incremental Prog Induced Fuel Costs (\$000s)	Total Costs (\$000s)	Total Benefits (\$000e)	Total Nat Banalita (\$000a)	Cumulative Discounted Net Benefits (\$000e)
000 001	<b>62</b>		\$1,100	\$0	\$0	(\$35)	\$0	(\$32)	\$1,175	\$67	(\$1,108)	(\$1,10
	\$0	\$155	\$2,267	\$0	\$0	(\$106)	(\$79)	(\$103)	\$2,422	\$288	(\$2,134)	(\$3,06
	\$0	\$159	\$2,337	\$0	\$0	(\$185)	(\$126)	(\$171)	\$2,498	\$462	(\$2,014)	(\$4,76
02	\$0 \$0 \$0	\$164	\$2,408	\$0	\$0	(\$263)	(\$160)	(\$246)	\$2,573	\$678	(\$1,894)	(\$6,22
03	\$0	\$169	\$2,482	\$0	\$0	(\$348)	(\$209)	(\$318)	\$2,651	\$875	(\$1,776)	(\$7,48
204	30	\$87	\$1,279	\$0	\$0 \$0	(\$400)	(\$222) (\$214)	(\$358) (\$366)	\$1,306	\$980	(\$386)	(\$7,73
205 206	\$0 \$0 \$0	50 50	\$0 \$0	\$0 \$0	\$0 \$0	(\$413) (\$422)	(\$205)	(\$371)	\$0 \$0	\$994 \$998	\$994 \$998	(\$7,14 (\$6,59
X07	90 50	\$0	<b>\$</b> 0	50	\$0	(\$431)	(\$197)	(\$384)	\$0	\$1,012	\$1,012	(\$6,08
008	50 50	\$0	\$0	\$0	\$0	(\$441)	(\$189)	(\$396)	\$0	\$1,027	\$1,027	(\$5,61
009	si	i <b>\$</b> 0	<u>\$0</u>	\$0	\$0	(\$454)	(\$181)	(\$403)	\$0	\$1,038	\$1,038	(\$5,17
010	50	50	\$0	\$0	50	(\$467)	(\$173)	(\$410)	\$0	\$1,050	\$1,050	(\$4,70
011	\$0 \$0 \$0 \$0	i <b>šo</b>	\$0	\$0	\$0	(\$480)	(\$165)	(\$424)	\$0 \$0	\$1,068	\$1,068	(\$4,31
012	\$0	\$0 \$0 \$0	\$0	\$0	\$0	(\$494)	(\$157)	(\$437)	\$0	\$1,087	\$1,087	(\$4,0
013	\$0	i <b>\$0</b>	<b>\$</b> 0	\$0	\$0	(\$507)	(\$148)	(\$444)	\$0	\$1,100	\$1,100	(\$3,6
014	\$0	) <b>\$0</b>	\$0	\$0	\$0	(\$521)	(\$140)		\$0	\$1,098	\$1,098	(\$3,3
015	\$0	\$0 1 \$0	\$0	\$0 \$0	\$0	(\$535)	(\$133)	(\$437)	\$0	\$1,105	\$1,105	(\$3,1
D16	50 50 50 50 50 50 50 50 50 50 50	\$0	\$0	\$0	\$0	(\$549)	(\$129)	(\$431)	\$0	\$1,108	\$1,108	(\$2,8
017	\$0	\$0 \$0	\$0	\$0	\$0	(\$564)	(\$126)	(\$427)	\$0	\$1,117	\$1,117	(\$2,6
018	50	\$0	\$0	\$0	\$0	(\$580)	(\$122)		\$0 \$0	\$1,154	\$1,154	(\$2,3
019	50	\$0	\$0 \$0	\$0	\$0 \$0	(\$603) (\$627)	(\$119) (\$115)		\$0 \$0	\$1,187 \$1,222	\$1,187 \$1,222	(\$2,1 (\$1,9
020 021	\$0 \$0	) \$0 ) \$0	\$0	\$0 \$0	\$0	(\$652)	(\$112)		\$0	\$1,258	\$1,258	(\$1,7
022		, şu ) <b>ş</b> u		\$0 \$0	\$0	(\$672)	(\$109)		\$0	\$1,290	\$1,290	(\$1,8
023	50	50		\$0	\$0	(\$692)	(\$108)		\$0	\$1,323	\$1,323	(\$1,4
024	51	\$0	\$0	\$0	\$0	(\$713)			\$0	\$1,356	\$1,358	(\$1,2
025	\$( \$(	) <b>\$</b> 0		\$0 \$0	\$0	(\$735)			\$0	\$1,391	\$1,391	(\$1,1
026		D \$0		\$0	\$0	(\$757)	(\$96)	(\$575)	\$0	\$1,427	\$1,427	(\$9
027	\$	D <b>\$</b> 0	) <b>\$0</b>	\$0	\$0	(\$780)	(\$93)	(\$592)	\$0	\$1,465	\$1,465	(\$4
028	*	*7	) <b>5</b> 0	<b>\$</b> 0	\$0	(\$803)	(\$90)	) (\$ <b>6</b> 10)	<b>\$</b> 0	\$1,503	\$1,503	(\$7
			*									
omine		\$81 \$85				(\$15,228			\$12,683 \$10,257	\$31,749 \$9,516	\$19,0 <b>66</b> (\$741	

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# INPUT DATA - PART 1

# Cost-Effectiveness Analysis per Rule 25-17.008 Fiorida Administrative Code

(1) Change in Peak KW Customer at motor	-1.90	kW/Cus	IV. Incremental Generation, Transmission, & Distribution ( (1) Base Year	1999	
(1) Change in Peer kill or Customer at constitut		kW Gen/Cui	(2) In-Service Year For Incremental Generation	2001	
(2) Change in Peak kW per Customer at generator	12.60%		(3) In-Service Year For Incremental T & D	2000	
(3) kW Line Loss Percentage		kWh/Cus/Yr	(4) Base Year Incremental Generation Cost	\$234.85	<b>V</b> kW
(4) Change in KWh per Customer al generator	7.70%		(5) Base Year Incremental Transmission Cost	\$58.75	5/kW
(5) kWh Line Loss Percentage	1.0014		(6) Base Year Incremental Distribution Cost	\$33.00	<b>KW</b>
(6) Group Line Loss Multiplier		kWh/Cue/Yr	(7) Gen, Tran, & Dist Cost Escalation Rate	2.56%	
(7) Annual Change in Customer kWh at Meter		kW/Cus	(8) Generator Fixed O & M Cost		\$/kW/Yr '
(8) Change in Winter kW per Cust at meter	0.00	KTT/COB	(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%	
I. Economic Life and K-Factors	30	Years	(13) Incremental Gen Variable O & M Costs	\$0.433	\$/kW/Yr
(1) DSM Program Study Period		Years	(14) Incre Gen Variable O&M Cost Esc Rate	3.84%	
(2) Economic Life of incremental Generation	30		(15) Incremental Gen Capacity Factor	3.40%	
(3) Economic Life of Incremental T&D	1.4493		(16) Incremental Generating Unit Fuel Cost	\$0.0356	\$/kWh
(4) K-Factor for Generation	1.4394		(17) Incremental Gen Unit Fuel Esc. Rate	3.00%	
(5) K-Factor for T&D	1.4364		* (18) Incremental Purchased Capacity Cost	\$20.70	\$/KW/YR
(6) Switch: Rev Req (0) or Val-of-Def (1)			* (19) Incremental Capacity Cost Esc Rate	2.56%	
· · · · · · · · · · · · · · · · · · ·					
III. Utility & Customer Costs	\$150.00	S/Cue	Stop Revenue Loss at In-Service Year? (Y=1, N=0)	0	
(1) Utility Nonrecurring Cost Per Cultorner		\$/Cus/Year			
(2) Utility Recurring Cost Per Customer	3.06%		V. (1) Non-Fuel Cost In Customer Bill (Base Year)		
(3) Utility Cost Escalation Rate	\$2,200.00	-	(1) Non-Fuel Cost In Customer Bill (Base Year)	\$0.0352	\$/kWh
(4) Customer Equipment Cost	3.06%		(2) Non-Fuel Escalation Rate	Per Table	
(5) Customer Equipment Cost Escalation Rate		\$/Cus/Year	(3) Customer Demand Charge Per kW (Base Year)	\$0.0000	\$/kW/Mo
(6) Customer O&M Cost	3.06%		(4) Demand Charge Escalation Rate	Per Table	-
(7) Customer O&M Cost Escalation Rate		\$/Cus	* (5)Average Annual Change in Monthly Billing kW	0	kW/Mo.
* (8) Customer Tax Credit Per Installation	3.06%				-
* (9) Customer Tax Credit Escalation Rate				<b></b>	
* (10) Change in Supply Costs		\$/Cus/Year			
*(11) Supply Costs Escalation Rate	3.06%		Summary Results for This Analys	la.	
* (12) Utility Discount Rate	8.97%		Guinning Researce for this Participe	RIM	Participants
*(13) Utility AFUDC Rate	10.30%		NPV Banefits(\$000s)	\$9,516	
* (14) Utility Nonrecurring Rebate/Incentive		) \$/Cus	NPV Costs (\$0008)	\$9,000	
(15) Utility Recurring Rebate/Incentive		\$/Cus/Year		\$517	
* (16) Utility Rebate/Incentive Escalation Rate	0.00%		NPV Net Benefits (\$000s)	4J 17	0.86

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\* Supplemental Information Not Specifically Specified in Cost Effectiveness Manual

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(1)	(2)	(3)	(4)	(5)	(6)	(7)	08 Florida Adr (8)	(9)	(10)	(11)	(12)	(13)	(14)
- ( Su	Change in Electric upply Costs	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 Bensfits (\$000s)	Total Net Benefits to All Customers (\$000s)	Cumuletive Discounted Net Benefits (\$000s)
<b>'eer</b> 1999	(\$000e) \$0	(\$0008)	\$100	\$39	(\$6)	\$0	\$15	\$0	\$0	\$190	\$44	(\$146)	(\$14
2000	\$0	\$155	\$200	\$114	(\$17)	(\$12)	\$49	\$0	\$0	\$404	\$143	(\$260)	(\$36
2001	\$0	\$159	\$200	\$183	(\$29)	(\$20)		\$0	\$0	\$440	\$232	(\$209)	(\$56
2002	\$0	\$164	\$200	\$263	(\$41) (\$55)	(\$27) (\$33)		\$0 \$0	\$0 \$0	\$481 \$520	\$331 \$417	(\$149) (\$103)	(\$67 (\$74
2003 2004	\$0 \$0	\$169 \$87	\$200 \$100	\$329 \$376	(\$83) (\$83)	(\$35)		\$0 \$0	\$0	\$357	\$474		(\$67
2005	\$0	\$0	\$0	\$375	(\$65)	(\$34		\$0	\$0	\$174	\$474	\$300	(\$4)
2006	\$0 \$0	\$0 \$0	\$0 \$0	\$379	(\$67)	(\$32	\$176	\$0 \$0	\$0	\$176	\$478		(\$3
2007	\$0	\$0	<b>\$</b> 0	\$368	(\$68)	(\$31		\$0	\$0	\$162	\$488 \$488	\$308 \$299	(\$1)
2008	\$0 \$0 \$0	\$0 \$0	\$0	\$387 \$391	(\$70) (\$72)	(\$30 (\$29		\$0 \$0	\$0 \$0	\$188 \$191	\$487 \$491		(ə \$
2009 2010	90 50	\$0	\$0 \$0	\$395	(\$74)			\$0	\$0	\$194	\$496		\$2
2011	<b>SO</b>	\$0	\$0	\$399	(\$76)			\$0	\$0	\$201	\$501	\$300	\$3
2012 2013	\$0 \$0	\$0 \$0	\$0 \$0	\$404 \$408	(\$78) (\$80)		) \$207 ) \$211	\$0 \$0	\$0 \$0	\$207 \$211	\$506 \$512		\$4 \$5
			•										

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) (4) (3) (8) (10) (11) (12) (5) (6) (7) (9) Utility Pald Change in Total Cumulative Customer Customer Other Other Participants' Tex Rebates & Total Total Net Discounted **O&M Costs** Costs Equip Costs Benefits Electric Bills Credits incentives Costs Benefits Benefits Not Benefits (\$000s) (\$000s) (\$000s) (\$000s) (\$000a) (\$000s) (\$000s) (\$000s) Year (\$000s) (\$000s) (\$000s) 1999 \$1,500 (\$144) \$0 \$0 \$0 \$100 \$1,539 (\$1,295) \$39 \$244 (\$1,295) 2000 \$3.092 (\$444) \$0 \$0 \$3,206 \$114 \$0 \$200 \$644 (\$2,562) (\$3,647) \$0 2001 \$3,187 (\$762) \$0 \$183 \$0 \$200 \$3,369 \$962 (\$2,407) (\$5,674) \$0 2002 \$3,284 (\$1,100) \$0 \$263 \$0 \$200 \$3,547 \$1,300 (\$2,248) (\$7,411) \$0 \$0 2003 \$3,385 (\$1,457) \$0 \$329 \$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) \$0 2005 \$0 (\$1,720) \$0 \$375 \$0 \$0 \$375 \$1,720 \$1,344 (\$8;295) 2006 \$0 \$0 \$0 \$0 \$0 (\$1.772) \$379 \$379 \$1.772 \$1,394 (\$7,531) ŠÖ \$0 \$0 2007 \$0 \$0 (\$1,827) \$388 \$388 \$1,827 \$1,438 (\$6,808) 2008 \$0 (\$1,883) \$0 **\$**0 \$0 \$0 \$387 \$387 \$1,883 \$1,495 (\$6,117) 2009 \$0 \$0 \$0 \$0 (\$1,940) \$391 \$0 \$391 \$1,940 \$1,549 (\$5,461) 2010 \$0 (\$2,000) \$0 \$0 \$395 \$0 \$0 \$395 \$1,604 (\$4,838) \$2,000 \$0 \$0 \$0 2011 \$0 \$399 \$0 \$399 (\$4,245) (\$2,061) \$2,061 \$1,661 2012 \$0 (\$2,124) \$0 \$0 \$404 \$0 \$0 \$404 \$2,124 \$1 720 (\$3,682) \$0 \$0 \$0 2013 \$0 \$408 \$1,781 (\$2,189) \$0 \$408 \$2,189 (\$3,147)

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	•	•						
Nominal NPV	\$16,191 \$13,094	(\$23,089) (\$11,634)		\$4,830 \$2,501	\$1,000 \$813	\$21,022 \$15,595	\$24,089 \$12,447	\$3,067 (\$3,147)
Disc	ount Rate =	8.97% 0.80	- <u></u> , .			<b>₹10,000</b>		<u>(</u> <b>40</b> , <b>111</b> )

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\$18,759 \$8,117

\$13,733 \$10,761

\$2,306 \$1,174 \$5,026 (\$2,644)

# Total Resource Cost-Effectiveness Messure

(1)		(3) Utility's Program Costs (\$000s)	(4) Participents'	(5) Other Costs (\$000s)	(6) Other Benefits (\$000s)	(7) Incremental Generation Cap Costs (\$000s)	(6) Incremental T&D Cap Costs (\$000a)	dministrative Co (9) Incremental Prog. Induced Fuel Costs (\$000s)	(10) Totai Costs (\$000s)	(11) Total Benefits (\$000e)	(12) Total Net Benefits (\$000s)	(13) Cumulative Discounted Nat Benefits (\$000e)
Yeer 1999 2000 2001 2002 2003 2004 2005 2006 2007 2006 2007 2008 2009 2010 2011 2012 2013	(\$000s) \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$75 \$156 \$156 \$164 \$164 \$164 \$169 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$1,357 \$2,648 \$2,424 \$2,184 \$1,928 \$76 (\$1,720) (\$1,772) (\$1,863) (\$1,940) (\$2,000) (\$2,001) (\$2,124)	(30003) \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	(0000) \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	(\$60) (\$77) (\$29) (\$41) (\$55) (\$63) (\$65) (\$65) (\$65) (\$65) (\$65) (\$70) (\$72) (\$72) (\$74) (\$76) (\$78) (\$78) (\$80)	\$0 (\$12) (\$20) (\$27) (\$33) (\$34) (\$34) (\$34) (\$32) (\$34) (\$32) (\$31) (\$30) (\$29) (\$29) (\$27) (\$26) (\$25)	\$15 \$49 \$81 \$117 \$151 \$170 \$170 \$174 \$176 \$182 \$188 \$191 \$191 \$201 \$201	\$1,447 \$2,852 \$2,665 \$2,465 \$2,465 \$333 \$174 \$176 \$182 \$188 \$191 \$194 \$201 \$201 \$207 \$211	\$6 \$29 \$49 \$68 \$88 \$1,819 \$1,871 \$1,926 \$1,982 \$2,040 \$2,101 \$2,163 \$2,227 \$2,292	(\$1,441) (\$2,823) (\$2,616) (\$2,307) (\$2,160) (\$234) \$1,844 \$1,896 \$1,744 \$1,896 \$1,794 \$1,806 \$1,906 \$1,902 \$2,019 \$2,082	(\$1,44 (\$4,03 (\$6,23 (\$8,08 (\$9,61
		, •										

(\$860) (\$435) (\$384) (\$210)

Nominal NPV

Discount Rate = Benefit/Cost Ratio = Ŧ

(\$6,896) \$1,460

\$810 \$855 8.97% 0.75

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> 1999 2001

2000 \$234.85 \$/kW

2.56%

2.99%

2.56%

3.26%

3.40% \$0.0356 \$/kWh

1.91%

2.56%

Per Table

Per Table

RIM

\$3,145

\$2,642

\$503

1.191

\$58.75 \$/kW

\$33.00 \$/kW

\$2.77 \$/kW/Yr

\$0.73 \$/kW/Yr \$0.84 \$/kW/Yr

\$0.433 \$/kW/Yr

\$20.70 \$/KW/YR

0

\$0.0352 \$/kWh

\$0.0000 \$/kW/Mo

0 kW/Mo.

Participants'

\$12,447

\$15,595

(\$3,147)

0.798

### INPUT DATA -- PART 1

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

		IV. Incremental Generation, Transmission, & Distribution C	losts
I. Program Demand Impacts and Line Losses	-0.30 kW/Cus	(1) Base Year	1
(1) Change in Peek kW Customer at meter	-0.39 kW Gen/Cui	(2) In-Service Year For Incremental Generation	2
(2) Change in Peak KW per Customer at generator	12.60%	(3) In-Service Year For Incremental T & D	2
(3) kW Line Loss Percentage	1,497 kWh/Cus/Yr	(4) Base Year Incremental Generation Cost	\$23
(4) Change in KWh per Customer at generator	7.70%	(5) Base Year Incremental Transmission Cost	\$50
(5) kWh Line Loss Percentage	1.0014	(6) Base Year Incremental Distribution Cost	\$3:
(8) Group Line Loss Multiplier	1.390 kWh/Cus/Yr	(7) Gen, Tran, & Dist Cost Escalation Rate	2.
(7) Annual Change in Customer kWh at Meter	4.40 kW/Cus	(8) Generator Fixed O & M Cost	\$
*(8) Change in Winter kW per Cust at meter		(9) Generator Fixed O&M Escalation Rate	2.
		(10) Transmission Fixed O & M Cost	\$
		(11) Distribution Fixed O & M Cost	\$
		(12) T&D Fixed O&M Escalation Rate	2.
II. Economic Life and K-Factors	15 Years	(13) Incremental Gen Variable O & M Costs	\$0
(1) DSM Program Study Period	40 Years	(14) Incre Gen Variable O&M Cost Esc Rate	3
(2) Economic Life of Incremental Generation	30 Years	(15) Incremental Gen Capacity Factor	<u> </u>
(3) Economic Life of Incremental T&D	1.4493	(16) Incremental Generating Unit Fuel Cost	
(4) K-Factor for Generation	1.4394	(17) Incremental Gen Unit Fuel Esc Rate	
(5) K-Factor for T&D *(6) Switch: Rev Req (0) or Val-of-Def (1)	0 1	* (18) Incremental Purchased Capacity Cost	2
U (B) Switch: Key Key (U) O Varol Boi (1)		* (19) Incremental Capacity Cost Eac Rate	
MI. Utility & Customer Costs		ti D	
(1) Utility Nonrecurring Cost Per Customer	\$150.00 \$/Cus	Stop Revenue Loss at In-Service Year? (Y=1, N=0)	
(2) Utility Recurring Cost Per Customer	\$0.00 \$/Cus/Year	V. (1) Non-Fuel Cost in Customer Bill (Base Year)	
(3) Utility Cost Escalation Rate	3.06%	(1) Non-Fuel Cost in Customer Bill (Base Year)	\$0
(4) Customer Environment Cost	\$3,000.00 \$/Cus	(2) Non-Fuel Escalation Rate	Per
(5) Customer Equpiment Cost Escalation Rate	3.06%	(3) Customer Demand Charge Per kW (Base Year)	\$0
(6) Customer O&M Cost	(\$287.00) \$/Cus/Year	(4) Demand Charge Escalation Rate	Per
(7) Customer O&M Cost Escalation Rate	3.06%	(5) Average Annual Change In Monthly Bitting kW	
*(A) 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	3.08%	Summary Results for This Analys	ils
•712) Utility Discount Rate	8.97%		RI
* (13) Little AFUDC Rate	10.30% \$200.00 \$/Cus	NPV Benefits(\$000s)	:
+ (1A) Litility Nonrecurring Rebate/Incentive	\$0.00 \$/Cus/Year	NPV Costs (\$000s)	:
* (15) Litility Recurring Rebete/Incentive		NPV Net Benefits (\$000s)	
* (16) Utility Rebate/Incentive Escalation Rate	0.00%	Benefit:Cost Ratio	

\* Supplemental information Not Specifically Specified in Cost Effectiveness Manual

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				1-Effectivence			De Florida Adr	(0)	(40)	744\	(49)	/12\	(14)
1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13) Total Nat	(14) Cumulative
	Change In	Utility's	Utility Paid	Change in	incremental Generation	Incremental T&D	Incremental Prog Induced	Other	Other	Total	Total	Benefits to	Discounied
	Electric	Program	Rebetes &	Electric		Cap Coata	Fuel Costa	Costs	Benefits	Costs	Benefits	All Customers	Net Benefits
	Supply Costs	Costs	(SOOGs)	Revenues (\$000)	Cap Costs (\$000s)	(\$000s)	(\$000s)	(\$000a)	(\$000s)	(\$000a)	(\$000s)	(\$000s)	(\$0004)
	(\$000c)	(\$000s) \$75	\$100	\$39	(\$6)	\$0	\$15	\$0	\$0	\$190	\$44	(\$146)	(\$14
1999	\$0 \$0	\$155	\$200	\$114	(\$17)	(\$12)		\$0	\$0	\$404	\$143	(\$260)	(\$38
2000 2001	\$0 \$0	\$159	\$200	\$183	(\$29)	(\$20)		\$0	\$0	\$440	\$232	(\$209)	(\$56
2002	\$0	\$104	\$200	\$263	(\$41)	(\$27)	\$117	\$0	\$0	\$481	\$331	(\$149)	(\$67
2003	\$0	\$169	\$200	\$329	(\$55)	(\$33)		\$0	\$0 \$0	\$520	\$417	(\$103)	(\$74
2004	\$0	\$87	\$100	\$376	(\$63)	(\$35)		\$0	\$0	\$357	\$474	\$117	(\$6) (\$4)
2005	\$0	\$0	\$0	\$375	(\$65)	(\$34		\$0	\$0 \$0	\$174	\$474	\$300 \$302	(\$4)
2006	\$0	\$0	\$0	\$379	(\$67)	(\$32		\$0 \$0	50	\$176	\$478 \$488	\$305	(\$1)
2007	\$0	\$0	\$0	\$385	(\$66)			<b>2</b> 0	\$0 \$0 \$0 \$0	\$182 \$168	\$487	\$299	(\$
2005	50	\$0	\$0	\$387	(\$70)	(\$30)		\$0		\$191	\$491	\$301	\$
2005	\$0	\$0	\$0	\$391	(\$72)			\$0 \$0	\$0	\$194	\$496	\$302	\$2
2010	\$0 \$0 \$0	\$0		\$395	(\$74)			\$0	\$0	\$201	\$501	\$300	\$3
2011	\$0	\$0	\$0	\$399 \$404	(\$76) (\$78)			\$0	50	\$207	\$506		\$4
2012	<b>\$0</b>	\$0	\$0 \$0	\$404	(\$76) (\$80)			\$0	\$0 \$0	\$211	\$512	\$301	\$5
2013	\$0 \$0 \$0 \$0	\$0 \$0	\$0 \$0	\$413	(\$82)			\$0	<b>\$0</b>	\$207	\$517	\$310	\$5
2014	<b>10</b>	\$0	50	\$417				\$0	<b>\$0</b>	\$207	\$523		\$6
2015	\$0	\$0	\$0	\$422				\$0	<b>\$0</b>	\$204	\$529		\$7
2016 2017	\$0	\$0	50					\$0	i <b>\$0</b>	\$202	\$530		\$8
2018	\$0	\$0	) <b>\$</b> (	\$432			i) <b>\$</b> 214	\$0	\$0	\$214	\$543		\$6
2019	\$0	50	50	\$437		) (\$19		\$0	\$0	\$221	\$551		
2020	\$0 \$0	\$0 \$0 \$0	) <b>\$</b> (	) \$442	(\$99			\$0	\$0	\$227	\$560		ې \$1,8
2021	\$0	\$0	) <b>\$</b> (	) \$448					<b>\$0</b>	\$234	\$566 \$577		
2022	\$0	\$0	) <b>\$</b>	\$453						\$241 \$249	\$580		
2023	\$0	\$( \$(	) \$1 ) \$1	\$460						\$257	\$590		
2024	\$0	<b>\$</b> 4		\$466					<b>\$0</b>	\$264	\$50		• •
2025		. și	) <b>\$</b>	D \$473 D \$480						\$272	\$615		: <b>\$1</b> ,
2026	<b>.</b> .	\$ \$	D \$	0 <b>\$46</b> 7		•				\$281	\$62		
2027				0 \$495		· · · · · · · · · · · · · · · · · · ·				\$289	\$63	6 <b>\$34</b> 7	' <b>\$</b> 1,
		-,	•										
			•										
iomini NP		\$8 \$8	56 \$8							\$7,687 \$3,196			
	Discount Rate												
Bec	efit/Cost Ralio		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) Utility Paid Total Change In Cumulative Customer Customer Other Other Participants Tax Rebates & Total Totai Net Discounted Condita Benefits Equip Costs **O&M Costs** Costs Benefits Electric Bills Benefits Net Renefits Incentives Costs (\$000s) Year (\$000s) (\$000s) (\$000s) (\$000s) (\$000s) (\$000a) (\$000a) (\$000s) (\$000s) (\$000s) 1990 \$0 50 \$1.539 \$244 (\$1,295) (\$1,295) \$1.500 (\$144) ŝn \$39 \$100 2000 \$3 092 (\$444) \$0 \$O \$114 \$0 \$200 \$3 206 \$644 (\$2.582) (\$3 647 Ŝ0 **\$**0 \$200 \$3,389 (\$2,407) (\$5.674) 2001 \$3.187 (\$762) \$0 \$183 \$962 2002 \$3.284 (\$1.100) ŝò \$0 \$263 50 \$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) \$0 \$0 \$0 2004 \$1.744 (\$1,669) \$376 \$100 \$2,120 \$1,769 (\$351) (\$9.098) \$0 \$0 \$375 50 (\$8.295) 2005 \$0 (\$1.720) \$0 \$375 \$1,720 \$1.344 \$0 \$0 ŝō 2006 \$O (\$1,772) \$379 \$0 \$379 \$1.772 \$1 394 (\$7.531) \$0 **\$**0 \$0 2007 \$0 \$388 **\$**0 \$388 \$1.438 (\$6.808 (\$1.827) \$1.827 \$0 \$0 \$0 \$0 \$0 2008 \$387 **\$**0 \$387 \$1.883 \$1,495 (\$6.117) (\$1.883) \$0 \$0 \$0 \$O \$1.549 2009 (\$1.940) \$391 \$391 \$1.940 (\$5.461) 2010 \$0 **\$**0 \$0 \$395 \$0 \$O \$395 \$2,000 \$1.604 (\$4,838) (\$2,000) \$0 2011 \$0 (\$2,061) \$0 \$399 \$0 \$0 \$399 \$2.061 \$1.661 (\$4,245) \$0 \$0 \$0 \$0 \$404 \$O \$2.124 \$1,720 (\$3.682 2012 (\$2.124) \$404 \$0 \$0 \$0 \$0 \$0 \$408 \$2,189 \$1.781 (\$3.147) 2013 (\$2,189) \$408 **\$**0 \$0 \$0 ŝò Ś0 \$2.258 (\$2,639 \$413 \$1.843 2014 (\$2.256) \$413 \$0 **\$**0 \$O \$0 \$O \$417 \$2,325 \$1,908 (\$2.157 2015 (\$2,325) \$417 \$1,974 \$0 \$0 **\$**0 \$0 \$0 \$422 \$2,396 (\$1.698) 2016 (\$2.396) \$422 \$0 \$0 50 \$0 \$0 \$2.043 \$427 \$427 \$2.470 (\$1.263 2017 (\$2,470) \$0 **\$**0 \$0 \$0 \$0 \$2,113 (\$850 2018 (\$2.545) \$432 \$432 \$2,545 \$0 **\$**0 \$0 \$0 (\$458) \$0 \$2,186 2019 (\$2.623) \$437 \$437 \$2.623 \$0 \$0 \$0 \$0 ŝō \$442 \$442 \$2,703 \$2,261 (\$86) 2020 (\$2,703)\$0 \$0 \$0 \$0 \$2.338 \$0 \$448 \$2,786 \$268 2021 (\$2,786) \$448 \$0 \$0 \$0 \$0 \$0 \$453 \$2.872 \$2.418 \$603 2022 (\$2.872) \$453 2023 \$0 (\$2,959) \$0 \$0 \$460 \$0 \$0 \$460 \$2,959 \$2,500 \$921 \$0 \$0 \$Ō \$0 \$2.584 \$1.222 \$466 \$0 \$466 \$3.050 2024 (\$3.050) 50 \$0 \$0 \$0 \$0 \$473 \$3,144 \$2,670 \$1,509 2025 (\$3,144) \$473 \$0 \$0 \$0 \$O \$0 \$2,760 \$1,780 2026 \$480 \$480 \$3,240 (\$3,240) \$0 Ś0 \$0 \$0 \$2.851 2027 4 \$0 (\$3.339)\$487 \$487 \$3,339 \$2.037 ŝo \$0 \$0 \$0 \$0 \$3,441 \$2.946 2028 (\$3,441) \$495 \$495 \$2,281

٠ \$11,584 \$1,000 \$66,239 \$38,464 Nominal \$16,191 (\$65,239) \$27,775 NPV (\$18, 132)\$3,571 \$813 \$16,665 \$18,946 \$2,281 \$13,094 8.97% Discount Rate = Benefit/Cost Ratio = 1.14

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Filename:

Total Resource Cost-Effectiveness Measure	
st-Effectiveness Analysis per Rule 25-17.008 Floride Administrative	C

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	<u>dministrative Co</u> (9)	(10)	(11)	(12)	(13)
<u>, , , , , , , , , , , , , , , , , , , </u>	Change in					Incremental	Incremental	Incremental				Cumulative
	Electric	i Utility's	Participants'	Other	Other	Generation	TED	Prog Induced	Total	Total	Net	Discounted
	Supply Costs	Program Costs		Costs	Benefits	Cap Costs	Cap Costs	Fuel Costa	Costs	Benefits	Benefits	Net Benefits
Year	(\$000s)	(\$000s)	(\$000s)	(\$000s)	(\$000e)	(\$000a)	(\$000e)	(\$000a)	(\$000s)	(\$000s)	(\$000s)	(\$000a)
	\$0		\$1,357	\$0	\$0		\$0	\$15	\$1,447			
999			\$2,648	\$0	\$0 \$0	(\$6)		\$49		\$8 500	(\$1,441)	(\$1,44
000	\$0				<b>3</b> U	(\$17)	(\$12)		\$2,852	\$29	(\$2,823)	(\$4,03
001	\$0	\$159	\$2,424	\$0	<b>\$</b> 0	(\$29)	(\$20)	\$81	\$2,665	\$49	(\$2,616)	(\$6,23
002	\$0	\$184	\$2,184	\$0	\$0	(\$41)	(\$27)	\$117	\$2,465	\$68	(\$2,397)	(\$8,08
003	\$0	\$169	\$1,928	\$0	\$0	(\$55)	(\$33)	\$151	\$2,248	\$88	(\$2,160)	(\$9,61
004	\$0	\$67	\$76	\$0	\$0	(\$63)	(\$35)	\$170	\$333	\$98	(\$234)	(\$9,77
005	\$0	\$0	(\$1,720)	\$0	\$0	(\$65)	(\$34)	\$174	\$174	\$1,819	\$1,644	(\$8,78
1006	\$0 \$0	\$0	(\$1,772)	\$0	\$0	(\$67)	(\$32)	\$176	\$176	\$1,871	\$1,696	(\$7,85
007	<b>\$</b> 0	\$0	(\$1,827)	\$0	\$0	(\$66)	(\$31)	\$18 <u>2</u>	\$182	\$1,926	\$1,744	(\$6,96
2008	\$0	\$0	(\$1,883)	\$0	\$0	(\$70 <u>)</u>	(\$30)	\$168	\$188	\$1,962	\$1,794	(\$6,15
1009	\$0	\$0	(\$1,940)	\$0	\$0	(\$72)	(\$29)	\$191	\$191	\$2,040	\$1,850	(\$5,37
2010	\$0	\$0	(\$2,000)	\$0	\$0	(\$74)	(\$27)	\$194	\$194	\$2,101	\$1,906	(\$4,63
2011	\$0	\$0 \$0 \$0 \$0 \$0 \$0	(\$2,061)	\$0	\$0	(\$76)	(\$26)	\$201	\$201	\$2,163	\$1,962	(\$3,93
012	\$0 \$0 \$0	\$0	(\$2,124)	\$0	\$0	(\$78)	(\$25)	\$207	\$207	\$2,227	\$2,019	(\$3,26
2013	\$0	\$0	(\$2,189)	\$0	\$0	(\$80)	(\$23)	\$211	\$211	\$2,292	\$2,082	(\$2,64
1014	\$0	\$0	(\$2,256)	\$0	\$0	(\$82)	(\$22)	\$207	\$207	\$2,360	\$2,154	(\$2,05
2015	\$0	\$0	(\$2,325)	\$0	\$0	(\$84)	(\$21)	\$207	\$207	\$2,431	\$2,223	(\$1,48
2016	\$0	\$0	(\$2,396)	\$0	\$0	(\$87)	(\$20)		\$204	\$2,503	\$2,299	(\$95
2017	\$0	\$0		\$0	\$0	(\$89)	(\$20)		\$202	\$2,579	\$2,376	(\$44
2018	\$0	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	(\$2,545)	\$0	\$0	(\$92)	(\$19)		\$214	\$2,656	\$2,442	\$3
2019	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	02	(\$2,623)	\$0	\$0	(\$95)	(\$19)		\$221	\$2,737	\$2,516	\$40
2020	\$0	ś.	(\$2,703)	\$0	\$0	(\$99)	(\$18)		\$227	\$2,821	\$2,593	\$90
2021	50	so.	(\$2,786)	\$0 \$0	\$0	(\$103)	(\$16)		\$234	\$2,907	\$2,673	\$1,31
2022	\$0 \$1	\$0	(\$2,872)	\$0	\$0	(\$106)	(\$17)		\$241	\$2,995	\$2,753	\$1,69
2023		\$0	(\$2,959)	\$0	\$0	(\$109)	(\$17)	• •	\$249	\$3,085	\$2,837	\$2,0
2023		\$0	(\$3,050)	\$0	\$0	(\$113)	(\$16)	•	\$257	\$3,179	\$2,922	\$2,3
		\$0	(\$3,144)	\$0	\$0				\$264	\$3,275	\$3,011	\$2,71
2025	30	\$0 \$0	(\$3,240)	\$0	\$0				\$272	\$3,374	\$3,102	\$3,0
2026	\$0		(#3,290)	\$0					\$281	\$3,477		\$3,3
2027	\$0		(\$3,339)	30 50	\$0 \$0				\$289	\$3,582	\$3,196 \$3,293	\$3,5 \$3,5
2028	<b>\$</b> 0 		(\$3,441)		<b>U</b>	(\$127)		,	•	••••	••,•••	<b>~~...</b>
			۲									
iominal NP\		\$810 \$650				(\$2,404) (\$873)			\$17,303 \$11,315	\$62,720 \$14,890	\$45,416 \$3,504	
	Discount Rate											
	nelt/Cost Ratio											

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PSC Form CE 1.1 Page 1 of 1 Run Date: 23-jul-98 03:20 PM Filename: gthp\_9

## INPUT DATA - PART 1

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

Demand impacts and Line Lotter		IV. Incremental Generatio
I. Program Demand Impacts and Line Losses (1) Change in Peek KW Customer at meter	-0.30 kW/Cus	(1) Base Year
(2) Change in Peek kW per Customer at generator	-0.39 kW Gen/Cut	(2) In-Service Year Fo
(2) Change in Plack KY per Countries in generation	12.60%	(3) In-Service Year Fo
(3) kW Line Loss Percentage (4) Change in KWh per Customer at generator	1,497 kWh/Cus/Yr	(4) Base Year Increme
(4) Change in Kvin per odeaning a generation	7.70%	(5) Base Year Increme
(5) kWh Line Loss Percentage	1.0014	(6) Base Year Increme
(6) Group Line Loss Multiplier (7) Annual Change in Customer KWh at Motor	1,390 kWh/Cus/Yr	(7) Gen, Tran, & Dist (
*(8) Change in Winter kW per Cust at meter	4.40 kW/Cus	(8) Generator Fixed O
(8) Change in Winder Kiv per Court in the		(9) Generator Fixed O
		(10) Transmission Flux
	<b>1</b>	(11) Distribution Fixed (12) T&D Fixed O&M
I. Economic Life and K-Factors	[	(12) I &D Fixed U&M (13) Incremental Gen
(1) OSM Program Study Period	30 Years	(14) Incre Gen Variab
(2) Economic Life of Incremental Generation	40 Years	(15) Incremental Gen
(3) Economic Life of Incremental T&D	30 Years	(16) Incremental Gen
(4) K-Factor for Generation	1.4493	(17) incremental Gen
TEL K Eactor for TAD	1.4394	* (18) incremental Purc
(6) Switch: Rev Reg (0) or Val-of-Def (1)	0	• (19) Incremental Cap
		Trevine
N. Utility & Customer Costs	\$150.00 \$/Cus	Stop Revenue Loss a
14\1 Hills Nonrecumna Cast Per Custones	\$150.00 \$/Cus/Year	
72) Littlify Recurring Cost Per Customer	3.05%	V. (1) Non-Fuel Cost In
(3) Littity Cost Escalation Rate	\$3,000.00 \$/Cus	(1) Non-Fuel Cost In
74) Customer Ecutoment Cost	3.08%	(2) Non-Fuel Escelat
(5) Customer Equpiment Cost Escalation Rate	(\$287.00) \$/Cus/Yeer	(3) Customer Deman
(8) Customer OBM Cost.	3.06%	(4) Demand Charge
(7) Customer O&M Cost Escalation Rate	\$0.00 \$/Cus	* (5)Average Annual C
*/8) Customer Tax Credit Per Installation	3.06%	
* (9) Customer Tex Credit Escalation Rate	\$0.00 \$/Cus/Year	· · · · · · · · · · · · · · · · · · ·
* (10) Change in Supply Costs	3.06%	1
*(11) Supply Costs Escalation Rate	8.97%	
* (12) Litility Discount Rate	10.30%	i [
	\$200.00 \$/Cus	11
+714) Littley Nonsecuring Rebite/Incertive	\$0.00 \$/Cus/Year	11
+ (15) ( Hilling Recurring Rebels/Incontry	0.00%	11
(16) Utility Rebate/Incentive Escalation Rate	0.0078	

V. Incremental Generation, Transmission, & Distribution	1999
(1) Base Year	2001
(2) In-Service Year For Incremental Generation	2001
(3) In-Service Yeer For Incremental T & D	
(4) Base Year Incremental Generation Cost	\$234.85 \$/kW
(5) Base Year Incremental Transmission Cost	\$58.75 \$/kW
(6) Rase Year Incremental Distribution Cost	\$33.00 \$/kW
(7) Gen. Tran. & Dist Cost Escalation Rate	2.58%
(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) TAD 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%
<ul> <li>(18) incremental Purchased Capacity Cost</li> </ul>	\$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 Escelation Rate	Per Table
(3) Customer Demand Charge Per kW (Base Year)	\$0.0000 \$/kW/Mo
(4) Demand Charge Escalation Rate	Per Table
<ul> <li>(5) Average Annual Change in Monthly Billing kW</li> </ul>	<u>0</u> kW/Mo.

Summary Results for This Analysis		<u> </u>
	RIM	Participants'
NPV Benefits(\$000s)	\$4,498	\$16,946
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 Messure

			Coe				08 Florida Ade						
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	Change in	Utility's	Utility Paid	Change in	Incremental	Incremental	Incremental	<b></b>		<b>.</b>	-	Total Not	Cumulative
	Electric	Program	Rebates &	Electric	Generation	TAD	Prog Induced	Other	Other	Total	Total	Benefits to	Discounted
	Supply Costs	Costs	Incentives	Revenues	Cap Costs	Cap Costs	Fuel Costs	Costs	Benefits	Costs	Bonelits	All Customers	Net Benefits
(ear	(\$000s)	(\$000e)	(\$000s)	(\$000)	(\$000s)	(\$000e)	(\$000e)	(\$000e)	(\$000a)	(\$000s)	(\$000s)	(\$000e)	(\$000e)
1999	\$0	\$75	\$100	(\$1)	(\$22)	\$0	(\$0)	\$0	\$0	\$176	\$22	(\$153)	(\$15:
2000	\$0	\$155	\$200	(\$2)	(\$67)	(\$50)	(\$1)	\$0	\$0	\$356	\$117	(\$239)	(\$37:
2001	\$0	\$159	\$200	(\$3)	(\$117)	(\$80)		\$0	\$0	\$362	\$198	(\$184)	(\$51)
2002	\$0	\$164	\$200	(\$4)	(\$165)	(\$107)	(\$2)	\$0	\$0	\$368	\$275	(\$94)	(\$58:
2003	\$0	\$169	\$200	(\$5)	(\$220)	(\$132)		\$0	\$0	\$374	\$354	(\$20)	(\$59
2004	\$0 \$0	\$87	\$100	(\$6)		(\$141)		\$0	\$0	\$193	\$395	\$203	(\$46
2005	\$0	\$0	\$0	(\$6)	(\$261)	(\$135)		\$0	\$0	\$6	\$396	\$393	(\$23
2008	\$0	\$0	\$0	(\$6)		(\$130)	(\$3)	\$0	\$0	\$6	\$399	\$393	(\$1
2007	\$0 \$0 \$0	\$0	\$0	(\$6)	(\$272)	(\$125)	(\$3)	\$0	\$0	\$8	\$400	\$394	\$18
2008	\$0	\$0	\$0	(\$6)		(\$119)		\$0	\$0	\$6	\$401	\$395	\$36
2009	\$0	\$0 \$0	<b>\$</b> 0	(\$8)		(\$114)		\$0	\$0	\$6	\$404	\$398	\$53
2010	\$0	<b>\$</b> 0	\$0 \$0 \$0	(\$6)		(\$109)		\$0 \$0	\$0	\$6 \$6	\$407	\$401	\$68 \$83
2011	\$0	\$0	30	(\$6)		(\$104)			\$0	30 44	\$410 \$414	\$404 \$408	\$963
2012	\$0	\$0 \$0	\$0 \$0	(\$6) (\$6)	(\$312) (\$320)	(\$99) (\$94)		\$0 \$0	\$0 \$0	\$6 \$6	\$417	\$406 \$411	\$1,09
2013	\$0	\$0	\$0 \$0			(\$89)		\$0	\$0 \$0	\$6	\$421	\$415	\$1,05
2014	\$0 \$0	\$0 \$0	04 80	(\$6) (\$6)		(\$84)		\$0	\$0	\$6	\$425	\$419	\$1,20
2015 2016	\$U	\$0 \$0	\$0 \$0	(\$6)		(\$81)		\$0	90 10	\$6	\$431	\$425	\$1,40
	\$0	\$0	\$0 \$0	(\$6)		(\$79)		\$0	\$0 \$0	\$6	\$439	\$432	\$1,50
2017 2018	<b>2</b> 0		\$0	(\$0) (\$7)		(\$77)		\$0	\$0 \$0	\$7	\$447	\$440	\$1,58
2018	\$0 \$0 \$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	40 \$0	(\$7)		(\$75)		\$0	\$0	\$7	\$459	\$452	\$1,66
2010	90 \$5		\$0 \$0	(\$7)		(\$73		\$0	\$0 \$0 \$0 \$0	\$7	\$472	\$465	\$1,74
2021	#0 \$0	\$0	\$0	(\$7)				\$0	\$0	\$7	\$486	\$479	\$1,81
2022		\$0	\$0	(\$7)		(\$69			\$0	\$7	\$497	\$490	\$1,88
2022	\$0 \$0 \$0 \$0	50	\$0	(\$7)		(\$67			\$0	\$7	\$508	\$501	\$1,94
2023	<b>4</b> 0	<b>\$</b> 0	\$0	(\$7)					\$0	\$7	\$519	\$512	\$2,00
2025	\$0	\$0	\$0	(\$7						\$7	\$531	\$523	\$2,06
2026	\$0	50	\$0	(\$7					\$0	\$7	\$543	\$535	\$2,11
2027	\$0	\$0	\$0	(\$7						\$7	\$555	\$548	\$2,16
2028	\$0	\$0	\$0	(\$7						\$7	\$568	\$561	\$2,21
		,											
			•										
Nominal NPV		\$810 \$655								\$1,965 \$1,522	\$12,311 \$3,735		
	lecount Rate =	8.97%								·	<u>*</u>		· · · · · · · · · · · · · · · · · · ·

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(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
					Change in		Utility Paid			Total	Cumulative
	Customer	Customer	Other	Other	Participants'	Tax	Rebates &	Total	Total	Net	Discounted
	Equip Costs	O&M Costs	Costs	Benefits	Electric Bills	Credits	incentives	Costs	Benefits	Benefits	Not Benefits
Year	(\$000s)	(\$000s)	(\$000s)	(\$000s)	(\$000s)	(\$000s)	(\$000s)	(\$000s)	(\$000s)	(\$000s)	(\$000s)
1999	\$1,500	(\$144)	\$0	\$0	(\$1)	\$0	\$100	\$1,500	\$244	(\$1,256)	(\$1,25
2000	\$3,092	(\$444)	\$0	\$0	(\$2)	\$0	\$200	\$3,092	\$645	(\$2,446)	(\$3,50
2001	\$3,187	(\$762)	\$0	\$0	(\$3)	\$0	\$200	\$3,187	\$965	(\$2,222)	(\$5,37
2002	\$3,284	(\$1,100)	\$0	\$0	(\$4)	\$0	\$200	\$3,284	\$1,304	(\$1,980)	(\$6,90
2003	\$3,385	(\$1,457)	\$0	\$0	(\$5)	\$0	\$200	\$3,385	\$1,662	(\$1,723)	(\$8,12
2004	\$1,744	(\$1,669)	\$0	\$0	(\$6)	\$0	\$100	\$1,744	\$1,774	\$30	(\$8,10
2005	\$0	(\$1,720)	\$0	\$0	(\$6)	\$0	\$0	\$0	\$1,725	\$1,725	(\$7.07
2006	\$0	(\$1,772)	\$0	\$0	(\$6)	\$0	\$0	\$0	\$1,778	\$1,778	(\$6,10
2007	\$0	(\$1,827)	\$0	\$0	(\$6)	\$0	\$0	\$0	\$1,832	\$1,832	(\$5,17
2008	\$0	(\$1,883)	\$0	\$0	(\$6)	\$0	\$0	\$0	\$1,888	\$1,888	(\$4,30
2009	\$0	(\$1,940)	\$0	\$0	(\$6)	\$0	\$0	\$0	\$1,946	\$1,946	(\$3,48
2010	\$0	(\$2,000)	\$0	\$0	(\$6)	\$0	\$0	\$0	\$2,006	\$2,006	(\$2,70
2011	\$0	(\$2,061)	\$0	\$0	(\$6)	\$0	\$0	\$0	\$2,067	\$2,067	(\$1,96
2012	\$0	(\$2,124)	\$0	\$0	(\$6)	\$0	\$0	\$0	\$2,130	\$2,130	(\$1,26
2013	\$0	(\$2,189)	\$0	\$0	(\$6)	\$0	\$0	\$0	\$2,195	\$2,195	(\$60
2014	\$0	(\$2,256)	\$0	\$0	(\$6)	\$0	\$0	\$0	\$2,262	\$2,262	\$1
2015	\$0	(\$2,325)	\$0	\$0	(\$6)	\$0	\$0	\$0	\$2,331	\$2,331	\$60
2016	\$0	(\$2,396)	\$0	\$0	(\$6)	\$0	\$0	\$0	\$2,403	\$2,403	\$1,16
2017	\$0	(\$2,470)	\$0	\$0	(\$6)	\$0	\$0	\$0	\$2,476	\$2,476	\$1,68
2018	\$0	(\$2,545)	\$0	\$0	(\$7)	\$0	\$0	\$0	\$2,552	\$2,552	\$2,18
2019	\$0	(\$2,623)	\$0	\$0	(\$7)	\$0	\$0	\$0	\$2,630	\$2,630	\$2,66
2020	\$0	(\$2,703)	\$0	\$0	(\$7)	\$0	\$0	\$0	\$2,710	\$2,710	\$3,10
2021	\$0	(\$2,786)	\$0	\$0	(\$7)	\$0	\$0	\$0	\$2,793	\$2,793	\$3,52
2022	\$0	(\$2,872)	\$0	\$0	(\$7)	\$0	\$0	\$0	\$2,878	\$2,878	\$3,92
2023	\$0	(\$2,959)	\$0	\$0	(\$7)	\$0	\$0	\$0	\$2,966	\$2,966	\$4,30
2024	\$0	(\$3,050)	\$0	\$0		\$0	\$0	\$0	\$3,057	\$3,057	\$4,68
2025	\$0	(\$3,144)	\$0	\$0		\$0	\$0	\$0	\$3,151	\$3,151	\$4,99
2026	\$0	(\$3,240)	\$0	\$0	(\$7)	\$0	\$0	\$0	\$3,247	\$3,247	\$5,31
	4 \$0	(\$3,339)	\$0	. \$0	(\$7)	\$0	\$0	\$0	\$3,346	\$3,346	\$5,62
2027	\$0	(\$3,441)	\$0	\$0	(\$7)	\$0		\$0	\$3,449	\$3,449	\$5,90

Participants' Cost-Effectiveness Measure

(\$175) (\$54) \$1,000 \$813 \$16,191 \$13,094

\$66,414 \$19,000

\$50,222 \$5,906

\$13,094 8.97% 1.45 Discount Rate = Benefit/Cost Ratio =

\$16,191

Nominal

NPV

(\$65,239) (\$18,132)

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(1)	(2) Change in Electric	(3) Utility's	(4) Participants'	(5) Other	(6) Other	(7) Incremental Generation	(8) Incremental T&D	(9) Incremental Prog Induced	(10) Total	(11) Total	(12) Total Net	(13) Cumulative
Year		Program Costa (\$000a)		Costs (\$000e)	Benefits (\$000s)	Cap Costs (\$000s)	Cap Costa (\$000s)	Fuel Costs (\$000s)	Costs (\$000s)	Benefits (\$000s)	Benefits (\$000s)	Discounted Net Benefits (\$000s)
999	\$0		\$1,357	\$0	\$0	(\$22)	\$0	(\$0)	\$1,432	\$22	(\$1,409)	(\$1,40
000	\$0	\$155	\$2,648	\$0	\$0	(\$67)	(\$50)		\$2,803	\$117	(\$2,685)	(\$3,87
001	\$0	\$159	\$2,424	\$0	\$0	(\$117)	(\$80)	(\$1)	\$2,584	\$198	(\$2,386)	(\$5,8
002	\$0	\$164	\$2,164	\$0	\$0	(\$166)	(\$107)	(\$2)	\$2,349	\$275	(\$2,074)	(\$7,4
003	\$0	\$169	\$1,928	\$0	\$0	(\$220)	(\$132)	(\$2)	\$2,097	\$354	(\$1,743)	(\$8,7
004	50	\$87	\$76	\$0	\$0	(\$252)	(\$141)	(\$3)	\$163	\$395	\$233	(\$8,5
005	\$0	<b>50</b>	(\$1,720)	\$0	\$0 \$0 \$0	(\$261)	(\$135)		\$0	\$2,118	\$2,118	(\$7,3
006	\$0 \$0 \$0	\$0	(\$1,772)	\$0	\$0 \$0 \$0	(\$267)	(\$130)		\$0	\$2,171	\$2,171	(\$6,1
007	\$0	\$0	(\$1,827)	\$0	\$0	(\$272)	(\$125)	(\$3)	\$0	\$2,226	\$2,226	(\$4,9
008	\$0	\$0	(\$1,883)	\$0	\$0	(\$279)	(\$119)	(\$3)	\$0	\$2,284	\$2,284	(\$3,9
009	\$0	so - 50	(\$1,940)	\$0	\$0 \$0 \$0 \$0	(\$287)	(\$114)	(\$3)	\$0	\$2,344	\$2,344	(\$2,9
010	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$0 \$0	(\$2,000)	\$0	\$0	(\$295)	(\$109)		\$0 \$0	\$2,406	\$2,406	(\$2,0
011	\$0	\$0	(\$2,061)	\$0	\$0	(\$303)	(\$104)	(\$3)	\$0	\$2,471	\$2,471	(\$1,1
012	\$0	\$0	(\$2,124)	\$0	\$0	(\$312)	(\$99)		\$0	\$2,538	\$2,538	(\$3
013	\$0	\$0	(\$2,189)	\$0	\$0	(\$320)	(\$94)		\$0	\$2,606	\$2,606	\$4
014	\$0	\$0	(\$2,256)	\$0	\$0 \$0	(\$329)	(\$89)		\$0	\$2,677	\$2,677	\$1,2
015	\$0	\$0 \$0	(\$2,325)	\$0 \$0	\$U	(\$338)	(\$84)		\$0 \$0	\$2,750	\$2,750	\$1,9
016	\$0		(\$2,396)	<b>4</b> 0	\$0 \$0 \$0	(\$347)	(\$81)		\$U	\$2,827	\$2,827	\$2,5
017	\$0	\$0 \$0	(\$2,470)	\$0	an a	(\$356)	(\$79)	(\$3)	<b>\$0</b>	\$2,908 \$2,992	\$2,908 \$2,992	\$3,1
018	\$0	i aŭ \$0	(\$2,545)	\$0 \$0	\$0 \$0	(\$366) (\$381)	(\$77)	) (\$3) ) (\$3)	\$0 \$0	\$2,992 \$3,082	\$3,082	\$3,7
019	\$0	i <b>s</b> u	(\$2,623)	\$0 \$0	\$0 \$0	(\$396)	(\$75) (\$73)	(\$3)	\$0 \$0	\$3,002 \$3,176	\$3,176	\$4,3 \$4,8
020	\$0	i <b>s</b> u i <b>s</b> u	(\$2,703)	\$0	\$0 \$0	(\$412)	(\$73) (\$71)		\$0 \$0	\$3,272	\$3,272	\$5,3
2021 2022	\$0	1 <b>2</b> 0	(\$2,786) (\$2,872)	\$0 \$0	\$0	(\$424)			\$0 \$0	\$3,368	\$3,368	\$5,8
2023	\$0 \$0	\$0 \$0	(\$2,959)	\$0 \$0	\$0	(\$437)	(\$69)		\$0 \$0	\$3,467	\$3,467	\$6,2
2023	şu \$0	, <del>,</del> , , <b>\$</b> 0	(\$3,050)	\$0 \$0	\$0	(\$450)	(\$67) (\$65)		*0	\$3,569	\$3,569	\$6,6
2025	\$0		(\$3,144)	\$0	\$0	(\$484)	(\$63)		\$0 \$0	\$3,674	\$3,674	\$7,0
2026	\$0	\$0 \$0 \$0	(\$3,240)	\$0	\$0	(\$478)	(\$61)		\$0	\$3,782	\$3,782	\$7.4
2027	\$0	50	(\$3,330)	\$0	\$0	(\$492)	(\$59)		\$0	\$3,894	\$3,894	\$7,7
2028	Ş.	50	(\$3,441)	\$0	\$0	(\$507)	(\$57)		\$0	\$4,010	\$4,010	\$8,1
	<b>.</b> .	•										
			ŧ									
ominal NPV		\$810 \$855	(\$5,038)			(\$9,617) (\$2,690)			\$11,426 \$9,587	\$71,975 \$17,706	\$60.549 \$8,119	
	Discount Rate	= 8.97%										

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#### INPUT DATA - PART 1

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

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		kW Gen/Cut
(3) kW Line Loss Percentage	12.60%	
(4) Change in KWh per Customer at generator		kWh/Cue/Yr
(5) kWh Line Loss Percentage	7.70%	
(6) Group Line Loss Multipler	1.0014	
(7) Annual Change in Customer kWh at Meter		kWh/Cus/Yr
*(8) Change in Winter kW per Cust at meter		kW/Cue
II. Economic Life and K-Factors		Marin
(1) DSM Program Study Period		Years
(2) Economic Life of Incremental Generation		
(3) Economic Life of Incremental T&D	1.4493	Years
(4) K-Factor for Generation		
(5) K-Factor for T&D	1.4394	
*(6) Switch: Rev Req (0) or Vel-of-Def (1)	<u> </u>	-
M. Utility & Customer Costs		A10
(1) Utility Nonrecurring Cost Per Customer	\$150.00	
(2) Utility Recurring Cost Per Customer		\$/Cus/Year
(3) Utility Cost Escalation Rate	3.06%	
(4) Customer Equipment Cost	\$3,000.00	
(5) Customer Equpiment Cost Escalation Rate	3.06%	
(6) Customer O&M Cost		\$/Cus/Year
(7) Customer O&M Cost Escalation Rate	3.06%	_
* (8) Customer Tax Credit Per Installation		\$/Cus
* (9) Customer Tax Credit Escalation Rate	3.06%	<u>.</u>
* (10) Change in Supply Costs	\$0.00	\$/Cus/Year
*(11) Supply Costs Escalation Rate	3.06%	
* (12) Utility Discount Rate	8.97%	
	10.30%	
• (13) Littley AFUDC Rate	0000 00	S/Cus
• (13) Utility AFUDC Rate • (14) Utility Nonrecurring Rebats/Incentive	<b>32</b> 00.00	
		\$/Cus/Year

(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	3.64%
(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
(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
<ul> <li>(5)Average Annuel Change in Monthly Billing kW</li> </ul>	0 kW/Mo.

Summary Results for This Analysis	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

## Attachment "C" Page 28 of 38

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#### Relapsyers' Impact Cost-Effectiveness Measure Cost-Effectiveness Analysis per Rule 25-17 008 Florida Administrative Code

143	(2)	(3)	(4)	t-Effectivenes: (5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
<u>(1)</u>	(2)	(3) (3)	Utility Paid	Chenge In	incremental	Incremental	Incremental					Total Net	Cumulative
	Change in Electric	Program	Rebates &	Electric	Generation	T&D	Prog Induced	Other	Other	Total	Total	Benefits to	Discounted
	Supply Costs	Costs	incentives	Revenues	Cap Costs	Can Costs	Fuel Costs	Costs	Benefits	Costs	Benefits	All Customers	Net Benefits
Yeer	(\$000s)	(\$000a)	(\$000s)	(\$000)	(\$000s)	(\$000s)	(\$000s)	(\$000a)	(\$000s)	(\$000s)	(\$000s)	(\$000s)	(\$000s)
1999	\$0	\$75	\$100	(\$29)	(\$35)	\$0	(\$11)	\$0	\$0	\$204	\$46	(\$158)	(\$15
2000	\$0	\$155	\$200	(\$85)	(\$105)	(\$79)		\$0	\$0	\$439	\$221	(\$218)	(\$35
2001	\$0	\$159	\$200	(\$135)	(\$185)	(\$126)		\$0	\$0	\$495	\$371	(\$123)	(\$46
2002		\$164	\$200	(\$195)	(\$263)	(\$169)		\$0	\$0	\$559	\$518	(\$41)	(\$49
2003	•	\$169	\$200	(\$244)	(\$348)	(\$209)		\$0	\$0	\$613	\$669	\$56	(\$45
2004	ŝõ	\$87	\$100	(\$278)	(\$400)	(\$222)		\$0	\$0	\$466	\$748	\$282	(\$27
2005		\$0	\$0	(\$276)	(\$413)			\$0	\$0	\$278	\$758	\$478	\$1
2006	\$0	\$0	\$0	(\$261)	(\$422)	(\$205)	•	\$0	\$0	\$281	\$756	\$477	\$27
2007	<b>\$0</b>	\$0	\$0	(\$288)	(\$431)			\$0	\$0	\$288	\$763	\$476	\$51
	• ·	\$0	\$0	(\$287)	(\$441)	(\$189)		\$0	\$0	\$287	\$770	\$483	\$73
2008		50	\$0	(\$290)	(\$454)	(\$181)	• •	\$0	\$0	\$290	\$777	\$487	\$94
2009		<b>2</b> 0	-	(\$293)	(\$467)	(\$173)			\$0	\$293	\$784	\$491	\$1,13
2010		\$0	\$0						\$0	\$296	\$793	\$497	\$1,31
2011		\$0	\$0	(\$296)	(\$480)				\$0	\$299	\$804	\$505	\$1,47
2012		\$0	\$0	(\$298)	(\$494)						•		\$1,63
2013	\$0	\$0	\$0	(\$302)	(\$507)	(\$148)	) (\$156)	\$0	\$0	\$302	\$812		<b>41,0</b> 3

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2013	50	<b>30</b>	an.	(asuz)	(0007)	(4144)	(4100)	**	**				• • • • • •
	-1												
		•											
			¥										
			4		A.C. (10)	100 100	184 TOAL				20 500	R4 200	
Nominel NPV		\$810 \$655	\$1,000 \$813	(\$3,579) (\$1,853)	(\$5,446) (\$2,756)	(\$2,434) (\$1,327)	(\$1,709) (\$870)			\$5,389 \$3,321	\$9,589 \$4,952	\$4,200 \$1,631	
Discount Re	te = (	8.97% 1.49	_ <u>+</u> ,										
Benefit/Cost Rat	<u> </u>	1.49											

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			Cost	-E.Tectivenet	is Analysis per	Kule 23-17.0	us Piorida Agit	HNISTATIVE CO			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
					Change In		Utility Paid			Tota	Cumulative
	Customer	Customer	Other	Other	Participants'	Tax	Rebates &	Total	Total	Net	Discounted
	Equip Costs	O&M Costs	Costs	Benefits	Electric Bills	Credits	Incentives	Costs	Benefits	Benefits	Net Benefits
Year	(\$000s)	(\$000s)	(\$000s)	(\$000s)	(\$000e)	(\$000s)	(\$000a)	(\$000s)	(\$000s)	(\$000s)	(\$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)	(\$3,39)
2001	\$3,187	(\$762)	\$0	\$0	(\$135)	\$0	\$200	\$3,187	\$1,097	(\$2,089)	(\$5,15
2002	\$3,284	(\$1,100)	\$0	\$0	(\$195)	\$0	\$200	\$3,284	\$1,495	(\$1,789)	(\$6,53
2003	\$3,385	(\$1,457)	\$0	\$0	(\$244)	\$0	\$200	\$3,385	\$1,901	(\$1,484)	(\$7,59
2004	\$1,744	(\$1,669)	\$0	\$0	(\$278)	\$0	\$100	\$1,744	\$2,047	\$303	(\$7,39
2005	\$0	(\$1,720)	\$0	\$0	(\$278)	\$0	\$0	\$0	\$1,998	\$1,998	(\$6,20
2006	\$0	(\$1,772)	\$0	\$0	(\$281)	\$0	\$0	\$0	\$2,053	\$2,053	(\$5,07
2007	\$0	(\$1,827)	\$0	\$0	(\$288)	\$0	\$0	\$0	\$2,114	\$2,114	(\$4,01
2008	\$0	(\$1,883)	\$0	\$0		\$0	\$0	\$0	\$2,169	\$2,169	(\$3,01
2009	\$0	(\$1,940)	\$0	\$0		\$0	\$0	\$0	\$2,230	\$2,230	(\$2,06
2010	\$0	(\$2,000)	\$0	\$0		\$0	\$0	<b>\$0</b>	\$2,292	\$2,292	(\$1,17
2011	\$0	(\$2,061)	\$0	\$0		\$0	\$0	\$0	\$2,357	\$2,357	(\$33
2012	\$0	(\$2,124)	\$0	\$0		\$0	\$0	\$0	\$2,423	\$2,423	\$45
2013	\$0	(\$2,189)	\$0	\$0		\$0	\$0	\$0	\$2,491	\$2,491	\$1,20

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Nominal NPV	\$16,191 \$13,094	(\$23,089) (\$11,634) 8.97%	 (\$3,579) (\$1,853)	\$1,000 \$813	\$16,191 \$13,094	\$27,668 \$14,300	\$11,477 \$1,206	
Benefit/C	ount Rate = Cost Ratio =	1.09						

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

			Ca	st-Effective		is per Rule 25-1		dministrative Co	de			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	Change in					Incremental	Incremental	Incremental			Total	Cumulative
	Electric	Utility's	Participants'	Other	Other	Generation	T&D	Prog Induced	Total	Total	Net	Discounted
	Supply Costs	Program Costs	Program Costa	Costs	Benefits	Cap Costs	Cap Costs	Fuel Costs	Costs	Benefits	Benefits	Net Benefits
Year	(\$000s)	(\$000s)	(\$000s)	(\$000s)	(\$000s)	(\$000s)	(\$000a)	(\$000s)	(\$000s)	(\$000s)	(\$000s)	(\$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		\$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		(\$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	<b>\$0</b>	(\$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		(\$2,061)	\$0	\$0	(\$480)	(\$165)		\$0	\$2,854	\$2,854	\$978
2012	\$0		(\$2,124)	\$0	\$0	(\$494)	(\$157)		<b>\$</b> 0	\$2,928	\$2,928	\$1,936
2013	\$0	so \$0	(\$2,189)	\$0	\$0	(\$507)	(\$148)	(\$156)	\$0	\$3,000	\$3,000	\$2,837

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iominal NPV	\$810 \$655	(\$6,898) \$1,460	(\$5,448) (\$2,756)	(\$2,434) (\$1,327)	(\$1,709) (\$870)	\$11,426 \$9,587	\$27,103 \$12,425	\$15,677 \$2,837
Discount Rate = Benefit/Cost Ratio =	8.97% 1.30	+1,40U	(\$2,750)	(#1,321)	(4610)	49,001	<u></u>	¥2,031

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#### INPUT DATA - PART 1

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

Program Demand Impacts and Line Losses (1) Change in Peak KW Customer at meter	-1.90 kW/Cus	IV. Incremental Generation, Transmission, & Distribution C   (1) Base Year	1999	
(2) Change in Peak kW per Customer at generator	-2.46 kW Gen/Cu		2001	
(2) Change in Peak kw per Cusumer a generator	12.60%	(3) In-Service Year For Incremental T & D	2000	
(3) kW Line Loss Percentage	(1,109) kWh/Cus/Y		\$234.85	i/kW
(4) Change In KWh per Customer at generator	7.70%	(5) Base Year Incremental Transmission Cost	\$58.75	\$/kW
(5) kWh Line Loss Percentage	1.0014	(6) Base Year Incremental Distribution Cost	\$33.00	\$/kW
(6) Group Line Loss Multiplier	(1,030) kWh/Cus/Y		2.58%	
(7) Annual Change in Customer kWh at Meter	4.40 kW/Cus	(8) Generator Fixed O & M Cost	\$2.77	\$/kW/Yr '
*(6) Change in Winter kW per Cust at meter		(9) Generator Fixed O&M Escalation Rate	2.99%	
		(10) Transmission Fixed O & M Cost		\$/kW/Yr
		(11) Distribution Fixed O & M Cost	\$0.84	\$/kW/Yr
		(12) T&D Fixed O&M Escalation Rate	2.56%	
Economic Life and K-Factors	15 Years	(13) Incremental Gen Variable O & M Costs	\$0.433	\$/kW/Yr
(1) DSM Program Study Period	40 Years	(14) Incre Gen Variable O&M Cost Esc Rate	3.26%	
(2) Economic Life of Incremental Generation	30 Years	(15) Incremental Gen Capacity Factor	3.40%	
(3) Economic Life of Incremental T&D	1.4493	(16) Incremental Generating Unit Fuel Cost	\$0.0356	\$/kWh
(4) K-Factor for Generation	1.4394	(17) Incremental Gen Unit Fuel Esc Rate	1.91%	
(5) K-Factor for T&D	0	* (18) Incremental Purchased Capacity Cost	\$20.70	ş/KW/YĦ
* (6) Switch: Rev Reg (0) or Val-of-Def (1)	<u>v</u>	* (19) Incremental Capacity Cost Esc Rate	2.56%	
I. Utility & Customer Costs	\$150.00 \$/Cus	Stop Revenue Loss at In-Service Year? (Y=1, N=0)	0	
(1) Utility Nonrecurring Cost Per Customer	\$0.00 \$/Cus/Yes			-
(2) Utility Recurring Cost Per Customer	3.06%	V. (1) Non-Fuel Cost in Customer Bill (Base Year)		
(3) Utility Cost Escalation Rate	\$3,000.00 \$/Cus	(1) Non-Fuel Cost in Customer Bill (Base Year)	\$0.0352	\$/kWh
(4) Customer Equipment Cost	3.06%	(2) Non-Fuel Escalation Rate	Per Table	
(5) Customer Equpiment Cost Escalation Rate	(\$287.00) \$/Cus/Yea		\$0.0000	\$/kW/Mo
(6) Customer O&M Cost	3.06%	(4) Demand Charge Escalation Rate	Per Table	-
(7) Customer O&M Cost Escalation Rate	\$0.00 \$/Cus	* (5)Average Annual Change in Monthly Billing kW	0	°k₩/Mo.
*(8) Customer Tax Credit Per Installation	3.06%			-
* (9) Customer Tax Credit Escalation Rate				
* (10) Change in Supply Costs	\$0.00 \$/Cua/Yei			
*(11) Supply Costs Escalation Rate	3.06%	Summary Results for This Analysis		
* (12) Utility Discount Rate	8.97%		RIM	Participant
* (13) Utility AFUDC Rate	10.30%	NPV Benefits(\$000s)	\$4,952	,
* (14) Utility Nonrecurring Rebate/Incentive	\$200.00 \$/Cus		\$3,321	
* (15) Utility Recurring Rebate/Incentive	\$0.00 \$/Cus/Ye		\$1,631	
*(16) Utility Rebate/Incentive Escalation Rate	0.00%	NPV Net Benefits (\$000s) Benefit:Cost Ratio	1,491	

\* Supplemental Information Not Specifically Specified in Cost Effectiveness Manual

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## Ratepayers' Impact Cost-Effectiveness Measure

1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
<u></u>	Change In	Utility's	Utility Paid	Change in	Incremental	Incrementel	Incremental					Total Net	Cumulative
	Electric	Program	Rebates &	Electric	Generation	T&D	Prog Induced	Other	Other	Tolai	Total	Benefits to	Discounted
	Supply Costs	Costs	<b>Incentives</b>	Revenues	Cap Costs	Cap Costs	Fuel Costs	Costa	Benefits	Costa	Benefits	All Customers	Net Benefit
	(\$000e)	(\$000s)	(\$000s)	(\$000)	(\$000s)	(\$000e)	(\$000e)	(\$000e)	(\$000s)	(\$000s)	(\$000s)	(\$000s)	(\$000a)
1999	\$0	\$56	\$75	(\$22)			(\$8)	\$34	\$0	\$187	\$35	(\$153)	(\$1
2000	\$0	\$116	\$150	(\$63)	(\$80)			\$69	\$0	\$399	\$166	(\$233)	(\$3
2001	\$0	\$119	\$150	(\$102)				\$70	\$0	\$441	\$278	(\$162)	(\$5
2002	\$0	\$123	\$150	(\$146)	(\$197)			\$71	\$0	\$490	\$389	(\$101)	(\$5
2003	\$0	\$127	\$150	(\$183)	(\$201)			\$71	\$0	\$531	\$502	(\$29)	(\$6
2004	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$65	\$75	(\$209)	(\$300)			\$36	\$0	\$385	\$561	\$176	(\$4
2005	<b>\$</b> 0	\$0	\$0	(\$209)	(\$310)			\$0	\$0	\$209	\$567	\$358	(\$:
2006	\$0	\$0	\$0	(\$210)	(\$317)			\$0	\$0	\$210	\$568	\$358	. s (
2007	\$0	\$0	\$0	(\$218)	(\$324)			\$0	\$0	\$218	\$573	\$357	\$
2008	\$0	\$0	- \$0	(\$215)	(\$331)			\$0	\$0 \$0	\$215	\$577	\$362	\$
2009	50	<b>\$</b> 0	\$0 \$0	(\$217)				\$0	<b>\$</b> 0	\$217	\$583	\$365	Ş
2010	\$0	\$0	\$0	(\$220)	(\$350)		(\$108)	\$0	\$0	\$220	\$588	\$368	\$
2011	<b>\$0</b>	<b>\$0</b>	\$0	(\$222)	(\$360)			\$0	\$0	\$222	\$595	\$373	S
2012	\$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$	(\$224)		(\$117)	(\$115)	\$0	\$0	\$224	\$603	\$378	\$
2013	\$0	\$0	\$0	(\$227)	(\$380)	(\$111)		\$0	\$0	\$227	\$609	\$382	\$
2014	\$0	\$0	\$0	(\$229)	(\$391)				\$0	\$229	\$611	\$382	\$1
2015	\$0	\$0	\$0	(\$232)	(\$401)			\$0	\$0	\$232	\$616		\$1
2016	\$0	\$0 \$0	\$U	(\$235)	(\$412)			\$0	\$0	\$235	\$622		\$1
2017	\$0	\$0	\$U	(\$237)	(\$423)		(\$112)	\$0	<b>\$0</b>	\$237 \$240	\$630	\$393	\$1 \$1
2018	\$0	\$0	30	(\$240)				\$0	\$0 \$0		\$646	\$406	31 61
2019	\$0 \$0 \$0 \$0	\$0 \$0	90 \$0	(\$243) (\$246)	(\$452) (\$470)			\$0 \$0 \$0 \$0 \$0	\$0 \$0	\$243 \$246	\$664 \$683	\$421 \$437	\$1 \$1
2020 2021	<b>Q</b> U	\$0 \$0	06 60	(\$240)					\$0 \$0	\$240	\$703		\$1
2021	90 80	\$0 \$0		(\$249) (\$252)					\$0 \$0	\$252	\$720		\$1.
2023	\$0 \$0	\$0 \$0	\$0	(\$256)					\$0 \$0	\$258	\$737		\$1. \$1
2023	\$0	\$0	\$0	(\$259)					\$0	\$259	\$754		\$1
2024	\$0	\$0	\$Ŭ	(\$283)	(\$551)			\$0	\$0	\$263	\$772		\$1
2025	\$0	\$0	\$0	(\$267)					\$0	\$267	\$791	•	\$1
2027	\$0	\$0	\$0	(\$271)	(\$585				\$0	\$271	\$810		\$1
2027	\$0_ \$0	· \$0	\$0		(\$603)					\$275	\$831		<b>\$</b> 1
			•			·							
			*										
ninal NPV	,	\$607 \$491								\$8,146 \$3,371	\$17,780 \$5,385		
	Iscount Rate =	8.97%		NT 1172		17.1-10							····-
	fit/Cost Ratio =	1.59											

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#### Participants' Cost-Effectiveness Measure Cost-Effectiveness Analysis per Rule 25-17.008 Florida Administrative Code (2) (3) (12) (4) (5) (6) (7) (8) (9) (10) (11) Change in Utility Paid Total Cumulative Customer Customer Other Other Participants' Rebates & Net Discounted Total Total Tax **O&M Costs** Equip Costs Costs Benefits **Electric Bills** Credits Incentives Costs Benefits Benefits Net Benefits (\$000s) (\$000s) (\$000a) (\$000s) (\$000s) (\$000s) (\$000s) (\$000s) (\$000s) (\$000s) (\$000s) \$204 \$1,125 (\$108) \$34 \$0 (\$955) (\$955) \$0 (\$22) \$75 \$1,159 \$2,319 (\$333) \$69 \$0 (\$63) \$0 \$150 \$546 (\$2,646 \$2,368 (\$1,842) \$2,390 (\$572) \$70 \$0 (\$102) \$0 \$150 \$2,460 \$823 (\$1,637) (\$4,024 (\$825) \$71 \$0 \$O \$2.534 (\$5,116) \$2,463 (\$146) \$150 \$1,121 (\$1,413) \$2,538 \$0 \$0 (\$1,093) \$71 \$150 \$2,610 \$1,425 (\$1,184) (\$5,955) (\$183) \$1,308 \$36 \$0 \$0 (\$5,831 (\$1,251) (\$209)\$75 \$1,344 \$1,535 \$191 \$0 (\$4,936) \$0 (\$1,290) \$0 \$0 (\$209) \$0 \$0 \$1,498 \$1,498 \$1,540 (\$4,092) \$0 (\$1,329) \$0 \$0 (\$210) \$0 \$0 \$0 \$1,540 \$0 (\$1,370) \$0 **\$**0 \$0 **\$**0 \$1,586 (\$3,295 (\$216) \$0 \$1,586 \$0 \$0 \$0 (\$215) \$0 \$0 \$0 \$1,627 \$1,627 (\$2,544) (\$1,412) \$0 \$0 (\$1,835) \$0 \$0 (\$217) \$0 \$0 \$1.673 \$1,673 (\$1.455) \$0 (\$1,500) \$0 \$0 (\$220) \$0 \$0 \$0 \$1,719 \$1,719 (\$1,167 \$0 \$0 \$0 \$0 \$0 \$0 \$0 (\$537 (\$222) \$0 \$1,768 \$1,768 (\$1,546)\$0 \$58 (\$1,593) (\$224) \$0 \$0 \$0 \$1,817 \$1,817 \$0 \$0 \$0 \$0 (\$227) \$0 \$0 \$0 \$1,868 \$1,868 \$619 (\$1,642) \$1.149 (\$1,692) \$0 \$0 (\$229) \$0 \$0 \$0 \$1,921 \$1,921 \$0 \$0 \$0 \$0 \$0 (\$232) \$0 \$1.976 \$1,649 \$1.976 (\$1,744) \$0 \$0 **\$**0 \$0 \$2,120 (\$1.797) (\$235) \$0 \$0 \$2,032 \$2,032 \$0 \$0 \$0 \$0 \$0 \$0 \$2,089 \$2,565 (\$237) \$2,089 (\$1,852) \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$2,986 (\$1,909) \$0 \$0 (\$240)\$0 \$0 \$2,149 \$2,149 \$0 \$0 \$0 \$0 \$2,210 \$3,382 (\$243) \$2,210 (\$1,967) \$3,756 (\$2,028) \$0 \$0 (\$246) \$0 \$0 \$2,273 \$2,273 \$0 \$0 \$0 \$4,110 (\$2,090) \$0 (\$249) \$0 \$2,339 \$2,339 \$0 \$0 \$0 \$0 \$4,443 (\$2,154) \$0 (\$252) \$2,406 \$2,406 \$0 \$0 \$4,758 (\$2,220) \$0 (\$256) \$0 \$0 \$2,475 \$2,475 (\$2,288) \$0 \$0 (\$259) \$0 \$0 \$0 \$2,547 \$2,547 \$5,055 \$0 \$0 \$5,336 (\$2,358) \$0 \$0 (\$263) \$0 \$0 \$0 \$2,621 \$2,621 \$0 \$0 \$0 \$0 \$0 \$5,601 (\$2,430) (\$267) \$2,697 \$2,697 \$0 \$0 \$0 (\$271) \$0 \$0 \$0 \$2,775 \$2,775 \$5,852 (\$2,504) \$0 \$O \$6,088 (\$2,581) \$0 (\$275) \$0 \$0 \$0 \$2,856 \$2,858

ŧ Nominal \$12,143 (\$48,929) \$351 (\$6,438) \$750 \$12,495 \$56,117 \$43,622 NPV \$285 \$6,088 \$9.821 (\$13,599) \$610 \$18,194 (\$1,984) \$10,108 Discount Rate = 8.97% Benefit/Cost Ratio = 1.60

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(1)

Year

1999

2000

2001

2002

2003

2004

2005

2006

2007

2008

2009

2010

2011

2012

2013

2014

2015

2016

2017

2018

2019

2020

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(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	dministrative Co	(10)	(11)	(12)	(13)
	Change in					Incremental	Incremental	incremental			Total	Cumulative
	Electric	Utility's	Participante'	Other	Other	Generation	T&D	Prog Induced	Total	Total	Net	Discounted
	Supply Costs	Program Costs		Costs	Benefits	Cap Costs	Cap Costs	Fuel Costs	Costa	Benefits	Benefits	Net Benefits
Yeer	(\$000s)	(\$000s)	(\$000s)	(\$000s)	(\$000s)	(\$0006)	(\$000e)	(\$000e)	(\$000s)	(\$000s)	(\$000s)	(\$000s)
1999	\$0	\$56		\$34	\$0	(\$26)	\$0	(\$8)	\$1,108	\$35	(\$1,073)	(\$1,07
2000	\$0	\$116		\$69	\$0	(\$80)	(\$59)	(\$27)	\$2,171	\$168	(\$2,006)	(\$2,91
2001	\$0			\$70	\$0	(\$139)	(\$95)		\$2,008	\$278	(\$1,729)	(\$4,37
2002	\$0 - \$0	\$123		\$71	\$0	(\$197)	(\$127)	(\$65)	\$1,832	\$389	(\$1,443)	(\$5,48
2003	- <b>3</b> 0	\$127	\$1,446	\$71	\$0 \$0	(\$261)	(\$156)	(\$84)	\$1,644	\$502	(\$1,142)	(\$6,29
2004 2005	\$0	\$65		\$36	<b>2</b> 0	(\$300)	(\$167)	(\$94)	\$158	\$561	\$403	(\$6,03
2005	\$0 \$0	\$0	(\$1,290) (\$1,329)	\$0 \$0	\$0	(\$310)	(\$160)	(\$97)	<b>\$</b> 0	\$1,856	\$1,856	(\$4,92
2006	\$0 \$0	\$0 \$0	(\$1,329)	\$0	\$0 \$0 \$0	(\$317)	(\$154)		\$0 \$0	\$1,897	\$1,897	(\$3,88
2007	\$0 \$0	<b>a</b> u \$0	(\$1,370)	\$0 \$0	<b>2</b> 0	(\$324)	(\$148)	(\$101)	\$0	\$1,943	\$1,943	(\$2,90)
2009	\$0 \$0	\$0 \$0	(\$1,412) (\$1,455)	\$0	\$0 \$0	(\$331) (\$341)	(\$142)		\$0 \$0	\$1,989	\$1,989	(\$1,99
2009 2010	\$0	\$0 \$0	(\$1,400)		\$0 \$0	(\$341) (\$350)	(\$136)		<b>2</b> 0	\$2,038	\$2,038	(\$1,12
2010	\$0 \$0	\$0	(\$1,500) (\$1,546)	\$0 \$0	\$0 \$0	(\$350)	(\$130) (\$123)	(\$106)	\$0 \$0	\$2,087 \$2,141	\$2,087 \$2,141	(\$31) \$44
2012	\$0	\$0	(\$1,593)	\$0	\$0 \$0	(\$370)	(\$123) (\$117)	(\$112)	\$0 \$0	\$2,141 \$2,196	\$2,141 \$2,196	<del>۹۹۹</del> \$1,16
2012	\$0 \$0	\$0 \$0	(\$1,642)	\$0	\$0	(\$380)	(\$117)		\$0 \$0	\$2,250	\$2,190	\$1,10
2014	\$0	\$0	(\$1,692)	\$0	\$0	(\$391)	(\$105)		\$0	\$2,303	\$2,303	\$2,47
2015	\$0	50	(\$1,744)	\$0	\$0	(\$401)	(\$100)	(\$115)	\$0	\$2,360	\$2,360	\$3,07
2016	\$0 \$0	50	(\$1,797)	\$0	\$0 \$0	(\$412)	(\$97)	(\$113)	\$0	\$2,419	\$2,419	\$3,63
2017	\$0	\$0 \$0 \$0 \$0	(\$1,852)	\$0	\$0	(\$423)	(\$94)		\$0	\$2,482	\$2,482	\$4,16
2018	02	\$0	(\$1,909)	\$0	\$0	(\$435)	(\$92)		\$0	\$2,555	\$2,555	\$4,66
2019	\$0	\$0	(\$1,967)	\$0	\$0	(\$452)	(\$89)	(\$123)	\$0	\$2,631	\$2,631	\$5,13
2020	50	- <b>50</b>	(\$2.028)	\$0	\$0	(\$470)	(\$87)	(\$126)	\$0	\$2,711	\$2,711	\$5,58
2021	\$0		(\$2,090)	\$0	\$0	(\$489)	. (\$84)	(\$130)	\$0	\$2,793	\$2,793	\$6,00
2022	. \$0	\$0	(\$2,154)	\$0	\$0	(\$504)	(\$82)		\$0	\$2,873	\$2,873	\$6,40
2023	\$0	\$0	(\$2,220)	\$0	\$0	(\$519)	(\$79)		\$0	\$2,956	\$2,956	\$6,77
2024	\$0	\$0 \$0 \$0	(\$2,288)	\$0	\$0	(\$535)	(\$77)	(\$143)	\$0	\$3,042	\$3.042	\$7,13
2025	\$0	\$0	(\$2,358)	\$0	\$0	(\$551)	(\$74)		\$0	\$3,130	\$3,130	\$7,46
2026	\$0	\$0 \$0	(\$2,430)	\$0	\$0	(\$568)	(\$72)		\$0	\$3,221	\$3,221	\$7,78
2027	\$0 \$0	\$0   \$0	(\$2,504)	\$0	\$0	(\$585)	(\$70)		\$0	\$3,315	\$3,315	\$8,08
2028	\$0	i <b>\$0</b>	(\$2,581)	\$0	\$0	(\$603)	(\$67)	(\$161)	\$0	\$3,411	\$3,411	\$8,36
			ŧ									
Nominal NPV	Discount Rate :	\$607 \$491 = 8.97%	(\$3,779)	\$351 \$285		(\$11,421) (\$3,195)	(\$3,093) (\$1,210)		\$8,921 \$7,476	\$62,528 \$15,843	\$53,807 \$8,367	

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

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## Run Date: Filename: Cost-Effectiveness Analysis per Rule 25-17.008 Florida Administrative Code

(1)	(2) Cumulative	(3) Cumulative	(4) Utility Average	(5) Marginal	(6) Marginal	(7)	(8)	(9)	(10)	(11)
	Total Participating	Participating Customers	System Fuel Cost	Fuel Cost (Decreases)	Fuel Cost (Increases)	Replacement Fuel Cost	Program kW Effectiveness	Program kWh Effectiveness	Other Costs	Other Benefits
Year	Customers	Adj Free Rides	(C / kWh)	(C / kWh)	(C / kWh)	(C / kWh)	Factor	Factor	(\$000)	(\$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	2.1687	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. <del>94</del> 72	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		3.3596	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

INPUT DATA - PART 2

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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	4.00	kW/Cus	(4)	emental Generation, Transmission, & Distribution Base Year	1999	
(1) Change in Peak kW Customer at meter			102-	n-Service Year For Incremental Generation	2001	
(2) Change in Peak kW per Customer at generator		kW Gen/Cur			2001	
(3) KW Line Loss Percentage	12.60%			In-Service Year For Incremental T & D		****
(4) Change in KWh per Customer at generator		kWh/Cus/Yr		Base Year Incremental Generation Cost	\$234.85	
(5) kWh Line Loss Percentage	7.70%			Base Year Incremental Transmission Cost	\$58.75	•
(6) Group Line Loss Multiplier	1.0014			Base Yeer Incremental Distribution Cost	\$33.00	\$/KVV
(7) Annual Change in Customer kWh at Meter		kWh/Cus/Yr		Gen, Tran, & Dist Cost Escalation Rate	2.56%	
*(8) Change in Winter kW per Cust at meter	4.40	kW/Cus		Generator Fixed O & M Cost		\$/kW/Yr
				Generator Fixed O&M Escalation Rate	2.99%	<b>.</b>
		l	1	Transmission Fixed O & M Cost	-	\$/kW/Yr
				Distribution Fixed O & M Cost		\$/kW/Yr
II. Economic Life and K-Factors				T&D Fixed O&M Escalation Rate	2.56%	
(1) DSM Program Study Period •		Years		Incremental Gen Variable O & M Costs		\$/kW/Yr
(2) Economic Life of incremental Generation		Years		Incre Gen Variable O&M Cost Esc Rate	3.84%	
(3) Economic Life of Incremental T&D		Years		Incremental Gen Capacity Factor	3.40%	****
(4) K-Factor for Generation	1.4493			Incremental Generating Unit Fuel Cost	\$0.0356	\$/kWh
(5) K-Factor for T&D	1.4394			Incremental Gen Unit Fuel Esc. Rate	3.00%	
() T *(6) Switch: Rev Req (0) or Val-of-Def (1)	0			Incremental Purchased Capacity Cost		\$/KW/YR
UT III. Utility & Customer Costs			* <u>(19</u> )	Incremental Capacity Cost Esc Rate	2.56%	
(1) Utility Nonrecurring Cost Per Customer	\$150.00	\$/Cus	l Sto	p Revenue Loss at In-Service Year? (Y=1, N=0)	0	
(2) Utility Recurring Cost Per Customer		\$/Cus/Year				•
(3) Utility Cost Escalation Rate	3.06%		i v.m	Non-Fuel Cost in Customer Bill (Base Year)		
(4) Customer Equipment Cost	\$3,000.00	S/Com		Non-Fuel Cost in Customer Bill (Base Year)	\$0.0352	\$/kWh
(5) Customer Equipment Cost Escalation Rate	3.06%	<b>.</b>		Non-Fuel Escalation Rate	Per Table	
(6) Customer O&M Cost		\$/Cus/Year		Customer Demand Charge Per kW (Base Year)		\$/kW/Mo
(7) Customer O&M Cost =:/	3.06%			Demand Charge Escalation Rate	Per Table	
*(8) Customer Call Cost Escalator Rate *(8) Customer Tax Credit Per Installation		S/Cus		Average Annual Change in Monthly Billing kW		kW/Mo.
*(9) Customer Tax Credit Escalation Rate	3.06%		192			
		\$/Cus/Year				
*(10) Change in Supply Costs	3.06%		1			
*(11) Supply Costs Escalation Rate			!	Pursuan Deputte for This Arche	.t.a	
*(12) Utility Discount Rate	8.97%		!	Summary Results for This Analys	RIM	Destale enter
• (13) Utility AFUDC Rate	10.30%		!		-	Participants'
*(14) Utility Nonrecurring Rebate/Incentive	\$200.00		!	NPV Benefits(\$000s)	\$5,365	
*(15) Utility Recurring Rebate/Incentive		\$/Cus/Year	1	NPV Costs (\$000s)	\$3,371	
*(16) Utility Rebate/Incentive Escalation Rate	0.00%		1	NPV Net Benefits (\$000s)	\$1,994	
		-	1 1	Benefit:Cost Ratio	1.592	1.602

\* Supplemental Information Not Specifically Specified in Cost Effectiveness Manual

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## Cost Effectiveness Analysis GoodCents Conversion Program

	Existing	System		New S	ystem	Cost E	ffectiv	eness
<u>Filename</u> gthp_1 (as-filed)	Heating 68% AFUE Gas Furnece	<u>Cooling</u> 7 SEER A/C		Heating 7.4 HSPF Heat Pump	Cooling 11 SEER Heat Pump	<u>RIM</u> 1.74	<u>PART</u> 1.65	<u>TRC</u> 2.20
Gas_HP	68% AFUE Gas Fumace	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	<b>Resistance Heat</b>	8 SEER A/C		7.4 HSPF Heat Pump	11 SEER Heat Pump	0.66	1.26	0.82

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Staff's First Set of Interrogatories Docket 981591-EG GULF POWER COMPANY January 11, 1999 Item No. 15 Page 1 of 1

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 costeffective 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.

Staff's First Set of Interrogatories Docket 981591-EG GULF POWER COMPANY January 11, 1999 Item No. 16 Page 1 of 1

- 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.

Staff's First Set of Interrogatories Docket 981591-EG GULF POWER COMPANY January 11, 1999 Item No. 17 Page 1 of 1

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.

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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.

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- 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.

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19. Please provide the annual total participation level expected by Gulf for the proposed Program. Explain how this level of program participation was derived.

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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 )

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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.

ret D. Neyman

Marketing Services Manager

Sworn to and subscribed before me this 14th day of <u>enilarip</u>, 1999.

a C. Ulelet-State of Florida at Large



Notary Public-3 af FL Comm. Exp: May 31, 2002 Comm. No: CC 725969

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**ARI** Bookstore

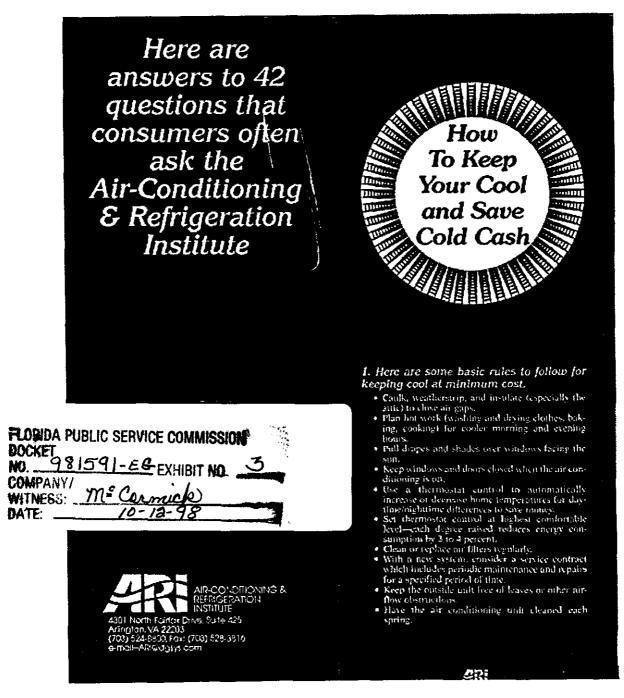
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Here Are Answers to 42 Questions That Consumers Often Ask the Air-Conditioning & Refrigeration Institute

[ 1-2 | 3-4 | 5-6 | 7-8 | 9-10 | 11-12 | 13-14 ]



08/04/1999

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## Here Are Answers to 42 Questions That Consumers Often Ask the Air-Conditioning & Refrigeration Institute

#### [ 1-2 | 3-4 | 5-6 | 7-8 | 9-10 | 11-12 | 13-14 ]

INDOOR AIR	Ī	INDO	OR AIR	
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#### 2. How does an air conditioner work?

An air conditioner transfers heat--from the inside of a huilding, 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 circumstancesfur example, how large is the area to be air conditioned, how large is the lamily, 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 exilings.

## 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 file 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 proceedures were followed. Newer units are expected to last even longer.

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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 yearbefore the peak cooling scason—by a qualified contractor or service technician. Then, remember to keep the air filter clean and the outdoor unit free of leaves and debrts.

## 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 thermostal is set proparty. 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 runting 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 storts 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 sereral 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?

INDOOR AIR

Like most items, in the olf-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 confort 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 cust and availability. The optimum indeor confort 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 he beet. Manually-operated control systems allow you to select a temperature setting which your unit will maintain.

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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 instal, 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 fluw is from the verns. Dur't just listen inside the house—go outside and listen to the condensing unit, too. This personal inspection is a good indicator, hat 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 is unsatticipated 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 nutside. 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

#### 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 of 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. J. 1992, and 9.7 SEER for single-package air conditioners and heat pumps, effective Jan. I, 1993. Heat pumps also are subject to federal standards of

Heat pumps also are subject to federal standards of 6.8 heating sensoral 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 splitsystem 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 indiners. A single package has both heat exchangers located in the some unit, usually indoors. Most residential central air conditioners and heat pumps are split systems. 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 nutdoor condensestcompressor uniand 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 condenses/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 induor evaporatur cuil 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 ratin (SUER). 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 tollows: <u>Capacity (Btub)</u> × Sooling Lood Hours

SEER 1000 × Electric Rate - Annual Operating Cost

For example, if a honce requires a unit with a capacity of 36,000 British thermal units per hour (Btuh), is incased 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	INDOOR AIR
36.000 1800	

36.000 × 1500 × .06 = 6432 per year 10 1000

The same calculation with a SEER of 12 reveals an annual operating cast 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
Northerst			
Northwest		. 17	. 63
North Central		. 262	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 duors 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 exactty 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 turnace, but the end result is the same: a warm, confortable 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 warning effect thus is something like warning your bath water more gradually and uniformly by turning the hot water fauces to a moderately warm setting rather than turning the faucet all the way to maximum hot water. 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 fassil fuel heating system such as gas or oil. Whether supplemental heating is necessary depends on your elimate 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 at the quality of air outside your home, the quality of air inside your home, and your home's indoor comforequipment. Indoor air quality varies givenly 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. Rescatch 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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INDOOR AIR	INDOOR AIR

Using a high efficiency air cleaner on the central realing/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 leaser degree the grilles and registers at the duct outleta—that collect most of the dust, and therefore need changing or cleaning.

Ducts usually don't require cleaning, especially if lilters 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 cleaningsome constructions provide this service.

#### 35. Should my home be humidified?

That depends largely on your climate and personal needs. Humidification is definitely helpful in many honces 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, willed plants, and static electricity which jolts hair, clother, and computer disks. Isdoor relative humidity may fall to around 7 percent, much drier than even the 25 percent relative humidity of the Sohara Desent 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 alt the time (the "on" setting on the thermostal) instead of periodically (the "auto" or "automatic" setting on the thermostal)?

If you live in a very humid climate you may not want to run the fan continuously because this reduces definmidification. 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 dehumidity 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 confort 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 rolatively incopensive monitors that are becoming increasingly available to the general public. Considerable research is being done on measures to control radon and its lealth effects as typically found in indusor 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 eigarette smoke to chemical ensanations from materials used in furniture or building construction, to biological contaminants such as fungl (e.g., molds and mildew) and bacteria growing in areas where muisture may collect and stagnate. This may occur in such diverse locations as improperly maintained or damaged celling tiles, dishwashers, carpeting and air conditioning drain para.

Most problems allegedly have occurred in commercial buildings. Cleardiness and adequate vontilation 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	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 ornne 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 fullowing a few simple guidelines: • A central au conditioner is a closed system and will

 A central and 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 I, 1992, intentional venting of refrigerant is against the law. All refrigerant from units must be recovered, Galy partoniae 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 an conditioning and heat pump extensis is nontoxic, nonflammable, odorless, and scaled within the system. Nonetboless, like any substance, it can be abused.

You should be aware that some people have deel from delaberately inhaling or "sniffing" pure gas (e.g., after huying and "sniffing" cans of refrigerant like those used to recharge automobile air conditioners). Inhaling such concentrated refrigerant vapor can cause cauliac irregularities and cardiac arrest—o fatal heart attack.

Although a large release of refrigerant vapor could displace oxygen available (or breathing and cause sofficiation, this is virtually impossible with residential systems because of the relatively small amount of refrigerant used in the 24,000 to 36,000 Bush (2-ton to 3-tori) units of most residential central air conditioning systems.

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**41.** In hol 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 thern astat up to about 82 depress 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 rool any faster and might easily waste money by rooling 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 technicate careers.

To order, write to the Air-Conditioning and Refrigeration Institute and enclose a self-addressed, stamped envelope for each single paraphlet ordered. Additional postage may be required if requesting several paraphlets.

 Consumer Guide to Efficient Central Climate Control Systems. Shows homeowners how to keep confinitable while holding down utility hilk 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 Humidily Your Home or Business, Highlights advantages and relatively low costs of humidifying dry air (8 panels).
 Life, Liberty and the Pursuit of Comfort.

Life, Liberty and the Pursuit of Comfort.
 Explains the operations and advantages of a duciless split air-conditioning system (8 panels).
 Career Opportunities in Heating, Air Condi-

 Career Opportunities in Heating, Air Conditioning and Refrigeration. Onlines opportunities available for people interested in hearming technicians in the heating, venithation, air-conditioning and refrigeration industry (# panels).

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## **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

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http://www.ashrae.org

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#### **Owning and Operating Costs**

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 <sup>b</sup>	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		

Table 3 Estimates of Service Lives of Various System Components\*

Source: Data obtained from a survey of the United States by ASHRAE Technical Committee TC 1.8 (Akalin 1978). See Lovvorn and Hiller (1985) and Easton Consultants (1986) for further information. 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:

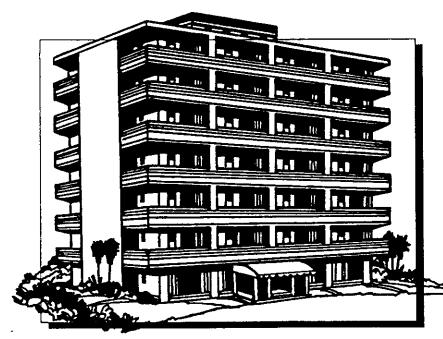
- Straight charge—cost per kilowatt per month, charged for the peak demand of the month.
- Excess charge—cost per kilowatt above a base demand (e.g., 50 kW), which may be established each month.

STATE OF FLORIDA

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## 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

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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.

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# TABLE 6-3 Page 1 ELECTRICALLY DRIVEN COOLING EQUIPMENT, CAPACITIES <65,000 BTU/H:</td> MINIMUM PERFORMANCE EFFICIENCIES<sup>1</sup> - SEER, EER, IPLV<sup>2</sup>

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TYPE OF EQUIPMENT, CAPACITIES, RATING CONDITIONS (°F)	EER	SEER	IPLV 2
Central Units			
Air Cooled - Seasonal Rating <sup>3</sup>			
Split-system		10.0	
Single-package		9.7	
Evaporatively Cooled		1	
Standard Rating (80db/67wb indoor,			}
95db/75wb outdoors)	9.3		
Int. Part Load Value (80db/67wb out.)	0.0	]	8.5
Water Cooled			•.•
Water-Source Heat Pump (80db/67wb indoor)			
Standard Rating (85 entering water)	9.3	[	i
Low Temp. Rating (75 entering)	10.2	]	
Ground-Water Heat Pump			
Standard Rating (70 entering)	11.0		
Low Temp. Rating (50 entering)	11.5	ļ	ļ
Ground Source Heat Pump	11.0		1
•	10.0		
77° Entering brine	10.0		
70° Entering brine	10.4	ļ	
Unitary Air Conditioners (80db/67wb indoor)	0.2		Į
Standard Rating (85 entering)	9.3		8.3
Int. Part Load Value (75 entering)			0.3
Packaged Terminal Units (PTAC & PTHP)			
Standard Rating (95db outdoor)		]	}
<u>&lt;</u> 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	ł	1
11,001 - 12,000 Btu/h	8.2		
12,001 - 13,000 Btu/h	8.0	1	
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	1	
>20,000 Btu/h (with louvers)	8.2		1
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	1	
With reverse cycle (without louvers)	8.0		
		L	L

<sup>1</sup> Test procedures for equipment referenced shall be in accordance with the applicable standard listed in Chapter 3.
 <sup>2</sup> 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.

<sup>3</sup> To be consistent with National Appliance Energy Conservation Act of 1987, P.L. 100-12.

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## WATER HEATING CONVERSION \$140 REBATE Individual Participant

Qualifying Unit

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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

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## FREE HOT WATER HEATER Information

### Customer Options for Water Heater Conversion Program <u>Must be Gas TO Electric</u>

- 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).

### 2<sup>nd</sup> 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).

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## 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

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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.

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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.

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Staff's First Set of Interrogatories Docket 981591-EG GULF POWER COMPANY January 11, 1999 Item No. 7 Page 1 of 1

7. Please explain the cause of the decrease in "customer O&M cost" contained on page 4, section III. (6) of Guif'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".

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PEOPLES GAS - WF		(		MONTHLY D	UE TO FUEL COSTS	5)	
		1000CUFT	SCUFT	\$/THERM	¢/THERM		
ALL CU FT	ALL THERMS	\$7.42	\$0.00742	\$0.7423	74.2	\$0.924	34
- <u></u>				HARGE EVER	Y MONTH		
Normal weather rate. Does	not include Weisther Nor	makason Charg	e in writer.				
CHIPLEY - CHPGAS			<u></u>		_		
CuFT		/1000CUFT	SICUFT	\$/THERM	¢/THERM		
UNDER 2,500 CU FT		\$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
		\$1.10 A	AINIMUM BILL				
CHIPLEY - CHPGAS	IN (INSIDE CITY)						
CuFT	THERMS \$	1000CUFT	SCUFT	\$/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
		\$1.00 N	MINIMUM BILL		·····		
DE FUNIAK SPRING	S - DFUNKOUT.RA	T (OUTSIDE	cm				
(MAY CHANGE M	<b>ONTHLY DUE TO P</b>	FUEL COSTS	}				
CuFT		1000CUFT	SCUFT	S/THERM	¢/THERM		
ALL CU FT	ALL THERMS	\$7.13	\$0.00713	\$0.7130	71.3	\$0,827	20,
		£1.40.4					
		34.40 (	JUSI UMER C	HARGE EVER			
DE FUNIAK SPRING			<u>n</u>				
MAY CHANGE MON							
		1000CUFT	SCUFT	S/THERM	¢/THERM		
	ALL THERMS	\$5.48	\$0.00648	\$0.6482	64.8	\$0.752	9
		\$4.00	CUSTOMER (	CHARGE EVE	Y MONTH		
		\$4.00	CUSTOMER (	CHARGE EVER	RY MONTH		
WEIGHTED AVERAGE PI	RICE CUSTOMERS PAY					\$0.950	
WEIGHTED AVERAGE PI		Y FOR NATURAL	GAS IN MYE IN	AN EFFICIENT H	OME:	\$0.950	37
WEIGHTED AVERAGE PI	*	Y FOR NATURAL	L GAS IN KINE IN PRICE VS 6/1 HERM (DOE/E	AN FEEICIENT H 1/94(\$.945/then EIA est. 1997;	<b>DME:</b> m):	0.6%	37
	*	Y FOR NATURAL	L GAS IN KINE IN PRICE VS 6/1 HERM (DOE/E	AN FEEICIENT H 1/94(\$.945/then EIA est. 1997;	<b>DME:</b> m):		37.
NATIONAL AVERAG	% E NATURAL GAS F (1996 avg. =	Y FOR NATURAL & CHANGE IN PRICE PER TI \$0.634	L GAS IN KINE IN PRICE VS 6/1 HERM (DOE/E	AN FEEICIENT H 1/94(\$.945/then EIA est. 1997;	OME:	0.6% \$0.689	37
NATIONAL AVERAG	% E NATURAL GAS F (1996 avg. =	LEOR NATURAL CHANGE IN PRICE PER TI \$0.634 ERMS	L GAS IN HWE IN I PRICE VS 6/1 HERM (DOE/E )	AN FEEICIENT H 1/94(\$.945/then ElA est. 1997; (Yellow Energ	<b>DME:</b> m):	0.6% \$0.689 PER/THERM	37
NATIONAL AVERAG	% E NATURAL GAS F (1996 avg. =	Y FOR NATURA CHANGE IN PRICE PER TI \$0.634 ERMS \$0.99000	L GAS IN HWE IN I PRICE VS 6/1 HERM (DOE/E ) PER GALLON	AN FEEICIENT H 1/94(\$.945/then ElA est. 1997; (Yellow Energ	<b>DME:</b> m):	0.6% \$0.689 PER/THERM \$1.089	37.
NATIONAL AVERAG LP GAS PRICES - G. PENSACOLA PANAMA CITY	% E NATURAL GAS F (1996 avg. = ALLONS AND THE	<u>Y FOR NATURAI</u> 6 CHANGE IN PRICE PER TI \$0.634 ERMS \$0.99000 \$1.25000	L GAS IN HWE IN I PRICE VS 6/1 HERM (DOE/E ) PER GALLON PER GALLON	AN FEFICIENT H 1/94(\$.945/then ElA est. 1997; (Yellow Energ	<b>DME:</b> m):	0.6% \$0.689 PER/THERM \$1.089 \$1.375	37.
NATIONAL AVERAG LP GAS PRICES - G. PENSACOLA PANAMA CITY FT WALTON BEACH	% E NATURAL GAS F (1996 avg. = ALLONS AND THE	Y FOR NATURAI CHANGE IN PRICE PER TI \$0.634 ERMS \$0.99000 \$1.25000 \$0.99000	L GAS IN HWE IN I PRICE VS 6/1 HERM (DOE/E ) PER GALLON PER GALLON PER GALLON	AN FEEICIENT H 1/94(\$.945/then ElA est. 1997: (Yellow Energ	<b>DME:</b> m):	0.6% \$0.689 PER/THERM \$1.089 \$1.375 \$1.089	37
NATIONAL AVERAG LP GAS PRICES - G. PENSACOLA PANAMA CITY	% E NATURAL GAS F (1996 avg. = ALLONS AND THE	Y FOR NATURAI CHANGE IN PRICE PER TI \$0.634 ERMS \$0.99000 \$1.25000 \$0.99000	L GAS IN HWE IN I PRICE VS 6/1 HERM (DOE/E ) PER GALLON PER GALLON	AN FEEICIENT H 1/94(\$.945/then ElA est. 1997: (Yellow Energ	<b>DME:</b> m):	0.6% \$0.689 PER/THERM \$1.089 \$1.375	37.
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# 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 <u>Air Conditioning and Refrigeration News</u> (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/contrac tors 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.

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- 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 sit

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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 fever "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 (Pigure 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.

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- 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.

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- 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 warketing 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.

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 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 Horth), and 17% other incentives (i.e., low-rate financing or loans repaid through electric bill addons). 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	163
Refrigerant components	12%
	1008

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.

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- 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 inplace 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).

#### RECOMMENDATIONS

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,

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- 18 years for das furnaces.

Methods of life-cycle cost analysis used in equipment comperisons 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.

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### 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?	<u> </u>	Yes (continue)
			No (terminate)
3a.	What percentage of your sales are:	7	Residential
		%	Commercial
ЗЪ.	What percentage of your residential	•	New Construction
	business is:	^	New Consciuction
		7	Replacement
		7	Service

FROM THIS POINT ON, HAVE YOUR RESPONDENTS ANSWER IN TERMS OF THEIR

RESIDENTIAL BUSINESS ONLY.

		Gas	Unitary	Electric
	•	Furnaces	Air Conditioners	Heat Puops
4a.	Approximately how many (READ COLUMN HEADINGS) do you install in a typical year?			
	EACH EQUIPMENT TYPE ASK: rk vertically)			
4b.	What percentage of were for replacement (rather than new construction)?	Z	Z	
4c.	Of the replacement, what would you estimate as the percentage where "live" or still functioning equipment			•

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	1	rage 10 01 24	
	Gas Furnaces Ai	Unitery r Conditioners	Electric Heat Punps
was replaced for energy efficiency (or other) reasons?	×	7	7
44.1. Based on your experience, what would you estimate has been the average age at replacement (when the tota unit is replaced)? If un to answer, skip to 44.3	1	Ávg.	Avg
4d.2. What might be a reasonable maximum/minimum replacement age? (Skip to 4e.)		Min	Msn
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, 1 the quality and reliability been improved the last couple of years?	y of		
Yes (continue) No (Go to Sa)	8	8	8
4f. Do you expect this to lead a	to () () ()		
FOR EACH EQUIPMENT TYPE ASK: (Work vertically)			
5a. Do you believe that the service life of equipment being installed today will bethan has been the case in the past? Longer Shorter The same as			S
5b. Do you believe that the being installed today will require service than earlier models Greater Less About the same	i? () () ()		
Sc. What average service life (years) does your company u for in discussi with prospective customers in cost comparisons? (Skip to 5d)	ons		

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	nable to answer, ranges: < 10 years 10-14 15-19	()	()		
	< 10 years 10-14	()	()		
		()		()	
	15–19		()		
	20-24				
	25+	6	6	<u>}</u>	
Don '	t know (skip to q	.6) ()	()	()	
Sd. What facto	is the source of ors?				
Manui	facturer	()	()	()	
	ibutor	$(\mathbf{i})$	. ()	$\mathbf{S}$	
	LE Guidelines experience or opi	() niom ()		()	
	methods do you u opt only if neces		the proper sizing (	of equipment?	
:	a. Replace wit	h comparable equ	ipment ()		
	b. Rule of thu	mb or other	$\sim$		
		ulation (standar rm; heat loss su			
	d. Computer-ba	sed program	<u>ب</u> ( )		
		ouse computer ty/mfr's compute	r ())	only ask if they ise a computer- based program	
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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)	C	)
•	Simple payback analysis	( )	)

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• Life cycle cost analysis ()

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	· · · · · · · · · · · · · · · · · · ·	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
86.	What might be a reasonable minimum/ maximum replacement age (skip to 8c)	Min		_Min _Max
8c.	If unable to answer, prompt with ranges ( 5-7 years 8-10 years 11-14 years 15-19 years 20+ years What would you estimate as an average installed cost (equipment and labor) for areplacement compressor (typical or most common size in your area)?	(for Avg. only): () () () () () ()	() () () ()	
8d.	Approximately, what percentage of the installed cost of a totally new unit would this be? (Skip to 9)			
9.	If unable to answer, prompt with ranges: 20-30% 30-40% 40-50% In terms of your average annual service calls for . what percentage are for		8	
	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	<b>3</b>		

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•	ASK FOR EACH EQUIPMENT TYPE:	. Gas Furnaces		tary <u>ditioners</u>	Electric Heat Pumps	
10a.	Approximately what percentage of your total service activity for is on annual service contracts?	<u></u>	<u>z</u>	%	<u></u>	_7
106.	Is this annual service contract port	ion:				
	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?	•				
	Qn 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 breakdow you expect to sell this year?	n by effic	iency le	vel of the		
	AFUE Gas Furnace	SEER	E	lectric Hea	t Pump	
	< 80% standard	<7.5			%	
8	80-84% hi-efficiency%	7.5-9.0	) <u></u>	<u></u>	<del>z</del>	
	85+% condensing%	9.0+ [Relates	to Heat	Pumps]	<u> </u>	
12.	What incentives are being offered by		in t	erms of the	electric	
	heat pump?	Manufact		<u>Utili</u>		
	a. Cash	Y() N	()	Y()	N ( )	
	1. Average Amount	s		\$		
	b. Rebates	Y () N	()	Y()	N ( )	
	1. Average Amount	\$		\$		
	d. Co-op Advertising	Y() )	()	¥()	N ( )	
	e. Other	Y() H	•()	¥()	N ( )	

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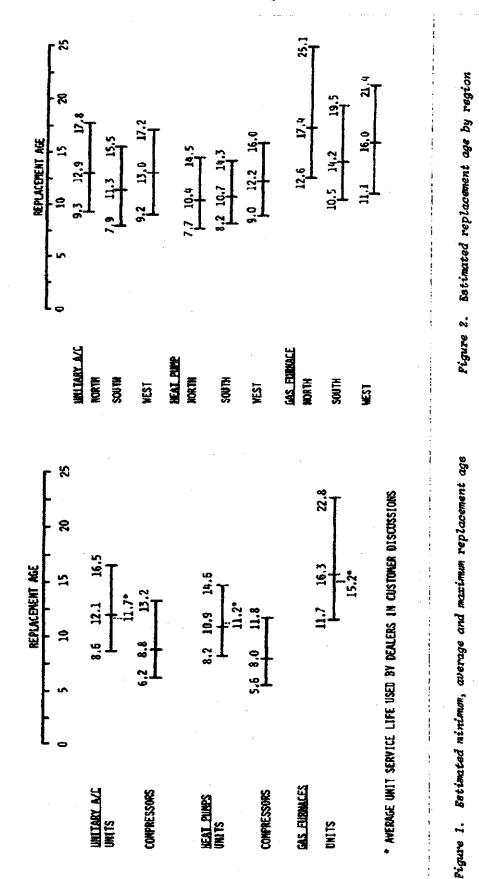
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f. None

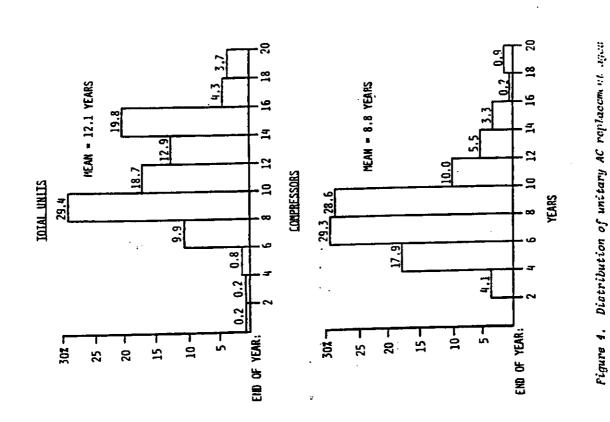
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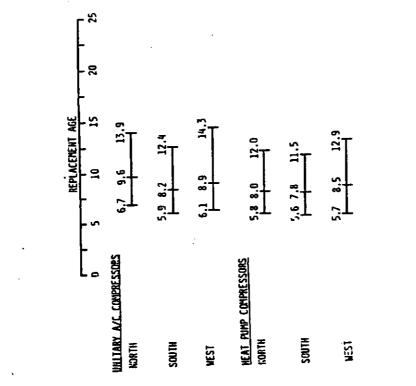
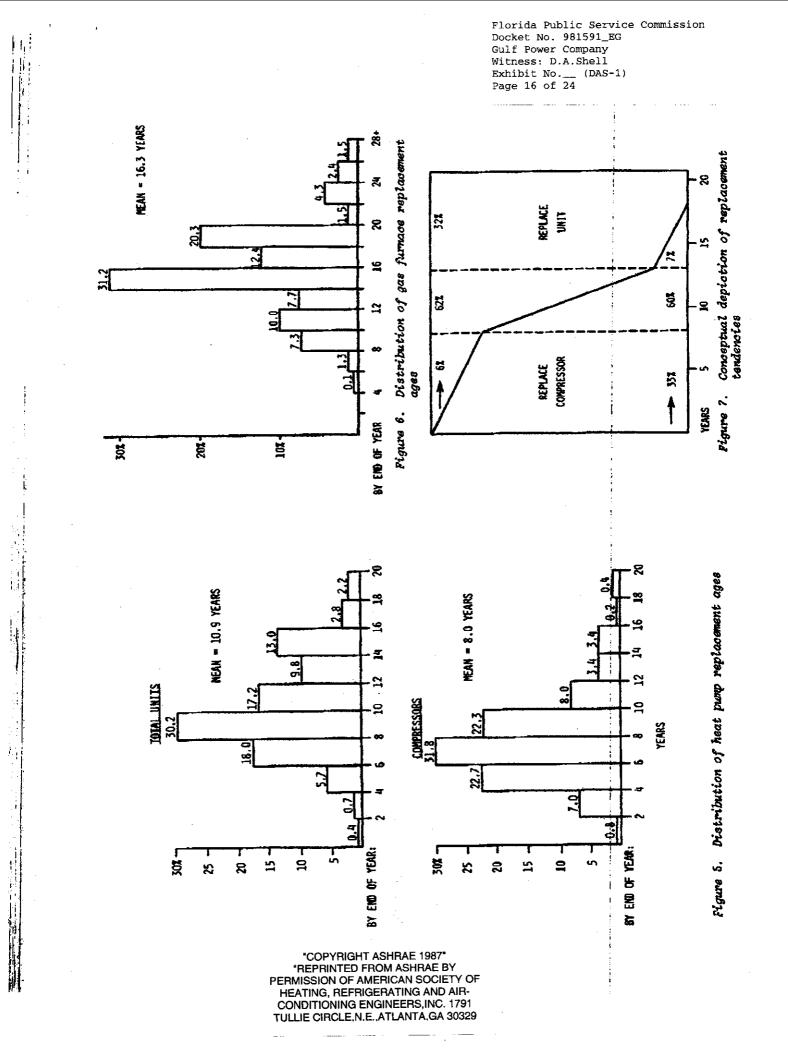


figure 3. Estimated compressor replacement age by region



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HI-85-10 No. 5

## A Study of Heat Pump Service Life

N.C. Lovvorn ASHRAE Member C.C. Hiller, Ph.D. ASHRAE Member

#### 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.

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#### 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.

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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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N. C. Lovvorn, Supervisor, Residential Heat Pumps, Alabama Power Company, Birmingham, AL, and Carl C. Hiller, Project Manager, Electric Power Research Institute, Palo Alto, CA.

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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:

- 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.
- 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).
- Provide breakdowns of the above information categorized by manufacturer, year of installation, and other appropriate groupings.

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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 I: Heat pumps installed between March 1964 and May 14, 1967.
- <u>Group 2</u>: 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

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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

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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 1,589 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,

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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.<sup>(4)</sup> 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

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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

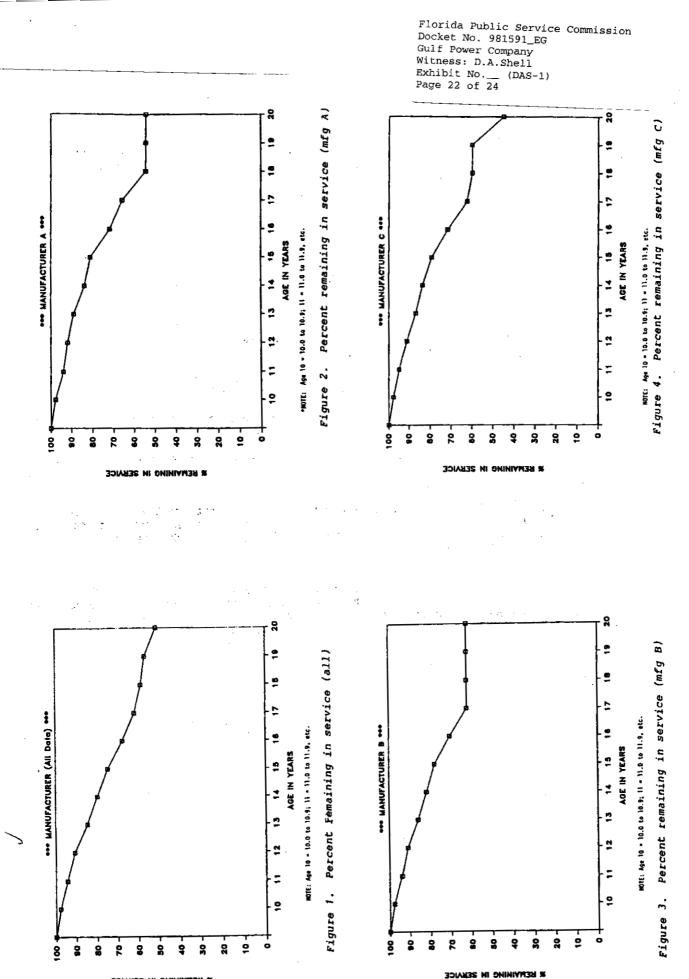
- 1. A total of 96.4% of the respondents surveyed were identified as still having heat pumps. another 1.6% reportedly have other forms of electric heating (possible reporting error they could also have been heat pumps).
- 2. A large percentage of the original known heat pump sample are still in operation, 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.

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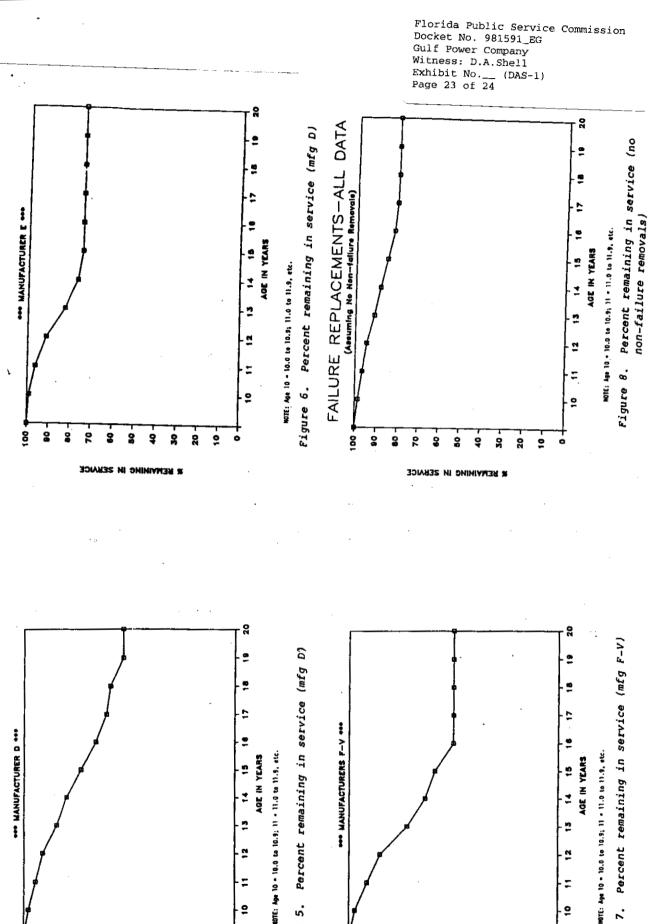
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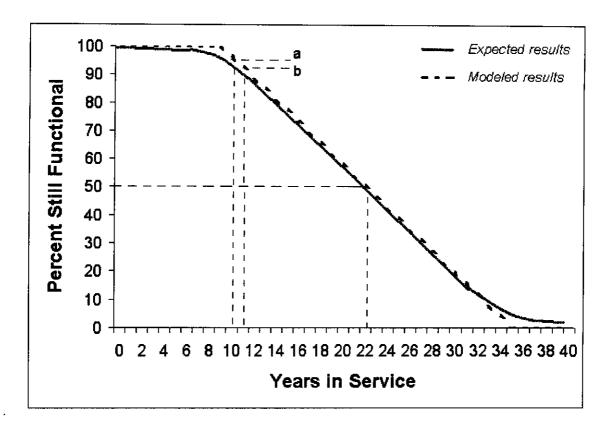
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### Derivation of HVAC Units in Service vs. Age and Probability of Failure vs. Age

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%

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### Table of Selected FPSC-Approved Energy Efficiency and Conservation Programs

. . .

<u>Docket No.</u>	<b>Utility</b>	Program Name	<u>Analysis Period</u>	
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 30 years Management		

FLOBIDA PUBLIC SERVICE COMMISSION DOCKET NO. <u>981591-EG</u> EXHIBIT NO. <u>5</u>
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DOCUMENT NUMBER-DATE

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#### 35.2

#### 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	
Stearn-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 plaaned 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 Florida Public Service Commission Docket No. 981591\_\_\_ EG Gulf Power Company Witness: T. S. Spangenberg, Jr. Exhibit No. \_\_\_\_ (TSS-2) Page 2 of 2

#### **1999 ASHRAE Applications Handbook**

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 propetty 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.

### **GULF POWER COMPANY**

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Year		<u>Site Plan without</u> <u>sion Program</u> Net Firm Winter Peak <u>Demand, MW</u>			Site Plan with GC rogram as Filed 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

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