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RECORDS AND  
REPORTING  
AUG 13, 1999

Charles A. Guyton  
850.222.3423

Blanca S. Bayó, Director  
Records and Reporting  
Florida Public Service Commission  
4075 Esplanade Way, Room 110  
Tallahassee, Florida 32399-0850

**By Hand Delivery**

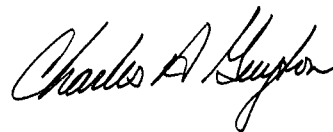
Re: FPL/Gas R&D Reseach  
Findings in Docket 950492-EG  
990000

Dear Ms. Bayó:

Enclosed for filing on behalf of Florida Power & Light Company (FPL) are the original and fifteen (15) copies of 1) FPL's Gas R&D Gas Heat Pump Research Project Research Findings and 2) Gas R&D Gas Water Heating Research Project Research Findings. These reports are being filed pursuant to Order No. PSC-95-1146-FOF-EG in Docket No. 950492-EG

If you or your Staff have any questions regarding this filing, please contact me.

Very truly yours,



Charles A. Guyton

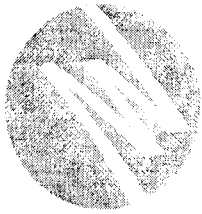
- AFA \_\_\_\_\_
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- SEC \_\_\_\_\_
- WAW \_\_\_\_\_
- OTH \_\_\_\_\_

cc: Robert V. Elias, Esq.

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**FPL**

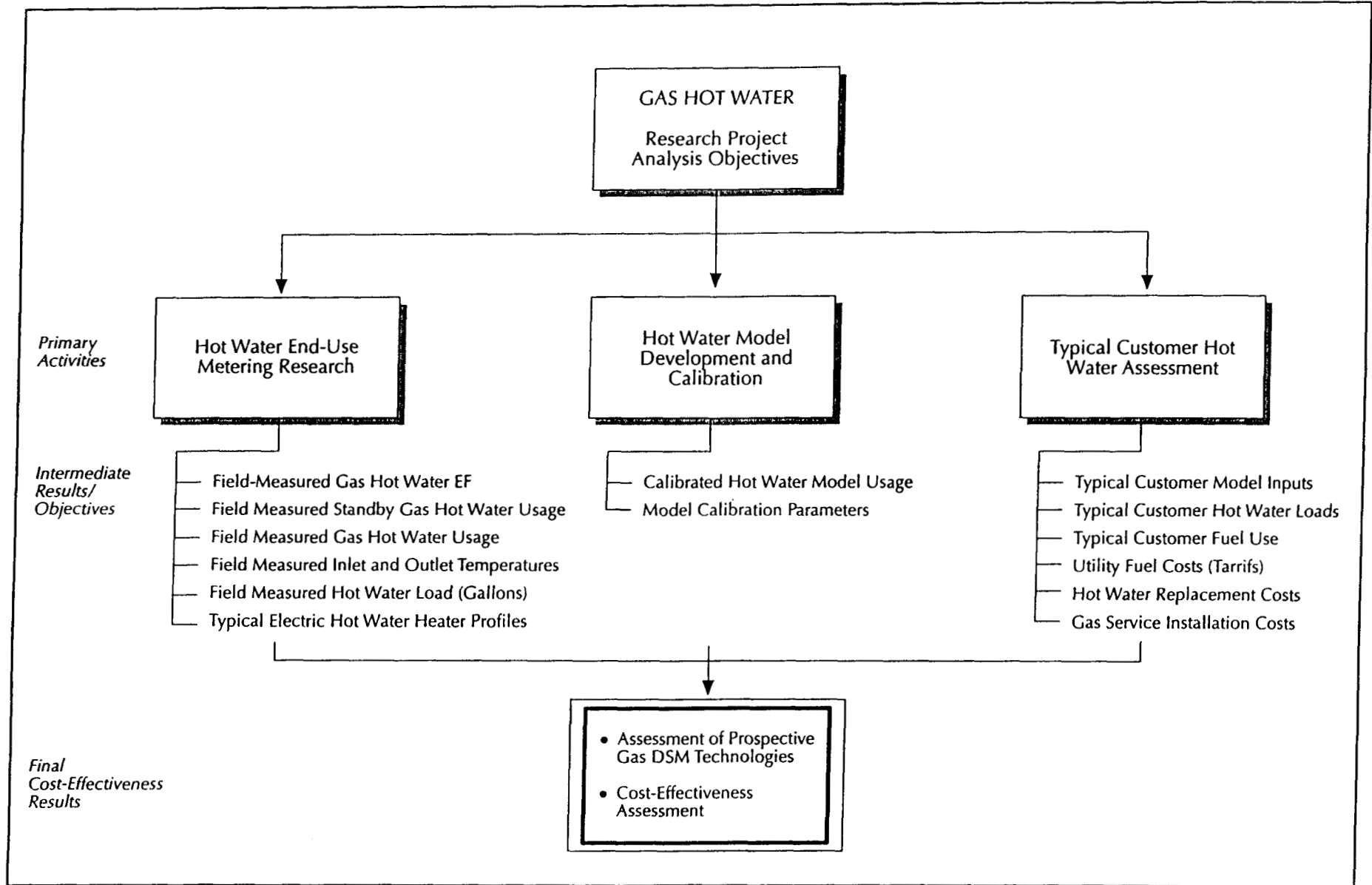
Natural Gas End-Use Technology R&D Plan

Gas Water Heating Research Project

Research Findings

Florida Power & Light  
June 1999

**Exhibit 1**  
**Overview of the FPL Natural Gas Hot Water Research Project**  
**Analysis Objectives**



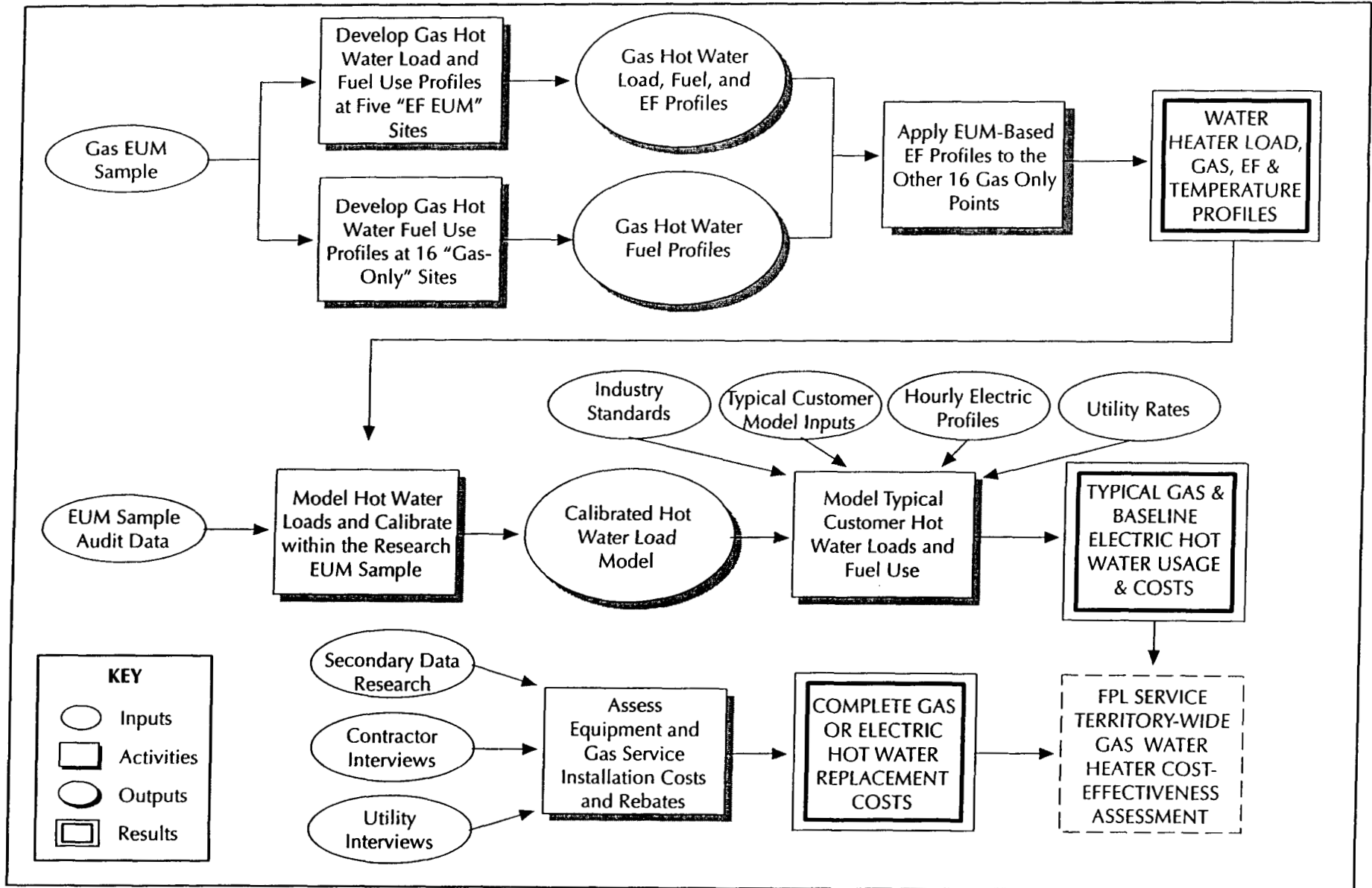
**RESULTS OF THE FLORIDA POWER AND LIGHT (FPL) NATURAL GAS (GAS) HOT WATER RESEARCH PROJECT ARE PRESENTED IN THIS REPORT.**

- This report describes the research approach through a presentation of the primary analysis activities and data sources.
- First the methods and results are presented from the hot water end-use metering (EUM) assessment. This assessment consists of an in-depth analysis of hot water loads and gas/electric consumption, measured using FPL program evaluation and gas research EUM samples.
- Then a hot water usage model is presented that was developed for this study, based upon research conducted by the Lawrence Berkeley Laboratory.<sup>1</sup>
- Next typical customer hot water usage profiles are developed using FPL evaluation sources, and integrated comparisons are made of the cost to install and operate gas and electric technologies for several customer segments.

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<sup>1</sup> Modeling Patterns of Hot Water Use in Households, LBL-37805, November 1996; and  
The Effect of Efficiency Standards on Water Use and Water Heating Energy Use in the U.S.: A Detailed End-Use Treatment, LBL-35475,  
May 1994.

**Exhibit 2**  
**Analysis Steps Supporting the FPL Gas Hot Water Research Project**

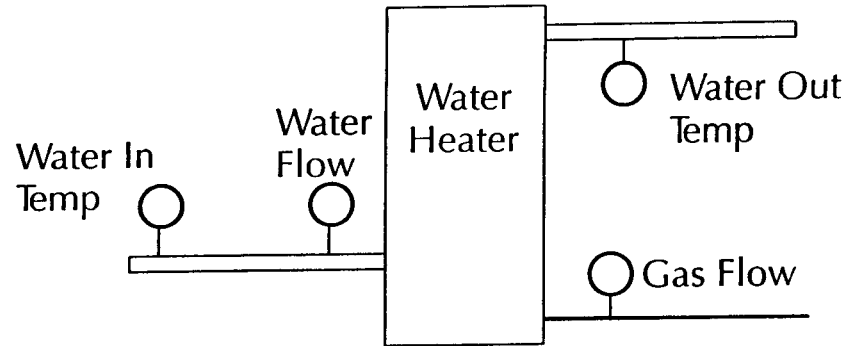


**THE PURPOSE OF THIS PROJECT IS TO ASSESS THE FEASIBILITY OF GAS APPLIANCE FUEL SWITCHING IN FPL SERVICE TERRITORY, BY DEVELOPING THE BEST AVAILABLE ESTIMATES OF CUSTOMER PAYBACK AND COST-EFFECTIVENESS FOR AVAILABLE TECHNOLOGIES IN THE FLORIDA MARKET.**

- The methods used incorporate the costs to purchase and install new hot water equipment (including the costs to obtain gas utility service), equipment rebates that are offered by the Florida gas utilities, monthly gas and electric usage, FPL system peak hour hot water electric demand, and electric and gas utility rates.
- The end product supports a FPL system-wide cost-effectiveness assessment for all stakeholders, to identify new DSM technologies.
- As illustrated in the facing exhibit, three primary objectives were identified at the outset of this project to ensure a successful assessment of gas hot water fuel switching opportunities.
  - **Hot Water End-Use Metering Research.** Twenty-one gas hot water sites were monitored and analyzed to determine hot water loads and gas hot water fuel usage.
  - **Hot Water Model Development and Calibration.** The above hot water usage profiles are used to support hot water model calibration.
  - **Typical Customer Hot Water Assessment.** Typical customer hot water load and gas and electricity use estimates are derived by Department of Community Affairs (DCA) climate and house type. The integration of these estimates with utility rates and equipment costs are used to evaluate the economic feasibility of gas hot water fuel switching.

**CUSTOMER-BASED COST-EFFECTIVENESS RESULTS ARE PROVIDED AT THE CONCLUSION OF THIS REPORT.**

**Exhibit 3**  
**Monitoring Approach**



Channel Description	Units Measured	Sensor Information				Recorder Information		
		Description	Manufacturer	Actual Quantity Measured	Sensor Accuracy	Pulse Resolution	Estimated Maximum Demand Rate	Estimated Minimum Demand Rate
Gas Input	Btu	Diaphragm Meter	Equimeter	Cubic Feet of Gas	± 2%	1000 Btu	125,000 Btuh	13,000 Btuh
Hot Water Flow	Gallons	Positive Displacement Meter	Omega/Kent, ABB	Gallons	± 2%	1 Gallon	180 gph	NA
Inlet Water Temperature	°F	Pulse Type Temperature Sensor	PSI	Water Temperature	± 2°F	0.54°F	NA	NA
Supply Water Temperature	°F	Pulse Type Temperature Sensor	PSI	Water Temperature	± 2°F	0.54°F	NA	NA

**GAS HOT WATER METERING EQUIPMENT WAS INSTALLED IN THIS RESEARCH EFFORT IN ORDER TO VERIFY GAS EQUIPMENT PERFORMANCE IN THE FLORIDA CLIMATE (WHERE INLET WATER TEMPERATURES ARE RELATIVELY HIGH).**

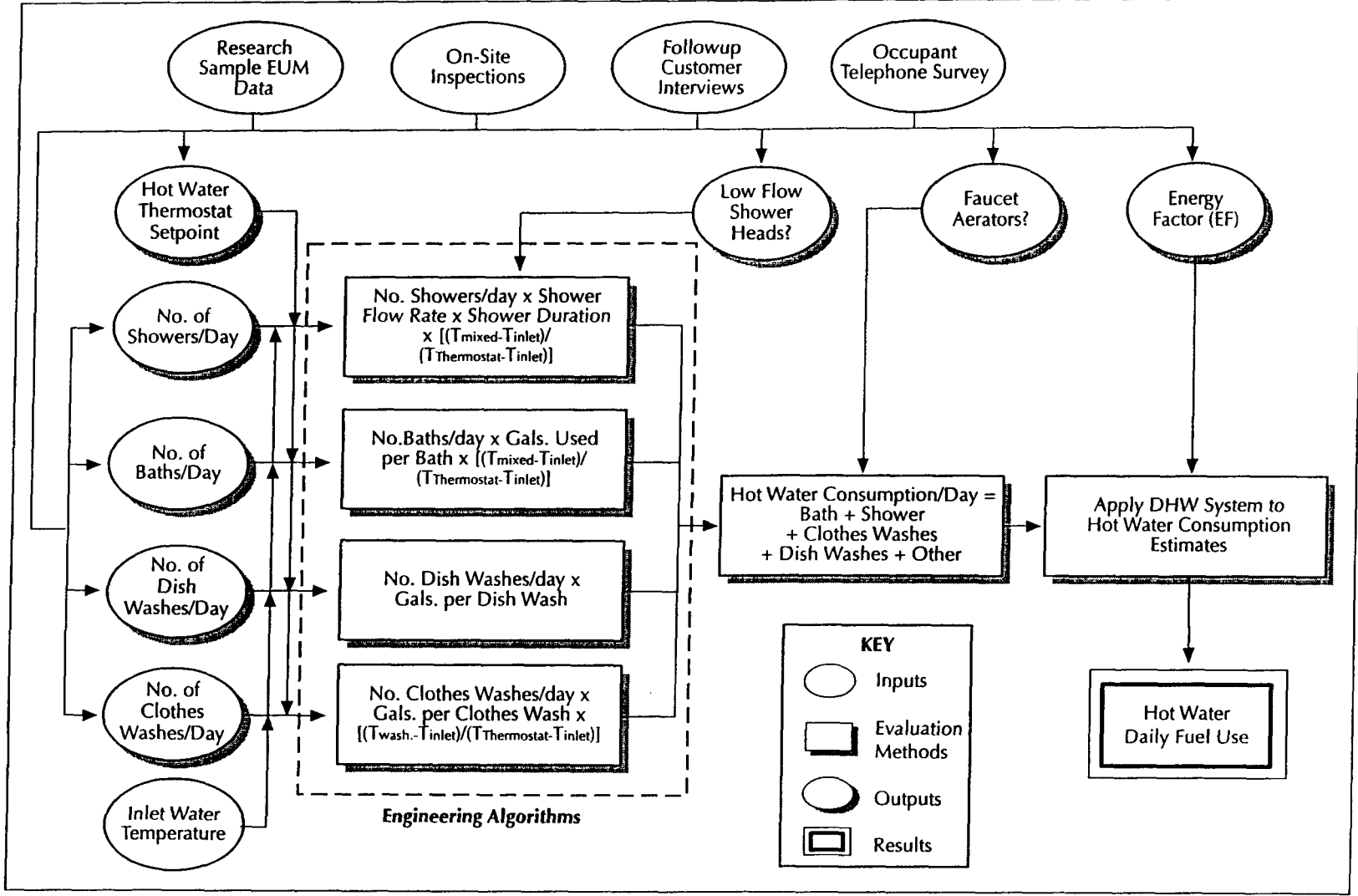
The facing exhibit shows the monitoring approach used to measure gas use at 16 customer sites, and gas use and hot water load at five additional EUM points.

- The monitoring points shown support both hot water load model calibration and gas hot water performance calibration. In effect, these data support a continuous assessment of gas hot water efficiency throughout the 24-month monitoring period.
  - For five sites the hot water load (Btu output) was measured directly. We refer to these customer sites as “EF-EUM” points throughout the remainder of this report. The monitoring points include the following gathered at five-minute intervals:
    - .. Inlet water temperature (cold)
    - .. Inlet supply water flow
    - .. Outlet supply water temperature (hot)
  - For the other 16 sites the hot water load is derived using a relationship between gas usage (Btu input) and hot water load (derived within the sample of five EF-EUM sites).

**GAS HOT WATER EUM METHODS AND RESULTS ARE USED TO CALIBRATE THE HOT WATER MODEL THAT IS DESCRIBED ON THE FOLLOWING PAGE.**



**Exhibit 4**  
**Hot Water Model Description**



**THE APPROACH USED TO ESTIMATE HOT WATER LOADS FOR BOTH GAS HOT WATER AND BASELINE ELECTRIC HOT WATER SYSTEMS IS ILLUSTRATED IN THE FACING EXHIBIT.**

- This model was used to calculate customer hot water loads both within the research sample (including model calibration using comparisons with metering-based hot water load estimates) and for typical FPL customers.
- The hot water model uses customer-measured EUM profiles, and hot water usage data based on on-site audits and telephone surveys. The data contributing to the hot water model consists of both behavioral and population-level components.
  - The behavioral data include the number of showers per week, number of baths per week, number of clothes washes per week, number of dishwashes per week, and the presence of faucet and shower low-flow plumbing fixtures.
  - The population data include fixed assumptions regarding appliance usage (such as UECs and loadshapes), appliance efficiency ratings (like EF), and water inlet and outlet temperature profiles.

**ONCE CALIBRATED, THIS HOT WATER MODEL IS USED TO ASSESS TYPICAL CUSTOMER HOT WATER LOADS, AS DEMONSTRATED ON THE FOLLOWING PAGE.**

**Exhibit 5**  
**Typical Customer Hot Water Use Profiles**

House Type	Hot Water Use Characteristics	Number of Contributing Observations	Mean Value per Home	Percentage of Homes	Source of Data
Single Family Detached	Number of occupants per home	1,604	2.7	-	FPL Appliance Saturation Survey
	No. of showers per day	880	2.6	-	Evaluation audit data
	Length of each shower* (minutes)	NA	6.5	-	Engineering judgement
	No. of baths per day	845	0.17	-	Evaluation audit data
	Hot water temperature setting (°F)	873	125	-	Evaluation audit data
	Low-flow shower head saturation	870	-	41%	Evaluation audit data
	Clothes washer saturation	776	-	91%	FPL Appliance Saturation Survey
	Clothes washes per day**	873	0.72	-	Evaluation audit data
	Dishwasher saturation	776	-	71%	FPL Appliance Saturation Survey
	Dishwasher washes per day**	629	0.56	-	Evaluation audit data
	Faucet aerator saturation	883	-	58%	Evaluation audit data
	Seasonal occupancy rates*** (%)	1,604	94 - 99	-	FPL Appliance Saturation Survey
	Ground water inlet water temperature**** (°F)	4	74 - 84	-	4 EUM points
	Surface water inlet water temperature**** (°F)	1	68 - 83	-	1 EUM point
	Electric Hot Water Baseline Energy Factor (EF)	-	0.90	-	Energy Policy and Conservation Act
Gas Hot Water Baseline Energy Factor (EF)	-	0.54	-	Energy Policy and Conservation Act	
Single Family Attached	Number of occupants per home	1,237	2.0	-	FPL Appliance Saturation Survey
	Clothes washer saturation	357	-	59%	FPL Appliance Saturation Survey
	Dishwasher saturation	357	-	76%	FPL Appliance Saturation Survey
	Faucet aerator saturation	154	-	47%	Evaluation audit data
	Seasonal occupancy rates*** (%)	1,237	76 - 98	-	FPL Appliance Saturation Survey
Mobile Home	Number of occupants per home	262	2.2	-	FPL Appliance Saturation Survey
	Clothes washer saturation	39	-	78%	FPL Appliance Saturation Survey
	Dishwasher saturation	39	-	44%	FPL Appliance Saturation Survey
	Faucet aerator saturation	16	-	0%	Evaluation audit data
	Seasonal occupancy rates*** (%)	1,237	69 - 98	-	FPL Appliance Saturation Survey

- The number of minutes per shower was set to a constant for all customers as part of the model calibration process. Average audit responses suggested a range from 9-10 minutes. The LBL default is 5 minutes/shower.
- \*\* The number of clothes washes or dishwashes per day is calculated for a population of customers that have each appliance, excluding zero's.
- \*\*\* Occupancy rates vary seasonally and regionally, and were modeled using an average that was derived for each month.
- \*\*\*\* Inlet water temperatures vary seasonally, and were modeled using an average that was derived for each month.  
EUM-based water temperature ranges were verified using reported finished water temperatures, obtained through interviews with water utilities.

**DATA RELATED TO HOT WATER LOADS, PREVIOUSLY GATHERED FOR USE IN DSM EVALUATION ACTIVITIES AND OTHER FPL SYSTEM-WIDE OBJECTIVES, WERE OBTAINED FOR USE ON THIS PROJECT.**

These valuable data were used to estimate typical customer appliance holdings and other important data related to hot water loads.

- Research-specific results were leveraged to the general FPL population using the wealth of FPL-specific data mentioned above and identified in the facing exhibit. Self-report behavioral data (from on-site audits and telephone surveys) were combined with available data on geographic/seasonal customer trends affecting hourly hot water consumption.
- These hot water loads were then converted to fuel consumption using an energy factor (EF) term.
  - EF is a dimensionless term that represents the ratio of hot water load delivered to electricity or gas used.
  - Baseline EF were derived for gas and electric systems using manufacturing standards for water heaters mandated by the Energy Policy and Conservation Act (Public Law 94-163) and the National Appliance Energy Conservation Act (100-12). The resulting EF ratings for 40 gallon storage hot water heaters is 0.54 and 0.90 for gas and electric hot water systems, respectively.
- Using the calibrated model, in conjunction with typical customer behavior and appliance holdings, typical customer hot water usage estimates were derived for gas and electric appliances.
- Electric water heater peak-hour demand usage was then estimated by applying hourly hot water profiles (derived using FPL's program evaluation EUM resources).

**THE RESULTING FUEL USE ESTIMATES ARE USED IN THE CUSTOMER-BASED COST-EFFECTIVENESS ASSESSMENT, PRESENTED ON THE FOLLOWING PAGE.**

**Exhibit 6**  
**Hot Water Usage and Cost Results**  
**Supporting the Assessment of Gas Fuel Switching Cost-Effectiveness**

Building Type	DCA Climate Zone	Percent of Population	Water Heater Installed Costs							Water Heater Operating Costs					Electric Impacts****		
			Installed Cost for a Gas Water Heater* (\$)	Gas Water Heater Rebate** (\$)	Gas Connect'n Charge*** (\$)	Gas Water Heater Installed Cost with Connect'n Charge Less Rebate (\$)	Installed Cost for an Electric Hot Water Heater* (\$)	Increment'l Gas Water Heater Installed Cost w/ Rebate (\$)	Increment'l Gas Water Heater Installed Cost w/o Rebate (\$)	Annual Hot Water Gas Use (Therms)	Annual Gas Hot Water Utility Costs (\$)	Annual Hot Water Electric Use (kWh)	Annual Electric Hot Water Utility Costs (\$)	Annual Gas Hot Water Operating Savings (\$)	Summer Demand (kW)	Winter Demand (kW)	Incremental Life Cycle Cost for Gas Systems***** (\$)
Single Family Detached	North	3.38%	872	440	19	452	426	26	466	123	189	2,183	183	-7	0.20	0.52	111
	Central	16.51%	872	525	15	363	426	-63	462	127	221	2,254	189	-32	0.20	0.55	348
	South	31.82%	872	440	19	452	426	26	466	123	195	2,172	182	-12	0.20	0.53	186
Single Family Attached	North	0.68%	900	440	21	482	426	56	496	72	150	1,281	99	-51	0.11	0.32	713
	Central	7.12%	900	525	17	392	426	-34	491	84	181	1,491	117	-64	0.12	0.38	798
	South	32.08%	900	440	21	482	426	56	496	83	164	1,463	118	-47	0.13	0.37	662
Mobile Home	North	1.42%	941	440	13	515	426	89	529	97	142	1,720	136	-6	0.16	0.42	171
	Central	3.64%	941	525	11	427	426	1	526	91	157	1,619	131	-25	0.12	0.44	328
	South	3.35%	941	440	13	515	426	89	529	90	140	1,596	131	-8	0.13	0.42	198
FPL System Weighted Average			889	463	19	445	426	19	482	105	184	1858	153	-31	0.16	0.46	415

- \* Costs to install an electric or gas water heater includes a "base" cost of \$425, which covers the water heater equipment and the labor to install each appliance. There are also additional costs for gasline extensions and stubs, chimney work, water piping, disconnect wiring, permit fees, and conversion-related repairs. These additional cost estimates are based upon the results from an electric-to-gas water heater conversion program in Consumers Power Company service territory. That program was sponsored by the Michigan Public Service Commission (Home Energy Magazine Online, March/April 1994).
- \*\* Peoples Gas, representing the North and South climates, offers a \$440 rebate to fuel switch from an electric to gas water heater. City Gas representing the Central climate, offers a \$525 rebate to fuel switch from an electric to gas water heater.
- \*\*\* The gas connection charge is only applicable to the customers in FPL service territory that do not have gas service prior to the fuel switch. FPL appliance saturation survey records indicate that the percentage of residential customers (that have gas service available, electric water heaters, but no gas) is 77.2% of single family detached homes, 85.3% of single family attached homes, and 53.6% of mobile homes. The connection charge is applied to these percentages when estimating the full gas hot water installation costs.
- \*\*\*\* Peak demand impacts are the reduction in peak hour usage for customers that fuel switch from an electric to gas hot water heater.
- \*\*\*\*\* Preliminary life cycle cost estimates assume no inflation and a discount rate of zero. A 13 year life for the equipment is assumed for both electric and gas storage systems, based on ACEEE, and verified using Lawrence Berkeley Laboratory source.

**HOT WATER END-USE RESEARCH RESULTS INDICATE THAT A SWITCH TO A GAS WATER HEATER FROM ELECTRIC IS NOT CURRENTLY COST EFFECTIVE, IN SPITE OF THE SUBSTANTIAL REBATES THAT ARE PROVIDED BY GAS UTILITIES.**

As illustrated in the facing exhibit, gas water heaters have both a higher first cost and, in most cases, higher monthly energy costs than electric water heaters. The later is true because most fuel switch opportunities in FPL service territory are for all electric customers (i.e., the gas water heater that is added is the only gas appliance in the house), and for those customers the entire monthly customer charge is applied to the gas water heater.

- To assess the economic viability of a customer decision to purchase a gas water heater, the incremental life cycle cost for the gas hot water fuel switch investment is calculated. A simple formula is applied, assuming no inflation and a discount rate of zero. The results are not favorable for the gas fuel switch investment, especially given that the gas hot water heater installed costs almost always exceed those of an electric system, and the utility costs are greater for the gas system than those of the electric system.
- These results are based on an assessment that assumes natural replacement customer actions, rather than discretionary retrofit. That is, it is assumed that a customer who is considering a fuel switch to gas will be replacing the hot water system, regardless of fuel choice.
- The gas connection charge is only applicable to the customers in FPL service territory that do not have gas service prior to the fuel switch. Gas utility personnel who were interviewed indicated that the actual costs to install gas service from the street to the house are approximately \$600-750. However, customers are only responsible for the \$20-25 connection fee (which is applied only to the fraction of customers with all electric service prior to the retrofit).

**Exhibit 7**  
**Gas Water Heating vs Competing Equipment Cost-Effectiveness**  
**Participant Test and Rate Impact Test**

Gas Technology	Competing Electric Technology	CASE 1			CASE 2		
		Participant Ratio	RIM Ratio	Participant Incentive Level	Participant Ratio	RIM Ratio	Participant Incentive Level
Gas Water Heating	Electric Water Heating	1.01	0.512	\$122.00	0.95	0.5646	\$0.00

**HOT WATER END-USE RESEARCH RESULTS INDICATE THAT A SWITCH TO A GAS WATER HEATER FROM ELECTRIC IS NOT CURRENTLY COST EFFECTIVE FOR THE PARTICIPANT OR THE UTILITY.**

As illustrated in the facing exhibit, gas water heating is not a cost-effective solution for the utility and the participant. In Case 1 the participant incentive level was set to ensure a participant ratio of 1.01 however, in that scenario the measure failed the RIM test with a ratio of .5646. In Case 2 the participant incentive levels were set to \$0 in order to maximize the RIM ratio and it didn't pass the Participants or RIM test.

The following CPF run indicates that it is not possible for the technology of residential gas water heating to be cost-effective for both the participant and the utility.



INPUT DATA -- PART 1 CONTINUED  
PROGRAM METHOD SELECTED: REV\_REQ  
PROGRAM NAME: Gas Water Heater w/1000 participants In 2000

I. PROGRAM DEMAND SAVINGS & LINE LOSSES

(1) CUSTOMER kW REDUCTION AT METER .....	0.21 kW
(2) GENERATOR kW REDUCTION PER CUSTOMER .....	0.26 kW
(3) kW LINE LOSS PERCENTAGE .....	9.01 %
(4) GENERATOR kWh REDUCTION PER CUSTOMER .....	1,998.3 kWh
(5) kWh LINE LOSS PERCENTAGE .....	7.02 %
(6) GROUP LINE LOSS MULTIPLIER.....	1.0000
(7) CUSTOMER kWh INCREASE AT METER .....	0.0 kWh

II. ECONOMIC LIFE & K FACTORS

(1) STUDY PERIOD FOR THE CONSERVATION PROGRAM .....	27 YEARS
(2) GENERATOR ECONOMIC LIFE .....	30 YEARS
(3) T&D ECONOMIC LIFE .....	35 YEARS
(4) K FACTOR FOR GENERATION .....	1.61524
(5) K FACTOR FOR T & D.....	1.46985

III. UTILITY & CUSTOMER COSTS

(1) UTILITY NON RECURRING COST PER CUSTOMER .....	*** \$/CUST
(2) UTILITY RECURRING COST PER CUSTOMER .....	*** \$/CUST
(3) UTILITY COST ESCALATION RATE .....	*** %**
(4) CUSTOMER EQUIPMENT COST .....	*** \$/CUST
(5) CUSTOMER EQUIPMENT ESCALATION RATE .....	*** %**
(6) CUSTOMER O & M COST .....	*** \$/CUST/YR
(7) CUSTOMER O & M COST ESCALATION RATE .....	*** %**
(8) INCREASED SUPPLY COSTS .....	*** \$/CUST/YR
(9) SUPPLY COSTS ESCALATION RATES.....	*** %**
(10) UTILITY DISCOUNT RATE .....	8.98 %
(11) UTILITY AFUDC RATE.....	10.30 %
(12) UTILITY NON RECURRING REBATE/INCENTIVE .....	*** \$/CUST
(13) UTILITY RECURRING REBATE/INCENTIVE .....	*** \$/CUST
(14) UTILITY REBATE/INCENTIVE ESCALATION RATE .....	*** %

IV. AVOIDED GENERATOR AND T&D COSTS

(1) BASE YEAR .....	1998
(2) IN-SERVICE YEAR FOR AVOIDED GENERATING UNIT .....	2005
(3) IN-SERVICE YEAR FOR AVOIDED T&D .....	2001-2005
(4) BASE YEAR AVOIDED GENERATING COST .....	519 \$/kW
(5) BASE YEAR AVOIDED TRANSMISSION COST .....	70 \$/kW
(6) BASE YEAR DISTRIBUTION COST .....	50 \$/kW
(7) GEN, TRAN & DIST COST ESCALATION RATE .....	1.78 %**
(8) GENERATOR FIXED O & M COST .....	35 \$/kW/YR
(9) GENERATOR FIXED O&M ESCALATION RATE .....	4.10 %**
(10) TRANSMISSION FIXED O & M COST .....	2.73 \$/kW
(11) DISTRIBUTION FIXED O & M COST .....	13.01 \$/kW
(12) T&D FIXED O&M ESCALATION RATE .....	4.10 %**
(13) AVOIDED GEN UNIT VARIABLE O & M COSTS .....	0.067 CENTS/kWh
(14) GENERATOR VARIABLE O&M COST ESCALATION RATE .....	2.70 %**
(15) GENERATOR CAPACITY FACTOR .....	91% ** (In-service year)
(16) AVOIDED GENERATING UNIT FUEL COST .....	2.17 CENTS PER kWh** (In-service y
(17) AVOIDED GEN UNIT FUEL COST ESCALATION RATE .....	1.75 %**

V. NON-FUEL ENERGY AND DEMAND CHARGES

(1) NON FUEL COST IN CUSTOMER BILL .....	*** CENTS/kWh
(2) NON-FUEL COST ESCALATION RATE .....	*** %
(3) DEMAND CHARGE IN CUSTOMER BILL .....	*** \$/kW/MO
(4) DEMAND CHARGE ESCALATION RATE .....	*** %

\* SUPPLEMENTAL INFORMATION NOT SPECIFIED IN WORKBOOK  
\*\* VALUE SHOWN IS FOR FIRST YEAR ONLY (VALUE VARIES OVER TIME)  
\*\*\* PROGRAM COST CALCULATION VALUES ARE SHOWN ON PAGE 2

\* INPUT DATA -- PART 1 CONTINUED  
 PROGRAM METHOD SELECTED: REV\_REQ  
 PROGRAM NAME: Gas Water Heater w/1000 participants in 2000

YEAR	(1) UTILITY PROGRAM COSTS WITHOUT INCENTIVES \$(000)	(2) UTILITY INCENTIVES \$(000)	(3) OTHER UTILITY COSTS \$(000)	(4) TOTAL UTILITY PROGRAM COSTS \$(000)	(5) ENERGY CHARGE REVENUE LOSSES \$(000)	(6) DEMAND CHARGE REVENUE LOSSES \$(000)	(7) PARTICIPANT EQUIPMENT COSTS \$(000)	(8) PARTICIPANT O&M COSTS \$(000)	(9) OTHER PARTICIPANT COSTS \$(000)	(10) TOTAL PARTICIPANT COSTS \$(000)
1998	0	0	0	0	0	0	0	0	0	
1999	0	0	0	0	0	0	0	0	0	
2000	22	122	0	144	69	0	20	97	117	
2001	0	0	0	0	139	0	0	199	199	
2002	0	0	0	0	139	0	0	204	204	
2003	0	0	0	0	141	0	0	210	210	
2004	0	0	0	0	141	0	0	215	215	
2005	0	0	0	0	143	0	0	221	221	
2006	0	0	0	0	142	0	0	227	227	
2007	0	0	0	0	143	0	0	233	233	
2008	0	0	0	0	144	0	0	240	240	
2009	0	0	0	0	144	0	0	246	246	
2010	0	0	0	0	147	0	0	253	253	
2011	0	0	0	0	147	0	0	260	260	
2012	0	0	0	0	148	0	0	268	268	
2013	0	0	0	0	149	0	0	276	276	
2014	0	0	0	0	151	0	0	284	284	
2015	33	122	0	155	152	0	30	292	322	
2016	0	0	0	0	153	0	0	300	300	
2017	0	0	0	0	153	0	0	309	309	
2018	0	0	0	0	154	0	0	318	318	
2019	0	0	0	0	155	0	0	327	327	
2020	0	0	0	0	156	0	0	337	337	
2021	0	0	0	0	157	0	0	347	347	
2022	0	0	0	0	158	0	0	357	357	
2023	0	0	0	0	159	0	0	367	367	
2024	0	0	0	0	160	0	0	378	378	

NOM	55	244	0	299	3,639	0	50	6,766	0	6,816
NPV	26	131	0	157	1,247	0	24	2,119	0	2,143

\* SUPPLEMENTAL INFORMATION NOT SPECIFIED IN WORKBOOK

\*\* NEGATIVE COSTS WILL BE CALCULATED AS POSITIVE BENEFITS FOR TRC AND RIM TESTS

CALCULATION OF GEN K-FACTOR  
 PROGRAM METHOD SELECTED REV\_REQ  
 PROGRAM NAME: Gas Water Heater w/1000 participants in 2000

(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
MID-YEAR RATE BASE \$(000)	DEBT \$(000)	PREFERRED STOCK \$(000)	COMMON EQUITY \$(000)	INCOME TAXES \$(000)	OTHER TAXES & INSURANCE \$(000)	DEPREC. \$(000)	DEFERRED TAXES \$(000)	TOTAL FIXED CHARGES \$(000)	PRESENT WORTH FIXED CHARGES \$(000)	CUMULATIVE PW FIXED CHARGES \$(000)
YEAR										
2005	172	6	0	12	7	2	6	0	34	34
2006	165	6	0	11	5	2	6	3	33	30
2007	157	5	0	11	5	2	6	2	31	26
2008	149	5	0	10	5	2	6	2	30	23
2009	142	5	0	10	5	2	6	2	29	21
2010	134	5	0	9	5	2	6	1	28	18
2011	127	4	0	9	5	2	6	1	27	16
2012	121	4	0	8	5	2	6	1	26	14
2013	114	4	0	8	4	2	6	1	25	13
2014	107	4	0	7	4	2	6	1	24	11
2015	101	3	0	7	4	2	6	1	23	10
2016	94	3	0	6	4	2	6	1	22	9
2017	88	3	0	6	3	2	6	1	21	8
2018	81	3	0	6	3	2	6	1	20	7
2019	75	3	0	5	3	2	6	1	19	6
2020	68	2	0	5	2	2	6	1	18	5
2021	61	2	0	4	2	2	6	1	17	4
2022	55	2	0	4	2	2	6	1	16	4
2023	48	2	0	3	2	2	6	1	15	3
2024	42	1	0	3	1	2	6	1	15	3
2025	36	1	0	2	2	2	6	(1)	14	2
2026	31	1	0	2	4	2	6	(2)	13	2
2027	28	1	0	2	4	2	6	(2)	12	2
2028	24	1	0	2	3	2	6	(2)	12	2
2029	20	1	0	1	3	2	6	(2)	11	1
2030	17	1	0	1	3	2	6	(2)	11	1
2031	13	0	0	1	3	2	6	(2)	10	1
2032	9	0	0	1	3	2	6	(2)	10	1
2033	6	0	0	0	3	2	6	(2)	9	1
2034	2	0	0	0	2	2	6	(2)	9	1

IN SERVICE COS (\$000) 173  
 IN SERVICE YEAR 2005  
 BOOK LIFE (YRS) 30  
 EFFEC. TAX RATE 38.575  
 DISCOUNT RATE 8.98%  
 OTAX & INS RATE 1.40%

**CAPITAL STRUCTURE**

SOURCE	WEIGHT	COST	
DEBT	45%	7.60	%
P/S	0%	0.00	%
C/S	55%	12.50	%

K-FACTOR = CPWFC / IN-SVC COST = 1.61524

DEFERRED TAX AND MID-YEAR RATE BASE CALCULATION  
 PROGRAM METHOD SELECTED: REV\_REQ  
 PROGRAM NAI Gas Water Heater w/1000 partk

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
YEAR	TAX DEPRECIATION SCHEDULE	TAX DEPRECIATION \$(000)	ACCUMULATED TAX DEPRECIATION \$(000)	BOOK DEPRECIATION \$(000)	ACCUMULATED BOOK DEPRECIATION \$(000)	BOOK DEPRECIATION FOR DEFERRED TAX \$(000)	ACCUMULATED BOOK DEPR FOR DEFERRED TAX \$(000)	DEFERRED TAX DUE TO DEPRECIATION \$(000)	TOTAL EQUITY AFUDC \$(000)	BOOK DEPR RATE MINUS 1/LIFE	(10)*(11) TAX RATE \$(000)	SALVAGE TAX RATE \$(000)	ANNUAL DEFERRED TAX (9)-(12)+(13) \$(000)	ACCUMULATED DEFERRED TAX \$(000)
2005	3.75%	6	6	6	6	5	5	0	13	0	0	0	0	(3)
2006	7.22%	12	18	6	12	5	11	3	13	0	0	0	3	0
2007	6.68%	11	30	6	17	5	16	2	13	0	0	0	2	2
2008	6.18%	10	40	6	23	5	21	2	13	0	0	0	2	4
2009	5.71%	10	49	6	29	5	27	2	13	0	0	0	2	6
2010	5.29%	9	58	6	35	5	32	1	13	0	0	0	1	7
2011	4.89%	8	66	6	40	5	37	1	13	0	0	0	1	8
2012	4.52%	8	74	6	46	5	43	1	13	0	0	0	1	9
2013	4.46%	7	81	6	52	5	48	1	13	0	0	0	1	10
2014	4.46%	7	89	6	58	5	53	1	13	0	0	0	1	11
2015	4.46%	7	96	6	63	5	59	1	13	0	0	0	1	12
2016	4.46%	7	104	6	69	5	64	1	13	0	0	0	1	13
2017	4.46%	7	111	6	75	5	69	1	13	0	0	0	1	13
2018	4.46%	7	119	6	81	5	75	1	13	0	0	0	1	14
2019	4.46%	7	126	6	86	5	80	1	13	0	0	0	1	15
2020	4.46%	7	134	6	92	5	85	1	13	0	0	0	1	16
2021	4.46%	7	141	6	98	5	91	1	13	0	0	0	1	17
2022	4.46%	7	149	6	104	5	96	1	13	0	0	0	1	17
2023	4.46%	7	156	6	109	5	101	1	13	0	0	0	1	18
2024	4.46%	7	164	6	115	5	107	1	13	0	0	0	1	19
2025	2.23%	4	167	6	121	5	112	(1)	13	0	0	0	(1)	18
2026	0.00%	0	167	6	127	5	117	(2)	13	0	0	0	(2)	16
2027	0.00%	0	167	6	132	5	123	(2)	13	0	0	0	(2)	14
2028	0.00%	0	167	6	138	5	128	(2)	13	0	0	0	(2)	12
2029	0.00%	0	167	6	144	5	133	(2)	13	0	0	0	(2)	10
2030	0.00%	0	167	6	150	5	139	(2)	13	0	0	0	(2)	8
2031	0.00%	0	167	6	155	5	144	(2)	13	0	0	0	(2)	6
2032	0.00%	0	167	6	161	5	149	(2)	13	0	0	0	(2)	4
2033	0.00%	0	167	6	167	5	155	(2)	13	0	0	0	(2)	2
2034	0.00%	0	167	6	173	5	160	(2)	13	0	0	0	(2)	0

SALVAGE / REMOVAL COST	0.00
YEAR SALVAGE / COST OF REMOVAL	2029
DEFERRED TAXES DURING CONSTRUCTION (SEE PAGE 5)	(3)
TOTAL EQUITY AFUDC CAPITALIZED (SEE PAGE 5)	13
BOOK DEPR RATE - 1/USEFUL LIFE	3.33%

DEFERRED TAX AND MID-YEAR RATE BASE CALCULATION  
 PROGRAM METHOD SELECTED: REV\_REQ  
 PROGRAM NAI Gas Water Heater w/1000 participants in 2000

(1)	(2)	(3)	(4)	(5)	(5a)*	(5b)*	(6)	(7)	(8)
YEAR	TAX DEPRECIATION SCHEDULE	TAX DEPRECIATION \$(000)	DEFERRED TAX \$(000)	END OF YEAR NET PLANT IN SERVICE \$(000)	ACCUMULATED DEPRECIATION \$(000)	ACCUMULATED DEF TAXES \$(000)	BEGINNING YEAR RATE BASE \$(000)	ENDING OF YEAR RATE BASE \$(000)	MID-YEAR RATE BASE \$(000)
2005	3.75%	6	0	167	6	(3)	175	169	172
2006	7.22%	12	3	161	12	0	169	161	165
2007	6.68%	11	2	155	17	2	161	153	157
2008	6.18%	10	2	150	23	4	153	145	149
2009	5.71%	10	2	144	29	6	145	138	142
2010	5.29%	9	1	138	35	7	138	131	134
2011	4.89%	8	1	132	40	8	131	124	127
2012	4.52%	8	1	127	46	9	124	117	121
2013	4.46%	7	1	121	52	10	117	111	114
2014	4.46%	7	1	115	58	11	111	104	107
2015	4.46%	7	1	109	63	12	104	98	101
2016	4.46%	7	1	104	69	13	98	91	94
2017	4.46%	7	1	98	75	13	91	84	88
2018	4.46%	7	1	92	81	14	84	78	81
2019	4.46%	7	1	86	86	15	78	71	75
2020	4.46%	7	1	81	92	16	71	65	68
2021	4.46%	7	1	75	98	17	65	58	61
2022	4.46%	7	1	69	104	17	58	52	55
2023	4.46%	7	1	63	109	18	52	45	48
2024	4.46%	7	1	58	115	19	45	38	42
2025	2.23%	4	(1)	52	121	18	38	33	36
2026	0.00%	0	(2)	46	127	16	33	30	31
2027	0.00%	0	(2)	40	132	14	30	26	28
2028	0.00%	0	(2)	35	138	12	26	22	24
2029	0.00%	0	(2)	29	144	10	22	18	20
2030	0.00%	0	(2)	23	150	8	18	15	17
2031	0.00%	0	(2)	17	155	6	15	11	13
2032	0.00%	0	(2)	12	161	4	11	7	9
2033	0.00%	0	(2)	6	167	2	7	4	6
2034	0.00%	0	(2)	(0)	173	0	4	0	2

\* Column not specified in workbook

(1) YEAR	(2) NO. YEARS BEFORE IN-SERVICE	(3) PLANT ESCALATION RATE	(4) CUMULATIVE ESCALATION FACTOR	(5) YEARLY EXPENDITURE (%)	(6) ANNUAL SPENDING (\$/kW)	(7) CUMULATIVE AVERAGE SPENDING (\$/kW)
1998	-7	0.00%	1.000	0.00%	0.00	0.00
1999	-6	1.78%	1.018	0.00%	0.00	0.00
2000	-5	1.53%	1.033	0.32%	1.72	0.88
2001	-4	2.64%	1.061	0.65%	3.58	3.51
2002	-3	2.62%	1.088	13.85%	78.24	44.42
2003	-2	2.28%	1.113	35.34%	204.20	185.63
2004	-1	2.27%	1.139	49.84%	294.50	434.98

100.00% 582.24

(8) NO. YEARS BEFORE IN-SERVICE	(8a)* CUMULATIVE SPENDING WITH AFUDC (\$/kW)	(8b)* DEBT AFUDC (\$/kW)	(8b)* CUMULATIVE DEBT AFUDC (\$/kW)	(9) YEARLY TOTAL AFUDC (\$/kW)	(9a)* CUMULATIVE TOTAL AFUDC (\$/kW)	(9b)* CONSTRUCTION PERIOD INTEREST (\$/kW)	(9c)* CUMULATIVE CPI (\$/kW)	(9d)* DEFERRED TAXES (\$/kW)	(9e)* CUMULATIVE DEFERRED TAXES (\$/kW)	(10) INCREMENTAL YEAR-END BOOK VALUE (\$/kW)	(11) CUMULATIVE YEAR-END BOOK VALUE (\$/kW)
1998	-7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1999	-6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2000	-5	0.86	0.03	0.03	0.09	0.07	0.07	(0.01)	(0.01)	1.80	1.80
2001	-4	3.59	0.12	0.15	0.37	0.46	0.34	(0.06)	(0.07)	3.95	5.75
2002	-3	44.88	1.54	1.69	4.63	3.40	3.74	(0.72)	(0.79)	82.87	88.62
2003	-2	190.72	6.55	8.24	19.72	24.80	14.39	(3.03)	(3.82)	223.91	312.54
2004	-1	459.79	15.86	24.09	47.73	72.53	34.44	(7.17)	(10.98)	342.23	654.77

24.09

72.53

52.57

(10.98)

654.77

IN SERVICE YEAR 2005  
PLANT COSTS 519  
AFUDC RATE 10.30%

	BOOK BASIS		
	BOOK BASIS	FOR DEF TAX	TAX BASIS
CONSTRUCTION CASH	153	153	153
EQUITY AFUDC	13		
DEBT AFUDC	6	6	
CPI			14
<b>TOTAL</b>	<b>173</b>	<b>160</b>	<b>167</b>

\* Column not specified in workbook

INPUT DATA – PART 2  
 PROGRAM METHOD SELECTED : REV\_REQ  
 PROGRAM NAME Gas Water Heater w/1000 participants in 2000

(1)	(2)	(3)	(4)	(5)	(6)*	(7)	(8)	(9)
YEAR	CUMULATIVE TOTAL PARTICIPATING CUSTOMERS	ADJUSTED CUMULATIVE PARTICIPATING CUSTOMERS	UTILITY AVERAGE SYSTEM FUEL COST (C/kWh)	AVOIDED MARGINAL FUEL COST (C/kWh)	INCREASED MARGINAL FUEL COST (C/kWh)	REPLACEMENT FUEL COST (C/kWh)	PROGRAM kW EFFECTIVENESS FACTOR	PROGRAM kWh EFFECTIVENESS FACTOR
1998	0	0	2.00	2.00	4.01	0.00	1.00	1.00
1999	0	0	2.23	2.23	3.92	0.00	1.00	1.00
2000	1,000	1,000	2.45	2.45	4.75	0.00	1.00	1.00
2001	1,000	1,000	2.73	2.73	5.52	0.00	1.00	1.00
2002	1,000	1,000	2.61	2.61	3.63	0.00	1.00	1.00
2003	1,000	1,000	2.60	2.60	3.97	0.00	1.00	1.00
2004	1,000	1,000	2.78	2.78	4.48	0.00	1.00	1.00
2005	1,000	1,000	2.93	2.93	5.33	3.25	1.00	1.00
2006	1,000	1,000	3.01	3.01	5.42	3.34	1.00	1.00
2007	1,000	1,000	3.13	3.13	6.29	3.49	1.00	1.00
2008	1,000	1,000	3.07	3.07	5.47	3.45	1.00	1.00
2009	1,000	1,000	3.15	3.15	5.57	3.60	1.00	1.00
2010	1,000	1,000	3.14	3.14	6.05	3.57	1.00	1.00
2011	1,000	1,000	3.32	3.32	6.31	3.71	1.00	1.00
2012	1,000	1,000	3.38	3.38	6.42	3.77	1.00	1.00
2013	1,000	1,000	3.47	3.47	6.48	3.84	1.00	1.00
2014	1,000	1,000	3.55	3.55	6.62	3.92	1.00	1.00
2015	1,000	1,000	3.58	3.58	6.63	3.95	1.00	1.00
2016	1,000	1,000	3.62	3.62	6.58	4.00	1.00	1.00
2017	1,000	1,000	3.75	3.75	7.54	4.13	1.00	1.00
2018	1,000	1,000	3.93	3.93	8.80	4.35	1.00	1.00
2019	1,000	1,000	4.09	4.09	10.25	4.55	1.00	1.00
2020	1,000	1,000	4.23	4.23	10.47	4.79	1.00	1.00
2021	1,000	1,000	4.32	4.32	10.81	4.88	1.00	1.00
2022	1,000	1,000	4.41	4.41	11.31	4.97	1.00	1.00
2023	1,000	1,000	4.53	4.53	11.92	5.10	1.00	1.00
2024	1,000	1,000	4.64	4.64	12.54	5.23	1.00	1.00

\* THIS COLUMN IS USED ONLY FOR LOAD SHIFTING PROGRAMS WHICH SHIFT CONSUMPTION TO OFF-PEAK PERIODS.  
 THE VALUES REPRESENT THE OFF PEAK SYSTEM FUEL COSTS.

AVOIDED GENERATING BENEFITS  
 PROGRAM METHOD SELECTED: REV\_REQ  
 PROGRAM NAME Gas Water Heater w/1000 participants in 2000

YEAR	(2) AVOIDED GEN UNIT CAPACITY COS \$(000)	(3) AVOIDED GEN UNIT FIXED O&M \$(000)	(4) AVOIDED GEN UNIT VARIABLE O&N \$(000)	(5) AVOIDED GEN UNIT FUEL COST \$(000)	(6) REPLACEMENT FUEL COST \$(000)	(7) AVOIDED GEN UNIT BENEFITS \$(000)
1998	0	0	0	0	0	0
1999	0	0	0	0	0	0
2000	0	0	0	0	0	0
2001	0	0	0	0	0	0
2002	0	0	0	0	0	0
2003	0	0	0	0	0	0
2004	0	0	0	0	0	0
2005	34	12	2	48	68	25
2006	33	13	2	48	72	22
2007	31	13	2	49	76	19
2008	30	14	2	50	75	20
2009	29	14	2	50	78	17
2010	28	15	2	48	74	19
2011	27	15	2	49	77	16
2012	26	16	2	51	79	16
2013	25	17	2	52	79	17
2014	24	17	2	54	80	17
2015	23	18	2	55	81	17
2016	22	19	2	56	81	18
2017	21	19	2	57	84	18
2018	20	20	2	59	89	13
2019	19	21	2	61	94	10
2020	18	22	3	63	99	7
2021	17	23	3	64	100	7
2022	16	24	3	66	102	6
2023	15	24	3	74	105	12
2024	15	25	3	74	107	10

NOM	476	359	44	1,124	1,700	304
NPV	145	88	11	288	437	94



AVOIDED T&D AND PROGRAM FUEL SAVINGS  
 PROGRAM METHOD SELECTED: REV\_REQ  
 PROGRAM NAME Gas Water Heater w/1000 participants in 2000

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(8a)*
YEAR	AVOIDED TRANSMISSION CAP COST \$(000)	AVOIDED TRANSMISSION O&M COST \$(000)	TOTAL AVOIDED TRANSMISSION COST \$(000)	AVOIDED DISTRIBUTION CAP COST \$(000)	AVOIDED DISTRIBUTION O&M COST \$(000)	TOTAL AVOIDED DISTRIBUTION COST \$(000)	PROGRAM FUEL SAVINGS \$(000)	PROGRAM OFF-PEAK PAYBACK \$(000)
1998	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	24	0
2001	3	1	4	2	4	6	55	0
2002	3	1	4	2	4	6	52	0
2003	3	1	4	2	4	6	52	0
2004	3	1	4	2	4	6	55	0
2005	3	1	4	2	4	6	59	0
2006	3	1	4	2	4	6	60	0
2007	3	1	4	2	4	6	63	0
2008	3	1	4	2	5	6	61	0
2009	3	1	4	2	5	6	63	0
2010	2	1	4	2	5	7	63	0
2011	2	1	4	2	5	7	66	0
2012	2	1	3	1	5	7	68	0
2013	2	1	3	1	6	7	69	0
2014	2	1	3	1	6	7	71	0
2015	2	1	3	1	6	7	72	0
2016	2	1	3	1	6	8	72	0
2017	2	2	3	1	7	8	75	0
2018	2	2	3	1	7	8	79	0
2019	2	2	3	1	7	8	82	0
2020	1	2	3	1	7	8	85	0
2021	1	2	3	1	8	9	86	0
2022	1	2	3	1	8	9	88	0
2023	1	2	3	1	8	9	91	0
2024	1	2	3	1	9	9	93	0

NOM.	53	32	85	34	138	172	1,703	0
NPV	21	9	31	14	40	54	540	0

\* THESE VALUES REPRESENT THE COST OF THE INCREASED FUEL CONSUMPTION DUE TO GREATER OFF-PEAK ENERGY USAGE. USED FOR LOAD SHIFTING PROGRAMS ONLY.

TOTAL RESOURCE COST TEST  
 PROGRAM METHOD SELECTED: REV\_REQ  
 PROGRAM NAME Gas Water Heater w/1000 participants in 2000

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
YEAR	INCREASED SUPPLY COSTS \$(000)	UTILITY PROGRAM COSTS \$(000)	PARTICIPANT PROGRAM COSTS \$(000)	OTHER COSTS \$(000)	TOTAL COSTS \$(000)	AVOIDED GEN UNIT BENEFITS \$(000)	AVOIDED T&D BENEFITS \$(000)	PROGRAM FUEL SAVINGS \$(000)	OTHER BENEFITS \$(000)	TOTAL BENEFITS \$(000)	NET BENEFITS \$(000)	CUMULATIVE DISCOUNTED NET BENEFITS \$(000)
1998	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	22	117	0	139	0	0	24	0	24	(115)	(97)
2001	0	0	199	0	199	0	10	55	0	65	(134)	(201)
2002	0	0	204	0	204	0	10	52	0	62	(142)	(301)
2003	0	0	210	0	210	0	10	52	0	62	(148)	(398)
2004	0	0	215	0	215	0	10	55	0	65	(150)	(487)
2005	0	0	221	0	221	25	10	59	0	93	(128)	(557)
2006	0	0	227	0	227	22	10	60	0	93	(134)	(625)
2007	0	0	233	0	233	19	10	63	0	92	(142)	(690)
2008	0	0	240	0	240	20	10	61	0	91	(148)	(753)
2009	0	0	246	0	246	17	10	63	0	90	(156)	(814)
2010	0	0	253	0	253	19	10	63	0	92	(161)	(871)
2011	0	0	260	0	260	16	10	66	0	93	(168)	(926)
2012	0	0	268	0	268	16	10	68	0	94	(174)	(978)
2013	0	0	276	0	276	17	10	69	0	96	(179)	(1,028)
2014	0	0	284	0	284	17	11	71	0	98	(185)	(1,074)
2015	0	33	322	0	355	17	11	72	0	100	(256)	(1,134)
2016	0	0	300	0	300	18	11	72	0	101	(200)	(1,176)
2017	0	0	309	0	309	16	11	75	0	102	(207)	(1,217)
2018	0	0	318	0	318	13	11	79	0	103	(215)	(1,255)
2019	0	0	327	0	327	10	11	82	0	103	(224)	(1,292)
2020	0	0	337	0	337	7	11	85	0	103	(234)	(1,327)
2021	0	0	347	0	347	7	12	86	0	104	(242)	(1,361)
2022	0	0	357	0	357	6	12	88	0	106	(250)	(1,393)
2023	0	0	367	0	367	12	12	91	0	115	(252)	(1,422)
2024	0	0	378	0	378	10	13	93	0	115	(263)	(1,450)

NOM	0	55	6,816	0	6,871	304	257	1,703	0	2,263	(4,608)
NPV	0	26	2,143	0	2,170	94	85	540	0	719	(1,450)

Discount Rate: 8.98 %  
 Benefit/Cost Ratio (Col(11) / Col(6)) : 0.33

PARTICIPANT COSTS AND BENEFITS  
 PROGRAM METHOD SELECTED: REV\_REQ  
 PROGRAM NAME Gas Water Heater w/1000 participants in 2000

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
YEAR	SAVINGS IN PARTICIPANTS BILLS \$(000)	TAX CREDITS \$(000)	UTILITY REBATES \$(000)	OTHER BENEFITS \$(000)	TOTAL BENEFITS \$(000)	CUSTOMER EQUIPMENT COSTS \$(000)	CUSTOMER O&M COSTS \$(000)	OTHER COSTS \$(000)	TOTAL COSTS \$(000)	NET BENEFITS \$(000)	CUMULATIVE DISCOUNTED NET BENEFITS \$(000)
1998	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0
2000	113	0	122	0	235	20	97	0	117	118	99
2001	228	0	0	0	228	0	199	0	199	29	121
2002	227	0	0	0	227	0	204	0	204	23	137
2003	231	0	0	0	231	0	210	0	210	21	151
2004	231	0	0	0	231	0	215	0	215	16	161
2005	234	0	0	0	234	0	221	0	221	13	168
2006	233	0	0	0	233	0	227	0	227	6	171
2007	235	0	0	0	235	0	233	0	233	1	171
2008	236	0	0	0	236	0	240	0	240	(4)	170
2009	235	0	0	0	235	0	246	0	246	(11)	165
2010	241	0	0	0	241	0	253	0	253	(13)	161
2011	241	0	0	0	241	0	260	0	260	(20)	154
2012	243	0	0	0	243	0	268	0	268	(25)	147
2013	244	0	0	0	244	0	276	0	276	(32)	138
2014	247	0	0	0	247	0	284	0	284	(37)	129
2015	248	0	122	0	370	30	292	0	322	48	140
2016	250	0	0	0	250	0	300	0	300	(50)	129
2017	251	0	0	0	251	0	309	0	309	(59)	118
2018	252	0	0	0	252	0	318	0	318	(66)	106
2019	254	0	0	0	254	0	327	0	327	(74)	94
2020	255	0	0	0	255	0	337	0	337	(81)	82
2021	257	0	0	0	257	0	347	0	347	(90)	69
2022	259	0	0	0	259	0	357	0	357	(98)	57
2023	260	0	0	0	260	0	367	0	367	(107)	44
2024	262	0	0	0	262	0	378	0	378	(116)	32
NOM	5,966	0	244	0	6,210	50	6,766	0	6,816	(606)	
NPV	2,044	0	131	0	2,175	24	2,119	0	2,143	32	

In Service of Gen Unit: 2005  
 Discount Rate : 8.98 %  
 Benefit/Cost Ratio ( Col(6) / Col(10)) 1.01

RATE IMPACT TEST  
 PROGRAM METHOD SELECTED: REV\_REQ  
 PROGRAM NAME Gas Water Heater w/1000 participants in 2000

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
YEAR	INCREASED SUPPLY COSTS \$(000)	UTILITY PROGRAM COSTS \$(000)	INCENTIVES \$(000)	REVENUE LOSSES \$(000)	OTHER COSTS \$(000)	TOTAL COSTS \$(000)	AVOIDED GEN UNIT & FUEL BENEFITS \$(000)	AVOIDED T&D BENEFITS \$(000)	REVENUE GAINS \$(000)	OTHER BENEFITS \$(000)	TOTAL BENEFITS \$(000)	NET BENEFITS \$(000)	CUMULATIVE DISCOUNTED NET BENEFITS \$(000)
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	22	122	69	0	213	24	0	0	0	24	(188)	(159)
2001	0	0	0	139	0	139	55	10	0	0	65	(74)	(216)
2002	0	0	0	139	0	139	52	10	0	0	62	(77)	(270)
2003	0	0	0	141	0	141	52	10	0	0	62	(79)	(322)
2004	0	0	0	141	0	141	55	10	0	0	65	(76)	(367)
2005	0	0	0	143	0	143	83	10	0	0	93	(49)	(394)
2006	0	0	0	142	0	142	83	10	0	0	93	(50)	(419)
2007	0	0	0	143	0	143	82	10	0	0	92	(52)	(443)
2008	0	0	0	144	0	144	81	10	0	0	91	(52)	(465)
2009	0	0	0	144	0	144	80	10	0	0	90	(53)	(486)
2010	0	0	0	147	0	147	82	10	0	0	92	(55)	(505)
2011	0	0	0	147	0	147	82	10	0	0	93	(54)	(523)
2012	0	0	0	148	0	148	84	10	0	0	94	(54)	(539)
2013	0	0	0	149	0	149	86	10	0	0	96	(52)	(554)
2014	0	0	0	151	0	151	88	11	0	0	98	(52)	(567)
2015	0	33	122	152	0	307	89	11	0	0	100	(207)	(615)
2016	0	0	0	153	0	153	90	11	0	0	101	(52)	(626)
2017	0	0	0	153	0	153	91	11	0	0	102	(51)	(636)
2018	0	0	0	154	0	154	92	11	0	0	103	(51)	(645)
2019	0	0	0	155	0	155	92	11	0	0	103	(52)	(653)
2020	0	0	0	156	0	156	92	11	0	0	103	(53)	(661)
2021	0	0	0	157	0	157	93	12	0	0	104	(52)	(669)
2022	0	0	0	158	0	158	94	12	0	0	106	(51)	(675)
2023	0	0	0	159	0	159	103	12	0	0	115	(44)	(680)
2024	0	0	0	160	0	160	102	13	0	0	115	(45)	(685)

NOM.	0	55	244	3,639	0	3,939	2,006	257	0	0	2,263	(1,676)
NPV	0	26	131	1,247	0	1,404	635	85	0	0	719	(685)

Discount Rate 8.98 %  
 Benefit/Cost Ratio (Col(12) / Col(7)) : 0.51



**FPL**

Natural Gas End-Use Technology R&D Plan

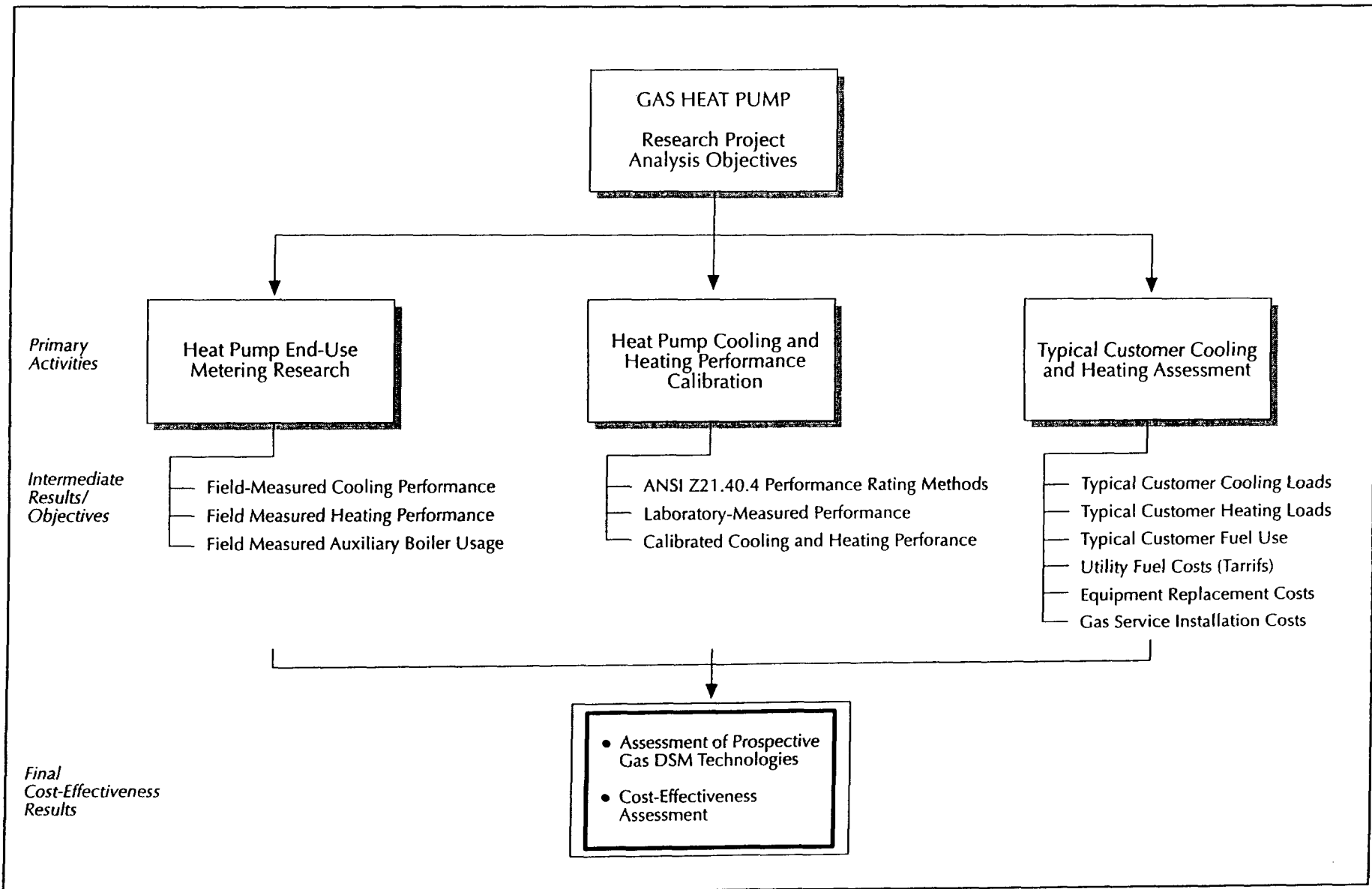
Gas Heat Pump Research Project

Research Findings

Florida Power & Light  
June 1999

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**Exhibit 1**  
**Overview of the FPL Natural Gas Heat Pump Research Project**  
**Analysis Objectives**



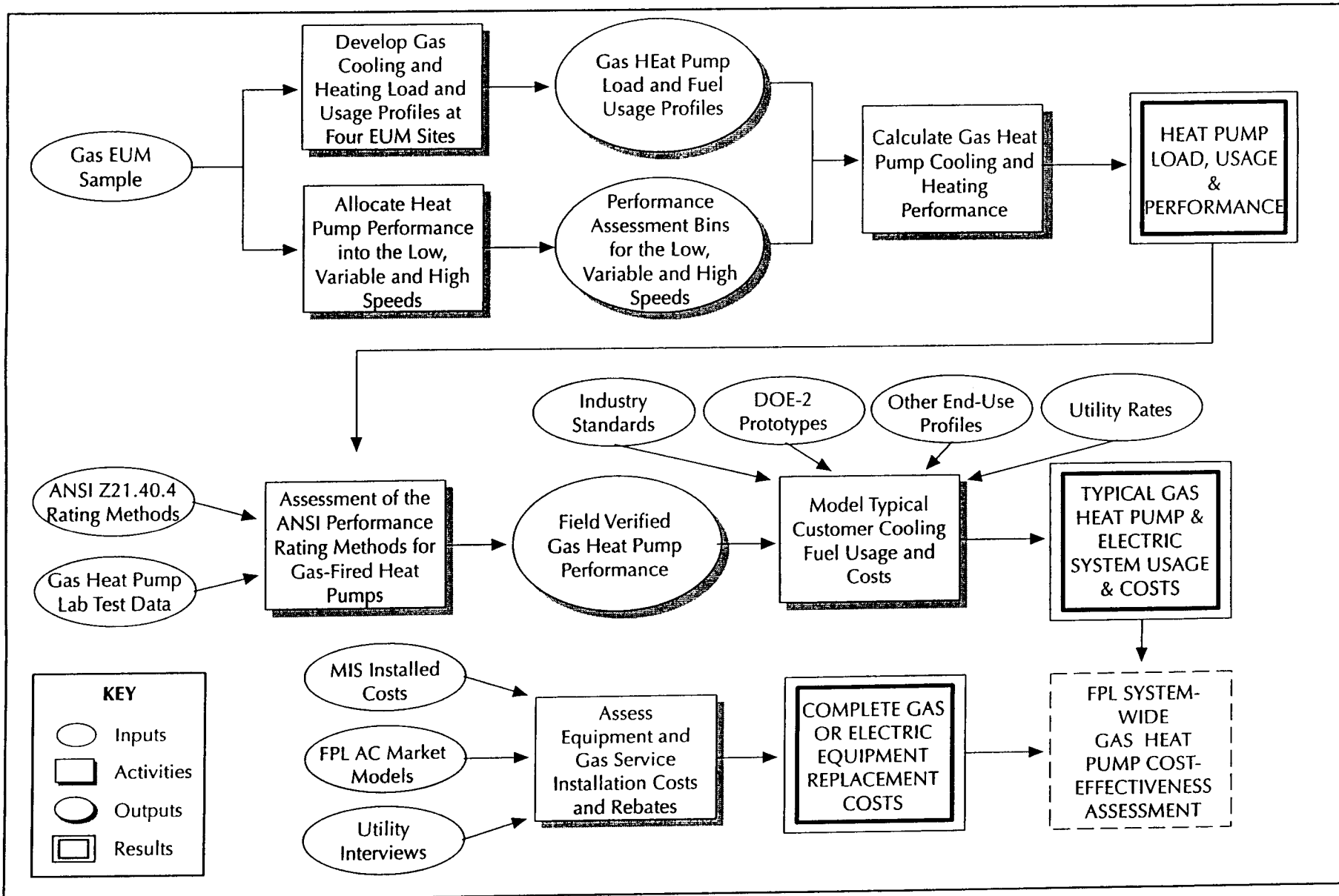
**RESULTS OF THE FLORIDA POWER AND LIGHT (FPL) NATURAL GAS (GAS) HEAT PUMP RESEARCH PROJECT ARE PRESENTED IN THIS REPORT.**

- This report describes the research approach through a presentation of the primary analysis activities and data sources.
- First the methods from the heat pump end-use metering (EUM) assessment are presented. This assessment consists of an in-depth analysis of heat pump loads and gas/electric consumption, measured using the FPL gas research EUM sample.
- Then the gas heat pump cooling and heating performance assessment is described, comparing the ANSI Z21.40.4<sup>1</sup> equipment performance ratings with field-measured performance.
- Next typical customer cooling and heating usage profiles using FPL evaluation sources are developed, and integrated comparisons of the cost to install and operate gas and competing electric technologies are made for several customer segments.

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<sup>1</sup> The American National Standard Institute's Performance Testing and Rating System for Gas-Fired Air-Conditioning and Heat Pumping Appliances, 1994.

**Exhibit 2**  
**Analysis Steps Supporting the FPL Gas Heat Pump Research Project**



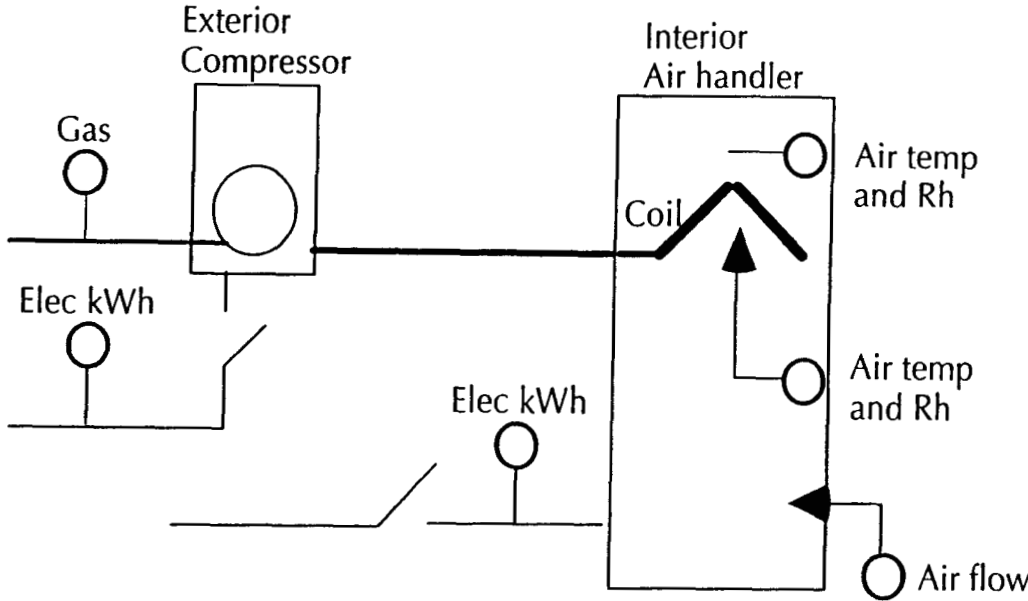


**THE PURPOSE OF THIS PROJECT IS TO ASSESS THE FEASIBILITY OF GAS APPLIANCE FUEL SWITCHING IN FPL SERVICE TERRITORY, BY DEVELOPING THE BEST AVAILABLE ESTIMATES OF CUSTOMER PAYBACK AND COST-EFFECTIVENESS FOR AVAILABLE TECHNOLOGIES IN THE FLORIDA MARKET.**

- The methods incorporate the costs to purchase and install new cooling and heating equipment (including the costs to obtain gas utility service), equipment rebates that are offered by FPL and the Florida gas utilities, monthly gas and electric usage, FPL system peak hour electric demand, and electric and gas utility rates.
- The end product supports an FPL service-territory specific cost-effectiveness assessment for all stakeholders, to identify new DSM technologies.
- As illustrated in the facing exhibit, three primary objectives were identified at the outset of this project to ensure a successful assessment of gas heat pump fuel switching opportunities.
  - **Heat Pump EUM Research.** Four gas heat pump sites were monitored and analyzed to determine cooling and heating loads and the corresponding gas and electric fuel usage. The ratio of load to fuel use describes the efficiency (or performance) of gas-fired heat pumping appliances.
  - **Gas Heat Pump Cooling and Heating Performance Assessment.** The above heat pump load and fuel usage profiles are used to support heat pump cooling and heating performance calibration.
  - **Typical Customer Cooling and Heating Assessment.** Typical customer cooling and heating loads (and gas and electricity use estimates) are derived for the gas heat pump and competing electric technologies, for single-family detached homes, by Department of Community Affairs (DCA) climate. The integration of these estimates with utility rates and equipment costs is used to evaluate the economic feasibility of gas heat pump fuel switching.

**CUSTOMER-BASED COST-EFFECTIVENESS RESULTS ARE PROVIDED AT THE CONCLUSION OF THIS REPORT.**

**Exhibit 3  
 Monitoring Approach**



Channel Description	Description of Units Measured	Sensor Information				Recorder Information		
		Description	Manufacturer	Actual Quantity Measured	Sensor Accuracy	Transition Resolution	Estimated Maximum Demand Rate	Estimated Minimum Demand Rate
Gas Input	Btu	Diaphragm Meter	Equimeter	Cubic Feet of Gas	± 2%	500 Btu	125,000 Btuh	13,000
Air Handler Electric Input	kWh	Virtual kWh Transducer	Synergistic	kW	± 3%	NA	0.42 kW	0.18 kW
Auxilliary Condenser Electric Input	kWh	Virtual kWh Transducer	Synergistic	kW	± 3%	NA	0.21 kW	0.10 kW
Gas Run Time	Seconds	Runtime Relay	Guardian	Runtime Seconds	1 second	1 second	NA	NA
Indoor Fan Air Flow	CFM	Anemometer	TSI	Feet/Minute	± 5%	NA	NA	NA
Return Air Dry Bulb Temperature	°F	Temperature Sensor	Hycal	Air Temperature	± 2°F	NA	NA	NA
Return Air Relative Humidity	% Saturated	Humidity Sensor	Hycal	Relative Humidity	± 2%	NA	NA	NA
Supply Air Dry Bulb Temperature	°F	Temperature Sensor	Hycal	Air Temperature	± 2°F	NA	NA	NA
Supply Air Relative Humidity	% Saturated	Humidity Sensor	Hycal	Relative Humidity	± 2%	NA	NA	NA

**GAS HEAT PUMP METERING EQUIPMENT WAS INSTALLED IN THIS RESEARCH EFFORT IN ORDER TO VERIFY GAS EQUIPMENT PERFORMANCE IN THE FLORIDA CLIMATE (WHERE THE COOLING SEASON IS EXTENSIVE AND HEATING USAGE IS VERY LIMITED).**

The facing exhibit shows the monitoring approach used to measure heat pump gas use, electricity usage and cooling and heating loads at four customer sites.

- The monitoring points shown support a continuous assessment of gas cooling and heating efficiency (or performance) throughout the 16-month monitoring period.
- There are two components of performance measurement: the input or fuel use for a particular interval, and the output or cooling/heating load delivered by the system.
  - To ensure a complete assessment of the fuel usage at each site, the following data points were obtained:
    - .. Outdoor unit gas consumption
    - .. Outdoor unit electric consumption
    - .. Indoor unit (air handler) electric consumption
  - The cooling and heating loads (output) were measured indirectly, using the following data points gathered at five-minute intervals:
    - .. Air temperature and humidity of the return air (before the cooling coil)
    - .. Air temperature and humidity of the supply air (after the cooling coil)
    - .. Air flow across the coil
    - .. Gas valve position (runtime)
    - .. Reversing valve position (to determine cooling/heating mode)
- Following the monitoring effort, two customers were given the option to either keep or replace their gas heat pump at FPL's expense. Both customers replaced the gas heat pump with an electric heat pump.

**METHODS AND RESULTS USED TO ASSESS FIELD MEASURED PERFORMANCE ARE PRESENTED NEXT.**

**Exhibit 4**  
**York Triathlon Performance Data**  
**In Accordance with the ANSI Z21.40.4 Rating Requirements**

Outdoor Temperature (°F)	Gas Input Rate (Unit Speed)	Cooling Performance Parameters for a Variable Speed Air-Source GHP		
		Cooling Output (kBtuh)	Gas Input (kBtuh)	Electric Input (kW)
82	Low (1)	22.9	14.8	0.29
67	Low (1)	24.3	13.5	0.29
87	Intermediate	31.0	23.9	0.39
95	High (2)	38.9	41.6	0.54
82	High (2)	40.4	39.6	0.54

Cooling cyclic degradation = 0.25.

Outdoor Temperature (°F)	Gas Input Rate (Unit Speed)	Type of Test	Heating Performance Parameters for a Variable Speed Air-Source GHP		
			Cooling Output (kBtuh)	Gas Input (kBtuh)	Electric Input (kW)
47	Low (1)	Steady-state	22.5	15.1	0.28
35	Low (1)	Frost Accumulation	19.1	15.0	0.28
17	Low (1)	Steady-state	13.8	13.8	0.32
17	Intermediate	Steady-state	23.5	21.1	0.39
35	High (2)	Frost Accumulation	40.5	34.2	0.51
17	High (2)	Steady-state	34.4	31.7	0.54
7	High (2)	Steady-state	30.6	30.5	0.63

Heating cyclic degradation = 0.25.

Defrost control factor = 1.0.

Auxilliary heater efficiency = 82%.

**UNTIL VERY RECENTLY, THE ONLY RESIDENTIAL GAS HEAT PUMP COMMERCIALY AVAILABLE IN THE UNITED STATES WAS THE YORK 3-TON TRIATHLON MODEL. HOWEVER, THE TRIATHLON MODEL IS NO LONGER BEING SOLD OR MANUFACTURED DUE TO ENGINE PROBLEMS.**

To circumvent the need to test the York Triathlon gas heat pump in a laboratory, York International was solicited for laboratory test results. The facing exhibit presents a summary of the laboratory performance data supplied by York in support of this research.

- The data received from York International fully supports the required tests under the ANSI Z21.40.4 testing and rating standard.
- The laboratory performance ratings were compared against field measured load and fuel consumption. The laboratory ratings were accepted in lieu of differences that exist between laboratory and field measurements, which suggested that field performance is not as desirable as the laboratory results suggest. This analytical decision gives the gas heat pump the “benefit of the doubt” with respect to its performance, and is consistent with the treatment of competing electric technologies (also based upon manufacturer equipment performance ratings).
- Equipment cooling and heating performance is independent of customer behavioral effects, which are captured in the typical customer cooling and heating load and usage assessment. Customer behavioral effects are captured using the vast FPL residential evaluation resources—most importantly, calibrated DOE-2 energy usage models and operating factor models for the cooling and heating end uses.

**TYPICAL CUSTOMER COOLING AND HEATING END-USE MODELING METHODS AND RESULTS ARE PRESENTED NEXT.**

**Exhibit 5**  
**DOE-2 Prototype Summary**

Home Characteristic	Prototype Description by DCA Climate		
	North	Central	South
Conditioned Floor Area (sqft)	1,559	1,559	1,559
Exposed Floor Type	Slab	Slab	Slab
Ceiling/Roof Area (sqft)	1,559	1,559	1,559
Ceiling/Roof R-Value (Ft <sup>2</sup> hr °F/Btu)	15	15	14
Average Ceiling Height	8	8	8
Concrete Block Gross Wall Area (sqft)	1,366	1,366	1,562
Block Wall U-Value (Btu/Ft <sup>2</sup> hr °F)	0.167	0.167	0.167
Framed Wall Gross Area (sqft)	114	114	42
Framed Wall U-Value (Btu/Ft <sup>2</sup> hr °F)	0.098	0.098	0.098
Glass Shading Coefficient (summer)	0.57	0.57	0.57
Glass Shading Coefficient (winter)	0.67	0.67	0.67
Glass Area (sqft)	222	222	232
Door Area (sqft)	30	30	30
System Cooling Capacity (tons)	3	3	3
Maximum No. of Occupants	3	3	3
Cooling Thermostat Setting	77 - 78	76	77 - 78
Heating Thermostat Setting	71 - 73	73 - 75	75

**PROTOTYPE DOE-2 MODELS GENERATED FOR USE IN DSM EVALUATION ACTIVITIES ARE PRESENTED IN THE FACING EXHIBIT. THESE REGION-SPECIFIC MODELS ARE USED TO ESTIMATE COOLING AND HEATING LOADS WITHIN A PARTICULAR CLIMATE, FOR BOTH COMPETING ELECTRIC AND GAS HEAT PUMP SYSTEMS.**

- The prototypes described in the facing exhibit were derived as part of previous FPL evaluation activities. They provide three single-family detached models, one for each of three primary weather stations used to model typical weather in FPL service territory.
  - The Daytona Beach, Vero Beach, and Miami weather stations are used to represent the Department of Community Affairs' (DCA's) North, Central, and South climates, respectively.
  - Although single-family attached and mobile home models are also available from these previous evaluations, all simulations and results were derived within the single-family detached housetype.
- Simulations using these prototypes, in conjunction with typical weather data, yield hourly operating estimates of cooling and heating loads for typical FPL customers.
  - Equipment performance characteristics are subsequently applied to these DOE-2 based loads, using an outdoor temperature bin model. The model conception and design is based upon the ANSI Z21.40.4 rating procedures, modified to estimate fuel use for both electric and gas appliances, while incorporating observed FPL weather and calibrated model-based, typical customer operating cooling and heating loads.
  - These operating estimates, however, require the application of operating factors to diversify them. Operating factors were previously developed for this purpose, based upon models that predict customer AC operation by daytype, hour, and observed ambient weather conditions.

**THE RESULTING FUEL USE ESTIMATES ARE USED IN THE CUSTOMER-BASED COST-EFFECTIVENESS ASSESSMENT.**

**Exhibit 6**  
**Gas Heat Pump and Competing Equipment**  
**Installed Costs and Maintenance Costs**  
**For Customers with Gas Water Heat**

DCA Climate	HVAC System Type	HVAC Installed Cost (\$)	Utility Rebate (\$)	Gas Connection Charge (\$)	Total Installed Cost (\$)	Incremental* Gas Heat Pump Installed Cost (\$)	Annual Maintenance Charge (\$)
North	Gas Heat Pump	9,595	890	-	8,705	-	240
	10 SEER AC w/ Strip Heat	2,200	-	-	2,200	6,505	80
	12 SEER AC w/ Strip Heat	2,844	155	-	2,689	6,016	80
	10 SEER HP	2,359	-	-	2,359	6,346	80
	12 SEER HP	3,050	182	-	2,868	5,837	80
Central	Gas Heat Pump	9,595	1,200	-	8,395	-	240
	10 SEER AC w/ Strip Heat	2,200	-	-	2,200	6,195	80
	12 SEER AC w/ Strip Heat	2,844	155	-	2,689	5,706	80
	10 SEER HP	2,359	-	-	2,359	6,036	80
	12 SEER HP	3,050	182	-	2,868	5,527	80
South	Gas Heat Pump	9,595	890	-	8,705	-	240
	10 SEER AC w/ Strip Heat	2,200	-	-	2,200	6,505	80
	12 SEER AC w/ Strip Heat	2,844	155	-	2,689	6,016	80
	10 SEER HP	2,359	-	-	2,359	6,346	80
	12 SEER HP	3,050	182	-	2,868	5,837	80

\* Incremental costs are in excess of costs for competing equipment, when a customer selects a gas heat pump.



GAS HEAT PUMP . . . CUSTOMER-BASED COST-EFFECTIVENESS . . . INSTALLED COST

**THE TOTAL INSTALLED COST OF A GAS HEAT PUMP IS AT LEAST THREE TIMES GREATER THAN THE COST OF A COMPETING ELECTRIC SYSTEM.**

In addition, annual maintenance costs for the gas heat pump are greater than those of competing systems, due largely to the annual "tune-up" that is needed for the gas heat pump engine.

**Exhibit 7**  
**Gas Heat Pump and Competing Equipment Operating Costs**  
**And Gas Heat Pump Savings and Payback**  
**For Customers with Gas Water Heat**

DCA Climate	HVAC System Type	Annual Natural Gas Use (Therms)	Annual Electricity Use (kWh)	Annual Electricity Impact* (kWh)	Summer Demand Impact* (kW)	Winter Demand Impact* (kW)	Annual Natural Gas Costs (\$)	Annual Electricity Costs (\$)	Annual Operating Costs (\$)	Annual Gas Heat Pump Utility Bill Savings (\$)	Simple Payback** (years)
North 6.5%	Gas Heat Pump	382	732	-	-	-	281	60	340	-	NA
	10 SEER AC w/ Strip Heat	-	7,876	7,144	2.29	6.15	-	650	650	310	43
	12 SEER AC w/ Strip Heat	-	7,143	6,411	1.88	6.15	-	589	589	249	68
	10 SEER HP	-	5,868	5,135	2.29	2.74	-	482	482	142	no payback
	12 SEER HP	-	5,076	4,343	1.88	2.62	-	416	416	76	no payback
Central 31.9%	Gas Heat Pump	427	822	-	-	-	384	67	451	-	NA
	10 SEER AC w/ Strip Heat	-	7,868	7,047	2.19	4.19	-	652	652	200	153
	12 SEER AC w/ Strip Heat	-	6,955	6,133	1.80	4.19	-	575	575	124	no payback
	10 SEER HP	-	6,587	5,765	2.19	1.63	-	544	544	93	no payback
	12 SEER HP	-	5,637	4,815	1.80	1.54	-	465	465	13	no payback
South 61.5%	Gas Heat Pump	453	870	-	-	-	327	71	398	-	NA
	10 SEER AC w/ Strip Heat	-	7,459	6,589	2.25	2.39	-	618	618	220	108
	12 SEER AC w/ Strip Heat	-	6,403	5,533	1.85	2.39	-	529	529	131	no payback
	10 SEER HP	-	7,014	6,144	2.25	0.76	-	580	580	183	280
	12 SEER HP	-	5,945	5,076	1.85	0.72	-	491	491	93	no payback
FPL System Weighted Average for SFD	Gas Heat Pump	439	845	-	-	-	342	69	411	-	NA
	10 SEER AC w/ Strip Heat	---	7,609	6,764	2.23	3.20	-	630	630	219	107
	12 SEER AC w/ Strip Heat	---	6,621	5,776	1.83	3.20	-	547	547	136	no payback
	10 SEER HP	---	6,796	5,952	2.23	1.16	-	562	562	151	no payback
	12 SEER HP	---	5,784	4,940	1.83	1.10	-	477	477	66	no payback

\* Impacts are the reduction in annual or peak hour usage for customers that fuel switch from a conventional air-conditioning and heating system to a gas heat pump.  
 \*\* Simple payback is calculated as the ratio of incremental first cost (investment) to annual savings.  
 For competing equipment and DCA climate combinations that have higher gas heat pump annual operating costs (including annual maintenance costs), payback for the gas heat pump investment cannot be achieved.

**HEAT PUMP END-USE RESEARCH RESULTS INDICATE THAT A SWITCH TO A GAS COOLING AND HEATING SYSTEM FROM ELECTRIC IS NOT CURRENTLY COST-EFFECTIVE TO THE PARTICIPANT, GIVEN THE REBATE LEVELS OFFERED BY THE GAS UTILITIES.**

As illustrated in the facing exhibit, gas heat pumps have a substantially higher first cost, but in most cases, lower monthly energy costs than do competing electric systems. However, the annual savings are dwarfed by the gas heat pump first cost, and certain electric heat pump equipment is cheaper to operate on an annual basis than the gas heat pump. For this reason, larger rebates would be required for gas heat pumps to be cost-effective from a customer's point of view.

- To emphasize how sizable the overall cost differences are between a gas heat pump and competing equipment, simple payback calculations were completed. These findings suggest that payback on the initial investment is achieved after a minimum of 43 years (when compared against a 10 SEER air conditioner with strip heat in the North DCA climate).
- These results are based on an assessment that assumes natural replacement customer actions, rather than discretionary retrofit. That is, it is assumed that a customer who is considering a fuel switch to gas will be replacing the air-conditioning and heating system, regardless of fuel choice.
- Where appropriate, costs include a \$20-25 connection fee to obtain gas service. Gas utility personnel who were interviewed indicated that actual costs to install gas service from the street to the house are normally \$600-\$750. However, customers are only responsible for the connection fee.

**THE FACING RESULTS ARE FOR CUSTOMERS WHO ALREADY OWN A GAS WATER HEATER WHEN THEY ELECT TO FUEL SWITCH TO A GAS HEAT PUMP. FOR CUSTOMERS WHO DO NOT OWN A GAS WATER HEATER AT THE TIME OF RETROFIT, THE COST-EFFECTIVENESS RESULTS ARE EVEN LESS FAVORABLE FOR THE GAS HEAT PUMP, PROVIDING A MINIMUM SIMPLE PAYBACK OF 112 YEARS (IN THE BEST CASE).**

**Exhibit 8**  
**Gas Heat Pump vs Competing Equipment Cost-Effectiveness**  
**Participant Test and Rate Impact Test**

Gas Technology	Competing Electric Technology	CASE 1			CASE 2		
		Participant Ratio	RIM Ratio	Participant Incentive Level	Participant Ratio	RIM Ratio	Participant Incentive Level
Gas Heat Pump	10 SEER AC w/ Strip Heat	1.01	0.432	\$6,100.00	0.53	1.0769	\$0.00
Gas Heat Pump	10 SEER HP	1.01	0.3801	\$6,241.00	0.47	1.0878	\$0.00

**HEAT PUMP END-USE RESEARCH RESULTS INDICATE THAT A SWITCH TO A GAS COOLING AND HEATING SYSTEM IS NOT CURRENTLY BENEFICIAL TO BOTH UTILITY AND THE PARTICIPANT GIVEN THE HIGH FIRST COSTS OF THE EQUIPMENT.**

As illustrated in the facing exhibit, gas heat pumps are not a cost-effective solution for the utility and the participant. In Case 1 the participant incentive level was set to ensure a participant ratio of 1.01 however, in that scenario the measure failed the RIM test with a ratio of .432. In Case 2 the participant incentive levels were set to \$0 in order to maximize the RIM ratio and while it passed the RIM test it didn't pass the Participants test with a ratio of 0.53.

The following CPF runs indicate that it is not possible for the technology of residential gas cooling and heating to be cost-effective for both the participant and the utility.

- **Res Gas Heat Pump vs 10 SEER AC** -- CPF run with 10 SEER Air Conditioning with Strip Heat as competing technology
- **Res Gas Heat Pump vs 10 SEER HP** -- CPF run with 10 SEER Heat Pump as competing technology



INPUT DATA – PART 1 CONTINUED  
PROGRAM METHOD SELECTED: REV\_REQ  
PROGRAM NAME: Gas HP vs 10 SEER HP w/1000 participants in 2000

I. PROGRAM DEMAND SAVINGS & LINE LOSSES

(1) CUSTOMER kW REDUCTION AT METER .....	2.07 kW
(2) GENERATOR kW REDUCTION PER CUSTOMER .....	2.66 kW
(3) kW LINE LOSS PERCENTAGE .....	9.01 %
(4) GENERATOR kWh REDUCTION PER CUSTOMER .....	6,401.4 kWh
(5) kWh LINE LOSS PERCENTAGE .....	7.02 %
(6) GROUP LINE LOSS MULTIPLIER.....	1.0000
(7) CUSTOMER kWh INCREASE AT METER .....	0.0 kWh

II. ECONOMIC LIFE & K FACTORS

(1) STUDY PERIOD FOR THE CONSERVATION PROGRAM .....	27 YEARS
(2) GENERATOR ECONOMIC LIFE .....	30 YEARS
(3) T&D ECONOMIC LIFE .....	35 YEARS
(4) K FACTOR FOR GENERATION .....	1.61524
(5) K FACTOR FOR T & D.....	1.46985

III. UTILITY & CUSTOMER COSTS

(1) UTILITY NON RECURRING COST PER CUSTOMER .....	*** \$/CUST
(2) UTILITY RECURRING COST PER CUSTOMER .....	*** \$/CUST
(3) UTILITY COST ESCALATION RATE .....	*** %**
(4) CUSTOMER EQUIPMENT COST .....	*** \$/CUST
(5) CUSTOMER EQUIPMENT ESCALATION RATE .....	*** %**
(6) CUSTOMER O & M COST .....	*** \$/CUST/YR
(7) CUSTOMER O & M COST ESCALATION RATE .....	*** %**
(8) INCREASED SUPPLY COSTS .....	*** \$/CUST/YR
(9) SUPPLY COSTS ESCALATION RATES.....	*** %**
(10) UTILITY DISCOUNT RATE .....	8.98 %
(11) UTILITY AFUDC RATE.....	10.30 %
(12) UTILITY NON RECURRING REBATE/INCENTIVE .....	*** \$/CUST
(13) UTILITY RECURRING REBATE/INCENTIVE .....	*** \$/CUST
(14) UTILITY REBATE/INCENTIVE ESCALATION RATE .....	*** %

IV. AVOIDED GENERATOR AND T&D COSTS

(1) BASE YEAR .....	1998
(2) IN-SERVICE YEAR FOR AVOIDED GENERATING UNIT .....	2005
(3) IN-SERVICE YEAR FOR AVOIDED T&D .....	2001-2005
(4) BASE YEAR AVOIDED GENERATING COST .....	519 \$/kW
(5) BASE YEAR AVOIDED TRANSMISSION COST .....	70 \$/kW
(6) BASE YEAR DISTRIBUTION COST .....	50 \$/kW
(7) GEN, TRAN & DIST COST ESCALATION RATE .....	1.78 %**
(8) GENERATOR FIXED O & M COST .....	35 \$/kW/YR
(9) GENERATOR FIXED O&M ESCALATION RATE .....	4.10 %**
(10) TRANSMISSION FIXED O & M COST .....	2.73 \$/kW
(11) DISTRIBUTION FIXED O & M COST .....	13.01 \$/kW
(12) T&D FIXED O&M ESCALATION RATE .....	4.10 %**
(13) AVOIDED GEN UNIT VARIABLE O & M COSTS .....	0.067 CENTS/kWh
(14) GENERATOR VARIABLE O&M COST ESCALATION RATE .....	2.70 %**
(15) GENERATOR CAPACITY FACTOR .....	91% ** (In-service year)
(16) AVOIDED GENERATING UNIT FUEL COST .....	2.17 CENTS PER kWh** (In-service y
(17) AVOIDED GEN UNIT FUEL COST ESCALATION RATE .....	1.75 %**

V. NON-FUEL ENERGY AND DEMAND CHARGES

(1) NON FUEL COST IN CUSTOMER BILL .....	*** CENTS/kWh
(2) NON-FUEL COST ESCALATION RATE .....	*** %
(3) DEMAND CHARGE IN CUSTOMER BILL .....	*** \$/kW/MO
(4) DEMAND CHARGE ESCALATION RATE .....	*** %

\* SUPPLEMENTAL INFORMATION NOT SPECIFIED IN WORKBOOK  
\*\* VALUE SHOWN IS FOR FIRST YEAR ONLY (VALUE VARIES OVER TIME)  
\*\*\* PROGRAM COST CALCULATION VALUES ARE SHOWN ON PAGE 2

\* INPUT DATA – PART 1 CONTINUED  
 PROGRAM METHOD SELECTED: REV\_REQ  
 PROGRAM NAME: Gas HP vs 10 SEER HP w/1000 participants in 2000

YEAR	(1) UTILITY PROGRAM COSTS WITHOUT INCENTIVES \$(000)	(2) UTILITY INCENTIVES \$(000)	(3) OTHER UTILITY COSTS \$(000)	(4) TOTAL UTILITY PROGRAM COSTS \$(000)	(5) ENERGY CHARGE REVENUE LOSSES \$(000)	(6) DEMAND CHARGE REVENUE LOSSES \$(000)	(7) PARTICIPANT EQUIPMENT COSTS \$(000)	(8) PARTICIPANT O&M COSTS \$(000)	(9) OTHER PARTICIPANT COSTS \$(000)	(10) TOTAL PARTICIPANT COSTS \$(000)
1998	0	0	0	0	0	0	0	0	0	
1999	0	0	0	0	0	0	0	0	0	
2000	22	6,700	0	6,722	220	0	6,583	265	6,847	
2001	0	0	0	0	445	0	0	543	543	
2002	0	0	0	0	445	0	0	557	557	
2003	0	0	0	0	451	0	0	572	572	
2004	0	0	0	0	452	0	0	587	587	
2005	0	0	0	0	457	0	0	603	603	
2006	0	0	0	0	456	0	0	619	619	
2007	0	0	0	0	458	0	0	636	636	
2008	0	0	0	0	460	0	0	654	654	
2009	0	0	0	0	460	0	0	672	672	
2010	0	0	0	0	471	0	0	691	691	
2011	0	0	0	0	470	0	0	710	710	
2012	0	0	0	0	474	0	0	731	731	
2013	31	6,700	0	6,731	477	0	9,352	752	10,105	
2014	0	0	0	0	483	0	0	774	774	
2015	0	0	0	0	485	0	0	797	797	
2016	0	0	0	0	489	0	0	820	820	
2017	0	0	0	0	490	0	0	843	843	
2018	0	0	0	0	493	0	0	868	868	
2019	0	0	0	0	496	0	0	893	893	
2020	0	0	0	0	499	0	0	919	919	
2021	0	0	0	0	502	0	0	946	946	
2022	0	0	0	0	505	0	0	973	973	
2023	0	0	0	0	509	0	0	1,001	1,001	
2024	0	0	0	0	512	0	0	1,030	1,030	

NOM	54	13,400	0	13,454	11,658	0	15,935	18,458	0	34,393
NPV	27	7,487	0	7,515	3,995	0	8,119	5,782	0	13,901

\* SUPPLEMENTAL INFORMATION NOT SPECIFIED IN WORKBOOK  
 \*\* NEGATIVE COSTS WILL BE CALCULATED AS POSITIVE BENEFITS FOR TRC AND RIM TESTS



**CALCULATION OF GEN K-FACTOR**  
**PROGRAM METHOD SELECTED REV\_REQ**  
**PROGRAM NAME: Gas HP vs 10 SEER HP w/1000 participants in 2000**

(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
MID-YEAR RATE BASE \$(000)	DEBT \$(000)	PREFERRED STOCK \$(000)	COMMON EQUITY \$(000)	INCOME TAXES \$(000)	OTHER TAXES & INSURANCE \$(000)	DEPREC. \$(000)	DEFERRED TAXES \$(000)	TOTAL FIXED CHARGES \$(000)	PRESENT WORTH FIXED CHARGES \$(000)	CUMULATIVE PW FIXED CHARGES \$(000)
2005	1,741	60	0	120	74	24	58	4	340	340
2006	1,668	57	0	115	48	24	58	26	329	641
2007	1,585	54	0	109	48	24	58	23	317	908
2008	1,506	51	0	104	48	24	58	20	305	1,144
2009	1,430	49	0	98	48	24	58	16	294	1,352
2010	1,357	46	0	93	48	24	58	14	283	1,537
2011	1,286	44	0	88	47	24	58	11	273	1,700
2012	1,218	42	0	84	47	24	58	9	263	1,844
2013	1,152	39	0	79	44	24	58	8	253	1,971
2014	1,085	37	0	75	41	24	58	8	244	2,084
2015	1,019	35	0	70	38	24	58	8	234	2,183
2016	952	33	0	65	35	24	58	8	224	2,270
2017	886	30	0	61	33	24	58	8	215	2,347
2018	819	28	0	56	30	24	58	8	205	2,414
2019	753	26	0	52	27	24	58	8	195	2,472
2020	687	23	0	47	24	24	58	8	186	2,523
2021	620	21	0	43	21	24	58	8	176	2,568
2022	554	19	0	38	18	24	58	8	166	2,606
2023	487	17	0	34	15	24	58	8	156	2,640
2024	421	14	0	29	13	24	58	8	147	2,668
2025	362	12	0	25	25	24	58	(6)	138	2,693
2026	317	11	0	22	37	24	58	(21)	132	2,715
2027	280	10	0	19	36	24	58	(21)	126	2,734
2028	243	8	0	17	34	24	58	(21)	121	2,750
2029	205	7	0	14	32	24	58	(21)	115	2,765
2030	168	6	0	12	31	24	58	(21)	110	2,778
2031	131	4	0	9	29	24	58	(21)	104	2,789
2032	93	3	0	6	27	24	58	(21)	99	2,799
2033	56	2	0	4	26	24	58	(21)	93	2,807
2034	19	1	0	1	24	24	58	(21)	88	2,814

IN SERVICE COS (\$000) 1,742  
 IN SERVICE YEAR 2005  
 BOOK LIFE (YRS) 30  
 EFFEC. TAX RATE 38.575  
 DISCOUNT RATE 8.98%  
 OTAX & INS RATE 1.40%

**CAPITAL STRUCTURE**

SOURCE	WEIGHT	COST
DEBT	45%	7.60 %
P/S	0%	0.00 %
C/S	55%	12.50 %

K-FACTOR = CPWFC / IN-SVC COST =

1.61524

DEFERRED TAX AND MID-YEAR RATE BASE CALCULATION  
 PROGRAM METHOD SELECTED: REV\_REQ  
 PROGRAM NAI Gas HP vs 10 SEER HP w/100C

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
YEAR	TAX	TAX	ACCUMULATED	ACCUMULATED	ACCUMULATED	ACCUMULATED	ACCUMULATED	DEFERRED	TOTAL	BOOK DEPR	(10)*(11)	SALVAGE	ANNUAL	ACCUMULATED
	DEPRECIATION SCHEDULE	DEPRECIATION \$(000)	TAX DEPRECIATION \$(000)	BOOK DEPRECIATION \$(000)	BOOK DEPRECIATION \$(000)	DEFERRED TAX \$(000)	DEFERRED TAX \$(000)	TAX DUE TO DEPRECIATION \$(000)	EQUITY AFUDC \$(000)	RATE MINUS 1/LIFE	TAX RATE \$(000)	TAX RATE \$(000)	DEFERRED TAX \$(000)	DEFERRED TAX \$(000)
2005	3.75%	63	63	58	58	54	54	4	129	0	0	0	4	(26)
2006	7.22%	122	185	58	116	54	108	26	129	0	0	0	26	1
2007	6.68%	113	298	58	174	54	161	23	129	0	0	0	23	24
2008	6.18%	104	402	58	232	54	215	20	129	0	0	0	20	43
2009	5.71%	97	499	58	290	54	269	16	129	0	0	0	16	60
2010	5.29%	89	588	58	348	54	323	14	129	0	0	0	14	73
2011	4.89%	83	671	58	407	54	376	11	129	0	0	0	11	84
2012	4.52%	76	747	58	465	54	430	9	129	0	0	0	9	93
2013	4.46%	75	823	58	523	54	484	8	129	0	0	0	8	101
2014	4.46%	75	898	58	581	54	538	8	129	0	0	0	8	110
2015	4.46%	75	973	58	639	54	592	8	129	0	0	0	8	118
2016	4.46%	75	1,049	58	697	54	645	8	129	0	0	0	8	126
2017	4.46%	75	1,124	58	755	54	699	8	129	0	0	0	8	135
2018	4.46%	75	1,199	58	813	54	753	8	129	0	0	0	8	143
2019	4.46%	75	1,275	58	871	54	807	8	129	0	0	0	8	151
2020	4.46%	75	1,350	58	929	54	861	8	129	0	0	0	8	160
2021	4.46%	75	1,426	58	987	54	914	8	129	0	0	0	8	168
2022	4.46%	75	1,501	58	1,045	54	968	8	129	0	0	0	8	176
2023	4.46%	75	1,576	58	1,104	54	1,022	8	129	0	0	0	8	185
2024	4.46%	75	1,652	58	1,162	54	1,076	8	129	0	0	0	8	193
2025	2.23%	38	1,689	58	1,220	54	1,129	(6)	129	0	0	0	(6)	187
2026	0.00%	0	1,689	58	1,278	54	1,183	(21)	129	0	0	0	(21)	166
2027	0.00%	0	1,689	58	1,336	54	1,237	(21)	129	0	0	0	(21)	145
2028	0.00%	0	1,689	58	1,394	54	1,291	(21)	129	0	0	0	(21)	125
2029	0.00%	0	1,689	58	1,452	54	1,345	(21)	129	0	0	0	(21)	104
2030	0.00%	0	1,689	58	1,510	54	1,398	(21)	129	0	0	0	(21)	83
2031	0.00%	0	1,689	58	1,568	54	1,452	(21)	129	0	0	0	(21)	62
2032	0.00%	0	1,689	58	1,626	54	1,506	(21)	129	0	0	0	(21)	42
2033	0.00%	0	1,689	58	1,684	54	1,560	(21)	129	0	0	0	(21)	21
2034	0.00%	0	1,689	58	1,742	54	1,613	(21)	129	0	0	0	(21)	0

SALVAGE / REMOVAL COST	0.00
YEAR SALVAGE / COST OF REMOVAL	2029
DEFERRED TAXES DURING CONSTRUCTION (SEE PAGE 5)	(29)
TOTAL EQUITY AFUDC CAPITALIZED (SEE PAGE 5)	129
BOOK DEPR RATE - 1/USEFUL LIFE	3.33%

DEFERRED TAX AND MID-YEAR RATE BASE CALCULATION  
 PROGRAM METHOD SELECTED: REV\_REQ  
 PROGRAM NAI Gas HP vs 10 SEER HP w/1000 participants in 2000

(1)	(2)	(3)	(4)	(5)	(5a)*	(5b)*	(6)	(7)	(8)
YEAR	TAX DEPRECIATION SCHEDULE	TAX DEPRECIATION \$(000)	DEFERRED TAX \$(000)	END OF YEAR NET PLANT IN SERVICE \$(000)	ACCUMULATED DEPRECIATION \$(000)	ACCUMULATED DEF TAXES \$(000)	BEGINNING YEAR RATE BASE \$(000)	ENDING OF YEAR RATE BASE \$(000)	MID-YEAR RATE BASE \$(000)
2005	3.75%	83	4	1,684	58	(26)	1,772	1,710	1,741
2006	7.22%	122	26	1,626	116	1	1,710	1,625	1,668
2007	6.68%	113	23	1,568	174	24	1,625	1,545	1,585
2008	6.18%	104	20	1,510	232	43	1,545	1,467	1,506
2009	5.71%	97	16	1,452	290	60	1,467	1,392	1,430
2010	5.29%	89	14	1,394	348	73	1,392	1,321	1,357
2011	4.89%	83	11	1,338	407	84	1,321	1,252	1,286
2012	4.52%	76	9	1,278	465	93	1,252	1,185	1,218
2013	4.46%	75	8	1,220	523	101	1,185	1,118	1,152
2014	4.46%	75	8	1,162	581	110	1,118	1,052	1,085
2015	4.46%	75	8	1,104	639	118	1,052	985	1,019
2016	4.46%	75	8	1,045	697	126	985	919	952
2017	4.46%	75	8	987	755	135	919	853	886
2018	4.46%	75	8	929	813	143	853	786	819
2019	4.46%	75	8	871	871	151	786	720	753
2020	4.46%	75	8	813	929	160	720	653	687
2021	4.46%	75	8	755	987	168	653	587	620
2022	4.46%	75	8	697	1,045	176	587	521	554
2023	4.46%	75	8	639	1,104	185	521	454	487
2024	4.46%	75	8	581	1,162	193	454	388	421
2025	2.23%	38	(6)	523	1,220	187	388	336	362
2026	0.00%	0	(21)	465	1,278	166	336	299	317
2027	0.00%	0	(21)	407	1,336	145	299	261	280
2028	0.00%	0	(21)	348	1,394	125	261	224	243
2029	0.00%	0	(21)	290	1,452	104	224	187	205
2030	0.00%	0	(21)	232	1,510	83	187	149	168
2031	0.00%	0	(21)	174	1,568	62	149	112	131
2032	0.00%	0	(21)	116	1,626	42	112	75	93
2033	0.00%	0	(21)	58	1,684	21	75	37	56
2034	0.00%	0	(21)	0	1,742	0	37	0	19

\* Column not specified in workbook

(1) YEAR	(2) NO. YEARS BEFORE IN-SERVICE	(3) PLANT ESCALATION RATE	(4) CUMULATIVE ESCALATION FACTOR	(5) YEARLY EXPENDITURE (%)	(6) ANNUAL SPENDING (\$/kW)	(7) CUMULATIVE AVERAGE SPENDING (\$/kW)
1998	-7	0.00%	1.000	0.00%	0.00	0.00
1999	-6	1.78%	1.018	0.00%	0.00	0.00
2000	-5	1.53%	1.033	0.32%	1.72	0.86
2001	-4	2.64%	1.061	0.65%	3.58	3.51
2002	-3	2.62%	1.088	13.85%	78.24	44.42
2003	-2	2.28%	1.113	35.34%	204.20	185.63
2004	-1	2.27%	1.139	49.84%	294.50	434.98

100.00% 582.24

(8) NO. YEARS BEFORE IN-SERVICE	(8) CUMULATIVE SPENDING WITH AFUDC (\$/kW)	(8a)* DEBT AFUDC (\$/kW)	(8b)* CUMULATIVE DEBT AFUDC (\$/kW)	(9) YEARLY TOTAL AFUDC (\$/kW)	(9a)* CUMULATIVE TOTAL AFUDC (\$/kW)	(9b)* CONSTRUCTION PERIOD INTEREST (\$/kW)	(9c)* CUMULATIVE CPI (\$/kW)	(9d)* DEFERRED TAXES (\$/kW)	(9e)* CUMULATIVE DEFERRED TAXES (\$/kW)	(10) INCREMENTAL YEAR-END BOOK VALUE (\$/kW)	(11) CUMULATIVE YEAR-END BOOK VALUE (\$/kW)
1998	-7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1999	-6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2000	-5	0.86	0.03	0.03	0.09	0.07	0.07	(0.01)	(0.01)	1.80	1.80
2001	-4	3.59	0.12	0.15	0.37	0.27	0.34	(0.06)	(0.07)	3.95	5.75
2002	-3	44.88	1.54	1.69	4.63	5.09	3.40	(0.72)	(0.79)	82.87	88.62
2003	-2	190.72	6.55	8.24	19.72	24.80	14.39	(3.03)	(3.82)	223.91	312.54
2004	-1	459.79	15.86	24.09	47.73	72.53	34.44	(7.17)	(10.98)	342.23	654.77

24.09

72.53

52.57

(10.98)

654.77

IN SERVICE YEAR 2005  
PLANT COSTS 519  
AFUDC RATE 10.30%

	BOOK BASIS	BOOK BASIS	TAX BASIS
	BOOK BASIS	FOR DEF TAX	TAX BASIS
CONSTRUCTION CASH	1,549	1,549	1,549
EQUITY AFUDC	129		
DEBT AFUDC	64	64	
CPI			140
TOTAL	1,742	1,613	1,689

\* Column not specified in workbook

INPUT DATA – PART 2  
PROGRAM METHOD SELECTED : REV\_REQ  
PROGRAM NAME Gas HP vs 10 SEER HP w/1000 participants in 2000

(1)	(2)	(3)	(4)	(5)	(6)*	(7)	(8)	(9)
YEAR	CUMULATIVE TOTAL PARTICIPATING CUSTOMERS	ADJUSTED CUMULATIVE PARTICIPATING CUSTOMERS	UTILITY AVERAGE SYSTEM FUEL COST (C/kWh)	AVOIDED MARGINAL FUEL COST (C/kWh)	INCREASED MARGINAL FUEL COST (C/kWh)	REPLACEMENT PROGRAM kW EFFECTIVENESS FACTOR	PROGRAM kW EFFECTIVENESS FACTOR	PROGRAM kWh
1998	0	0	2.00	2.27	2.08	0.00	1.00	1.00
1999	0	0	2.23	2.57	2.37	0.00	1.00	1.00
2000	1,000	1,000	2.45	2.86	2.61	0.00	1.00	1.00
2001	1,000	1,000	2.73	3.32	2.95	0.00	1.00	1.00
2002	1,000	1,000	2.61	3.11	2.84	0.00	1.00	1.00
2003	1,000	1,000	2.60	3.21	2.82	0.00	1.00	1.00
2004	1,000	1,000	2.78	3.46	3.03	0.00	1.00	1.00
2005	1,000	1,000	2.93	3.71	3.22	3.25	1.00	1.00
2006	1,000	1,000	3.01	3.82	3.31	3.34	1.00	1.00
2007	1,000	1,000	3.13	4.10	3.48	3.49	1.00	1.00
2008	1,000	1,000	3.07	3.99	3.39	3.45	1.00	1.00
2009	1,000	1,000	3.15	4.12	3.49	3.60	1.00	1.00
2010	1,000	1,000	3.14	4.21	3.48	3.57	1.00	1.00
2011	1,000	1,000	3.32	4.35	3.69	3.71	1.00	1.00
2012	1,000	1,000	3.38	4.50	3.76	3.77	1.00	1.00
2013	1,000	1,000	3.47	4.63	3.86	3.84	1.00	1.00
2014	1,000	1,000	3.55	4.74	3.94	3.92	1.00	1.00
2015	1,000	1,000	3.58	4.83	3.97	3.95	1.00	1.00
2016	1,000	1,000	3.62	4.91	4.00	4.00	1.00	1.00
2017	1,000	1,000	3.75	5.09	4.16	4.13	1.00	1.00
2018	1,000	1,000	3.93	5.37	4.37	4.35	1.00	1.00
2019	1,000	1,000	4.09	5.66	4.58	4.55	1.00	1.00
2020	1,000	1,000	4.23	5.87	4.75	4.79	1.00	1.00
2021	1,000	1,000	4.32	6.01	4.84	4.88	1.00	1.00
2022	1,000	1,000	4.41	6.17	4.95	4.97	1.00	1.00
2023	1,000	1,000	4.53	6.36	5.09	5.10	1.00	1.00
2024	1,000	1,000	4.64	6.55	5.22	5.23	1.00	1.00

\* THIS COLUMN IS USED ONLY FOR LOAD SHIFTING PROGRAMS WHICH SHIFT CONSUMPTION TO OFF-PEAK PERIODS.  
THE VALUES REPRESENT THE OFF PEAK SYSTEM FUEL COSTS.

**AVOIDED GENERATING BENEFITS**  
**PROGRAM METHOD SELECTED: REV\_REQ**  
**PROGRAM NAME Gas HP vs 10 SEER HP w/1000 participants in 2000**

YEAR	(2) AVOIDED GEN UNIT CAPACITY COS \$(000)	(3) AVOIDED GEN UNIT FIXED O&M \$(000)	(4) AVOIDED GEN UNIT VARIABLE O&M \$(000)	(5) AVOIDED GEN UNIT FUEL COST \$(000)	(6) REPLACEMENT FUEL COST \$(000)	(7) AVOIDED GEN UNIT BENEFITS \$(000)
1998	0	0	0	0	0	0
1999	0	0	0	0	0	0
2000	0	0	0	0	0	0
2001	0	0	0	0	0	0
2002	0	0	0	0	0	0
2003	0	0	0	0	0	0
2004	0	0	0	0	0	0
2005	340	122	17	459	689	249
2006	329	127	18	481	729	226
2007	317	132	19	496	772	191
2008	305	137	19	502	762	201
2009	294	143	20	502	765	173
2010	283	148	19	489	750	190
2011	273	154	20	496	780	163
2012	263	160	21	510	793	162
2013	253	167	21	526	799	168
2014	244	173	21	541	808	172
2015	234	180	22	551	813	174
2016	224	188	22	560	816	179
2017	215	195	23	577	846	164
2018	205	203	24	595	894	133
2019	195	211	25	616	944	103
2020	186	219	26	634	995	70
2021	176	228	26	648	1,013	66
2022	166	237	27	663	1,032	62
2023	156	247	28	749	1,057	123
2024	147	257	29	749	1,085	96

NOM	4,805	3,628	447	11,347	17,162	3,065
NPV	1,462	888	114	2,907	4,417	954

AVOIDED T&D AND PROGRAM FUEL SAVINGS  
 PROGRAM METHOD SELECTED: REV\_REQ  
 PROGRAM NAME Gas HP vs 10 SEER HP w/1000 participants in 2000

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(8a)*
YEAR	AVOIDED TRANSMISSION CAP COST \$(000)	AVOIDED TRANSMISSION O&M COST \$(000)	TOTAL AVOIDED TRANSMISSION COST \$(000)	AVOIDED DISTRIBUTION CAP COST \$(000)	AVOIDED DISTRIBUTION O&M COST \$(000)	TOTAL AVOIDED DISTRIBUTION COST \$(000)	PROGRAM FUEL SAVINGS \$(000)	PROGRAM OFF-PEAK PAYBACK \$(000)
1998	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	100	0
2001	35	8	43	23	36	58	236	0
2002	34	9	42	22	37	59	219	0
2003	32	9	41	21	38	60	230	0
2004	31	9	40	20	40	60	249	0
2005	30	10	40	19	42	61	269	0
2006	29	10	39	19	43	62	278	0
2007	28	10	38	18	45	63	302	0
2008	27	11	37	17	47	64	293	0
2009	26	11	37	17	49	65	303	0
2010	25	12	36	16	51	67	314	0
2011	24	12	36	15	53	68	321	0
2012	23	13	35	15	55	69	334	0
2013	22	13	35	14	57	71	344	0
2014	21	14	34	13	59	73	353	0
2015	19	14	34	13	62	74	360	0
2016	18	15	33	12	64	76	367	0
2017	17	15	33	11	67	78	381	0
2018	16	16	32	11	69	80	403	0
2019	15	17	32	10	72	82	426	0
2020	14	17	32	9	75	84	442	0
2021	13	18	31	9	78	87	454	0
2022	13	19	31	8	81	89	467	0
2023	12	19	32	8	84	92	482	0
2024	12	20	32	8	88	95	497	0

NOM.	536	320	856	348	1,389	1,737	8,426	0
NPV	215	94	309	140	406	546	2,567	0

\* THESE VALUES REPRESENT THE COST OF THE INCREASED FUEL CONSUMPTION DUE TO GREATER OFF-PEAK ENERGY USAGE. USED FOR LOAD SHIFTING PROGRAMS ONLY.

TOTAL RESOURCE COST TEST  
 PROGRAM METHOD SELECTED: REV\_REQ  
 PROGRAM NAMI Gas HP vs 10 SEER HP w/1000 participants in 2000

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
YEAR	INCREASED SUPPLY COSTS \$(000)	UTILITY PROGRAM COSTS \$(000)	PARTICIPANT PROGRAM COSTS \$(000)	OTHER COSTS \$(000)	TOTAL COSTS \$(000)	AVOIDED GEN UNIT BENEFITS \$(000)	AVOIDED T&D BENEFITS \$(000)	PROGRAM FUEL SAVINGS \$(000)	OTHER BENEFITS \$(000)	TOTAL BENEFITS \$(000)	NET BENEFITS \$(000)	CUMULATIVE DISCOUNTED NET BENEFITS \$(000)
1998	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	22	6,847	0	6,869	0	0	100	0	100	(6,769)	(5,700)
2001	0	0	543	0	543	0	101	236	0	337	(206)	(5,859)
2002	0	0	557	0	557	0	101	219	0	321	(237)	(6,027)
2003	0	0	572	0	572	0	101	230	0	331	(241)	(6,184)
2004	0	0	587	0	587	0	101	249	0	350	(237)	(6,326)
2005	0	0	603	0	603	249	101	269	0	619	16	(6,317)
2006	0	0	619	0	619	226	101	278	0	605	(14)	(6,324)
2007	0	0	636	0	636	191	101	302	0	594	(42)	(6,344)
2008	0	0	654	0	654	201	102	293	0	596	(58)	(6,369)
2009	0	0	672	0	672	173	102	303	0	579	(94)	(6,405)
2010	0	0	691	0	691	190	103	314	0	606	(85)	(6,435)
2011	0	0	710	0	710	163	104	321	0	588	(123)	(6,475)
2012	0	0	731	0	731	162	105	334	0	600	(131)	(6,515)
2013	0	31	10,105	0	10,136	168	106	344	0	617	(9,519)	(9,137)
2014	0	0	774	0	774	172	107	353	0	631	(143)	(9,173)
2015	0	0	797	0	797	174	108	360	0	642	(155)	(9,209)
2016	0	0	820	0	820	179	109	367	0	655	(164)	(9,244)
2017	0	0	843	0	843	164	111	381	0	656	(187)	(9,280)
2018	0	0	868	0	868	133	112	403	0	648	(220)	(9,320)
2019	0	0	893	0	893	103	114	426	0	643	(250)	(9,361)
2020	0	0	919	0	919	70	116	442	0	629	(290)	(9,405)
2021	0	0	946	0	946	66	118	454	0	638	(308)	(9,447)
2022	0	0	973	0	973	62	121	467	0	650	(323)	(9,488)
2023	0	0	1,001	0	1,001	123	124	482	0	728	(273)	(9,520)
2024	0	0	1,030	0	1,030	96	127	497	0	721	(310)	(9,553)

NOM	0	54	34,393	0	34,447	3,065	2,593	8,426	0	14,083	(20,364)
NPV	0	27	13,901	0	13,929	954	855	2,567	0	4,375	(9,553)

Discount Rate: 8.98 %  
 Benefit/Cost Ratio (Col(11) / Col(6)) : 0.31



PARTICIPANT COSTS AND BENEFITS  
 PROGRAM METHOD SELECTED: REV\_REQ  
 PROGRAM NAME Gas HP vs 10 SEER HP w/1000 participants in 2000

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
YEAR	SAVINGS IN PARTICIPANTS BILLS \$(000)	TAX CREDITS \$(000)	UTILITY REBATES \$(000)	OTHER BENEFITS \$(000)	TOTAL BENEFITS \$(000)	CUSTOMER EQUIPMENT COSTS \$(000)	CUSTOMER O&M COSTS \$(000)	OTHER COSTS \$(000)	TOTAL COSTS \$(000)	NET BENEFITS \$(000)	CUMULATIVE DISCOUNTED NET BENEFITS \$(000)
1998	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0
2000	361	0	6,700	0	7,061	6,583	265	0	6,847	213	180
2001	729	0	0	0	729	0	543	0	543	186	323
2002	729	0	0	0	729	0	557	0	557	171	445
2003	739	0	0	0	739	0	572	0	572	167	553
2004	741	0	0	0	741	0	587	0	587	154	645
2005	749	0	0	0	749	0	603	0	603	146	725
2006	748	0	0	0	748	0	619	0	619	128	790
2007	751	0	0	0	751	0	636	0	636	115	843
2008	755	0	0	0	755	0	654	0	654	101	885
2009	754	0	0	0	754	0	672	0	672	82	917
2010	771	0	0	0	771	0	691	0	691	80	946
2011	771	0	0	0	771	0	710	0	710	61	965
2012	777	0	0	0	777	0	731	0	731	46	979
2013	782	0	6,700	0	7,482	9,352	752	0	10,105	(2,623)	257
2014	791	0	0	0	791	0	774	0	774	17	261
2015	796	0	0	0	796	0	797	0	797	(1)	261
2016	801	0	0	0	801	0	820	0	820	(18)	257
2017	803	0	0	0	803	0	843	0	843	(41)	249
2018	808	0	0	0	808	0	868	0	868	(60)	239
2019	813	0	0	0	813	0	893	0	893	(80)	225
2020	818	0	0	0	818	0	919	0	919	(101)	210
2021	823	0	0	0	823	0	946	0	946	(122)	193
2022	828	0	0	0	828	0	973	0	973	(144)	175
2023	834	0	0	0	834	0	1,001	0	1,001	(167)	155
2024	839	0	0	0	839	0	1,030	0	1,030	(191)	135

NOM	19,111	0	13,400	0	32,511	15,935	18,458	0	34,393	(1,882)
NPV	6,549	0	7,487	0	14,036	8,119	5,782	0	13,901	135

In Service of Gen Unit: 2005  
 Discount Rate : 8.98 %  
 Benefit/Cost Ratio ( Col(6) / Col(10)) 1.01

RATE IMPACT TEST  
 PROGRAM METHOD SELECTED: REV\_REQ  
 PROGRAM NAME Gas HP vs 10 SEER HP w/1000 participants in 2000

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
YEAR	INCREASED SUPPLY COSTS \$(000)	UTILITY PROGRAM COSTS \$(000)	INCENTIVES \$(000)	REVENUE LOSSES \$(000)	OTHER COSTS \$(000)	TOTAL COSTS \$(000)	AVOIDED GEN UNIT & FUEL BENEFITS \$(000)	AVOIDED T&D BENEFITS \$(000)	REVENUE GAINS \$(000)	OTHER BENEFITS \$(000)	TOTAL BENEFITS \$(000)	NET BENEFITS \$(000)	CUMULATIVE DISCOUNTED NET BENEFITS \$(000)
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	22	6,700	220	0	6,942	100	0	0	0	100	(6,842)	(5,761)
2001	0	0	0	445	0	445	236	101	0	0	337	(107)	(5,844)
2002	0	0	0	445	0	445	219	101	0	0	321	(124)	(5,932)
2003	0	0	0	451	0	451	230	101	0	0	331	(120)	(6,010)
2004	0	0	0	452	0	452	249	101	0	0	350	(102)	(6,071)
2005	0	0	0	457	0	457	518	101	0	0	619	162	(5,982)
2006	0	0	0	456	0	456	504	101	0	0	605	149	(5,907)
2007	0	0	0	458	0	458	493	101	0	0	594	135	(5,845)
2008	0	0	0	460	0	460	494	102	0	0	596	135	(5,788)
2009	0	0	0	460	0	460	476	102	0	0	579	119	(5,741)
2010	0	0	0	471	0	471	503	103	0	0	606	136	(5,693)
2011	0	0	0	470	0	470	484	104	0	0	588	117	(5,655)
2012	0	0	0	474	0	474	496	105	0	0	600	126	(5,617)
2013	0	31	6,700	477	0	7,209	512	106	0	0	617	(6,591)	(7,433)
2014	0	0	0	483	0	483	524	107	0	0	631	148	(7,385)
2015	0	0	0	485	0	485	534	108	0	0	642	156	(7,359)
2016	0	0	0	489	0	489	546	109	0	0	655	167	(7,323)
2017	0	0	0	490	0	490	545	111	0	0	656	166	(7,291)
2018	0	0	0	493	0	493	536	112	0	0	648	156	(7,263)
2019	0	0	0	496	0	496	529	114	0	0	643	147	(7,239)
2020	0	0	0	499	0	499	513	116	0	0	629	130	(7,219)
2021	0	0	0	502	0	502	520	118	0	0	638	136	(7,200)
2022	0	0	0	505	0	505	529	121	0	0	650	144	(7,182)
2023	0	0	0	509	0	509	604	124	0	0	728	220	(7,156)
2024	0	0	0	512	0	512	593	127	0	0	721	209	(7,134)

NOM.	0	54	13,400	11,658	0	25,112	11,491	2,593	0	0	14,083	(11,028)
NPV	0	27	7,487	3,995	0	11,509	3,521	855	0	0	4,375	(7,134)

Discount Rate 8.98 %  
 Benefit/Cost Ratio (Col(12) / Col(7)) : 0.38

INPUT DATA – PART 1 CONTINUED  
PROGRAM METHOD SELECTED: REV\_REQ  
PROGRAM NAME: Gas HP vs 10 SEER AC w/1000 participants in 2000

I. PROGRAM DEMAND SAVINGS & LINE LOSSES

(1) CUSTOMER kW REDUCTION AT METER .....	2.38 kW
(2) GENERATOR kW REDUCTION PER CUSTOMER .....	3.05 kW
(3) kW LINE LOSS PERCENTAGE .....	9.01 %
(4) GENERATOR kWh REDUCTION PER CUSTOMER .....	7,274.7 kWh
(5) kWh LINE LOSS PERCENTAGE .....	7.02 %
(6) GROUP LINE LOSS MULTIPLIER .....	1.0000
(7) CUSTOMER kWh INCREASE AT METER .....	0.0 kWh

II. ECONOMIC LIFE & K FACTORS

(1) STUDY PERIOD FOR THE CONSERVATION PROGRAM .....	27 YEARS
(2) GENERATOR ECONOMIC LIFE .....	30 YEARS
(3) T&D ECONOMIC LIFE .....	35 YEARS
(4) K FACTOR FOR GENERATION .....	1.61524
(5) K FACTOR FOR T & D .....	1.46985

III. UTILITY & CUSTOMER COSTS

(1) UTILITY NON RECURRING COST PER CUSTOMER .....	*** \$/CUST
(2) UTILITY RECURRING COST PER CUSTOMER .....	*** \$/CUST
(3) UTILITY COST ESCALATION RATE .....	*** %**
(4) CUSTOMER EQUIPMENT COST .....	*** \$/CUST
(5) CUSTOMER EQUIPMENT ESCALATION RATE .....	*** %**
(6) CUSTOMER O & M COST .....	*** \$/CUST/YR
(7) CUSTOMER O & M COST ESCALATION RATE .....	*** %**
* (8) INCREASED SUPPLY COSTS .....	*** \$/CUST/YR
* (9) SUPPLY COSTS ESCALATION RATES .....	*** %**
* (10) UTILITY DISCOUNT RATE .....	8.98 %
* (11) UTILITY AFUDC RATE .....	10.30 %
* (12) UTILITY NON RECURRING REBATE/INCENTIVE .....	*** \$/CUST
* (13) UTILITY RECURRING REBATE/INCENTIVE .....	*** \$/CUST
* (14) UTILITY REBATE/INCENTIVE ESCALATION RATE .....	*** %

IV. AVOIDED GENERATOR AND T&D COSTS

(1) BASE YEAR .....	1998
(2) IN-SERVICE YEAR FOR AVOIDED GENERATING UNIT .....	2005
(3) IN-SERVICE YEAR FOR AVOIDED T&D .....	2001-2005
(4) BASE YEAR AVOIDED GENERATING COST .....	519 \$/kW
(5) BASE YEAR AVOIDED TRANSMISSION COST .....	70 \$/kW
(6) BASE YEAR DISTRIBUTION COST .....	50 \$/kW
(7) GEN, TRAN & DIST COST ESCALATION RATE .....	1.78 %**
(8) GENERATOR FIXED O & M COST .....	35 \$/kW/YR
(9) GENERATOR FIXED O&M ESCALATION RATE .....	4.10 %**
(10) TRANSMISSION FIXED O & M COST .....	2.73 \$/kW
(11) DISTRIBUTION FIXED O & M COST .....	13.01 \$/kW
(12) T&D FIXED O&M ESCALATION RATE .....	4.10 %**
(13) AVOIDED GEN UNIT VARIABLE O & M COSTS .....	0.067 CENTS/kWh
(14) GENERATOR VARIABLE O&M COST ESCALATION RATE .....	2.70 %**
(15) GENERATOR CAPACITY FACTOR .....	91% ** (In-service year)
(16) AVOIDED GENERATING UNIT FUEL COST .....	2.17 CENTS PER kWh** (In-service y
(17) AVOIDED GEN UNIT FUEL COST ESCALATION RATE .....	1.75 %**

V. NON-FUEL ENERGY AND DEMAND CHARGES

(1) NON FUEL COST IN CUSTOMER BILL .....	*** CENTS/kWh
(2) NON-FUEL COST ESCALATION RATE .....	*** %
(3) DEMAND CHARGE IN CUSTOMER BILL .....	*** \$/kW/MO
(4) DEMAND CHARGE ESCALATION RATE .....	*** %

\* SUPPLEMENTAL INFORMATION NOT SPECIFIED IN WORKBOOK  
\*\* VALUE SHOWN IS FOR FIRST YEAR ONLY (VALUE VARIES OVER TIME)  
\*\*\* PROGRAM COST CALCULATION VALUES ARE SHOWN ON PAGE 2

\* INPUT DATA – PART 1 CONTINUED  
 PROGRAM METHOD SELECTED: REV\_REQ  
 PROGRAM NAME: Gas HP vs 10 SEER AC w/1000 participants in 2000

YEAR	(1) UTILITY PROGRAM COSTS WITHOUT INCENTIVES \$(000)	(2) UTILITY INCENTIVES \$(000)	(3) OTHER UTILITY COSTS \$(000)	(4) TOTAL UTILITY PROGRAM COSTS \$(000)	(5) ENERGY CHARGE REVENUE LOSSES \$(000)	(6) DEMAND CHARGE REVENUE LOSSES \$(000)	(7) PARTICIPANT EQUIPMENT COSTS \$(000)	(8) PARTICIPANT O&M COSTS \$(000)	(9) OTHER PARTICIPANT COSTS \$(000)	(10) TOTAL PARTICIPANT COSTS \$(000)
1998	0	0	0	0	0	0	0	0	0	
1999	0	0	0	0	0	0	0	0	0	
2000	22	6,100	0	6,122	250	0	6,726	265	6,991	
2001	0	0	0	0	505	0	0	543	543	
2002	0	0	0	0	505	0	0	557	557	
2003	0	0	0	0	512	0	0	572	572	
2004	0	0	0	0	514	0	0	587	587	
2005	0	0	0	0	519	0	0	603	603	
2006	0	0	0	0	518	0	0	619	619	
2007	0	0	0	0	521	0	0	636	636	
2008	0	0	0	0	523	0	0	654	654	
2009	0	0	0	0	523	0	0	672	672	
2010	0	0	0	0	535	0	0	691	691	
2011	0	0	0	0	535	0	0	710	710	
2012	0	0	0	0	539	0	0	731	731	
2013	31	6,100	0	6,131	542	0	9,556	752	10,308	
2014	0	0	0	0	549	0	0	774	774	
2015	0	0	0	0	552	0	0	797	797	
2016	0	0	0	0	556	0	0	820	820	
2017	0	0	0	0	556	0	0	843	843	
2018	0	0	0	0	560	0	0	868	868	
2019	0	0	0	0	563	0	0	893	893	
2020	0	0	0	0	567	0	0	919	919	
2021	0	0	0	0	571	0	0	946	946	
2022	0	0	0	0	574	0	0	973	973	
2023	0	0	0	0	578	0	0	1,001	1,001	
2024	0	0	0	0	582	0	0	1,030	1,030	

NOM	54	12,200	0	12,254	13,248	0	16,282	18,458	0	34,741
NPV	27	6,817	0	6,844	4,540	0	8,296	5,782	0	14,078

\* SUPPLEMENTAL INFORMATION NOT SPECIFIED IN WORKBOOK  
 \*\* NEGATIVE COSTS WILL BE CALCULATED AS POSITIVE BENEFITS FOR TRC AND RIM TESTS

**CALCULATION OF GEN K-FACTOR  
PROGRAM METHOD SELECTED REV\_REQ  
PROGRAM NAME: Gas HP vs 10 SEER AC w/1000 participants in 2000**

(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
MID-YEAR RATE BASE \$(000)	DEBT \$(000)	PREFERRED STOCK \$(000)	COMMON EQUITY \$(000)	INCOME TAXES \$(000)	OTHER TAXES & INSURANCE \$(000)	DEPREC. \$(000)	DEFERRED TAXES \$(000)	TOTAL FIXED CHARGES \$(000)	PRESENT WORTH FIXED CHARGES \$(000)	CUMULATIVE PW FIXED CHARGES \$(000)
2005	1,998	68	0	137	85	28	67	4	390	390
2006	1,914	65	0	132	56	28	67	30	377	736
2007	1,819	62	0	125	56	28	67	26	364	1,042
2008	1,728	59	0	119	55	28	67	22	350	1,313
2009	1,641	56	0	113	55	28	67	19	338	1,552
2010	1,557	53	0	107	55	28	67	16	325	1,764
2011	1,476	50	0	101	54	28	67	13	313	1,951
2012	1,398	48	0	96	53	28	67	10	302	2,117
2013	1,322	45	0	91	51	28	67	10	291	2,263
2014	1,246	43	0	86	47	28	67	10	280	2,392
2015	1,169	40	0	80	44	28	67	10	269	2,506
2016	1,093	37	0	75	41	28	67	10	257	2,606
2017	1,017	35	0	70	37	28	67	10	246	2,694
2018	941	32	0	65	34	28	67	10	235	2,771
2019	864	30	0	59	31	28	67	10	224	2,838
2020	788	27	0	54	28	28	67	10	213	2,897
2021	712	24	0	49	24	28	67	10	202	2,948
2022	636	22	0	44	21	28	67	10	191	2,992
2023	560	19	0	38	18	28	67	10	180	3,030
2024	483	17	0	33	14	28	67	10	168	3,063
2025	415	14	0	29	28	28	67	(7)	158	3,091
2026	364	12	0	25	43	28	67	(24)	151	3,116
2027	321	11	0	22	41	28	67	(24)	145	3,138
2028	279	10	0	19	39	28	67	(24)	138	3,157
2029	236	8	0	16	37	28	67	(24)	132	3,174
2030	193	7	0	13	35	28	67	(24)	126	3,189
2031	150	5	0	10	33	28	67	(24)	120	3,201
2032	107	4	0	7	32	28	67	(24)	113	3,213
2033	64	2	0	4	30	28	67	(24)	107	3,222
2034	21	1	0	1	28	28	67	(24)	101	3,231

IN SERVICE COS (\$000) 2,000  
 IN SERVICE YEAR 2005  
 BOOK LIFE (YRS) 30  
 EFFEC. TAX RATE 38.575  
 DISCOUNT RATE 8.98%  
 OTAX & INS RATE 1.40%

CAPITAL STRUCTURE		
SOURCE	WEIGHT	COST
DEBT	45%	7.60 %
P/S	0%	0.00 %
C/S	55%	12.50 %

K-FACTOR = CPWFC / IN-SVC COST = 1.61524

DEFERRED TAX AND MID-YEAR RATE BASE CALCULATION  
 PROGRAM METHOD SELECTED: REV\_REQ  
 PROGRAM NAI Gas HP vs 10 SEER AC w/100C

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
YEAR	TAX SCHEDULE	TAX DEPRECIATION \$(000)	ACCUMULATED TAX DEPRECIATION \$(000)	BOOK DEPRECIATION \$(000)	ACCUMULATED BOOK DEPRECIATION \$(000)	DEFERRED TAX DEPRECIATION \$(000)	ACCUMULATED DEFERRED TAX DEPRECIATION \$(000)	DEFERRED TAX DUE TO DEPRECIATION \$(000)	TOTAL EQUITY AFUDC \$(000)	BOOK DEPR RATE MINUS 1/LIFE	(10)*(11) TAX RATE \$(000)	SALVAGE TAX RATE \$(000)	ANNUAL DEFERRED TAX (9)-(12)+(13) \$(000)	ACCUMULATED DEFERRED TAX \$(000)
2005	3.75%	73	73	67	67	62	62	4	148	0	0	0	4	(29)
2006	7.22%	140	213	67	133	62	123	30	148	0	0	0	30	1
2007	6.68%	129	342	67	200	62	185	26	148	0	0	0	26	27
2008	6.18%	120	462	67	267	62	247	22	148	0	0	0	22	49
2009	5.71%	111	573	67	333	62	309	19	148	0	0	0	19	68
2010	5.29%	102	675	67	400	62	370	16	148	0	0	0	16	84
2011	4.89%	95	770	67	467	62	432	13	148	0	0	0	13	97
2012	4.52%	88	858	67	533	62	494	10	148	0	0	0	10	107
2013	4.46%	87	944	67	600	62	556	10	148	0	0	0	10	116
2014	4.46%	87	1,031	67	667	62	617	10	148	0	0	0	10	126
2015	4.46%	87	1,117	67	733	62	679	10	148	0	0	0	10	135
2016	4.46%	87	1,204	67	800	62	741	10	148	0	0	0	10	145
2017	4.46%	87	1,290	67	867	62	803	10	148	0	0	0	10	155
2018	4.46%	87	1,377	67	933	62	864	10	148	0	0	0	10	164
2019	4.46%	87	1,463	67	1,000	62	926	10	148	0	0	0	10	174
2020	4.46%	87	1,550	67	1,067	62	988	10	148	0	0	0	10	183
2021	4.46%	87	1,636	67	1,133	62	1,050	10	148	0	0	0	10	193
2022	4.46%	87	1,723	67	1,200	62	1,111	10	148	0	0	0	10	202
2023	4.46%	87	1,809	67	1,267	62	1,173	10	148	0	0	0	10	212
2024	4.46%	87	1,896	67	1,333	62	1,235	10	148	0	0	0	10	221
2025	2.23%	43	1,939	67	1,400	62	1,296	(7)	148	0	0	0	(7)	214
2026	0.00%	0	1,939	67	1,467	62	1,358	(24)	148	0	0	0	(24)	191
2027	0.00%	0	1,939	67	1,533	62	1,420	(24)	148	0	0	0	(24)	167
2028	0.00%	0	1,939	67	1,600	62	1,482	(24)	148	0	0	0	(24)	143
2029	0.00%	0	1,939	67	1,667	62	1,543	(24)	148	0	0	0	(24)	119
2030	0.00%	0	1,939	67	1,733	62	1,605	(24)	148	0	0	0	(24)	95
2031	0.00%	0	1,939	67	1,800	62	1,667	(24)	148	0	0	0	(24)	71
2032	0.00%	0	1,939	67	1,867	62	1,729	(24)	148	0	0	0	(24)	48
2033	0.00%	0	1,939	67	1,933	62	1,790	(24)	148	0	0	0	(24)	24
2034	0.00%	0	1,939	67	2,000	62	1,852	(24)	148	0	0	0	(24)	0

SALVAGE / REMOVAL COST	0.00
YEAR SALVAGE / COST OF REMOVAL	2029
DEFERRED TAXES DURING CONSTRUCTION (SEE PAGE 5)	(34)
TOTAL EQUITY AFUDC CAPITALIZED (SEE PAGE 5)	148
BOOK DEPR RATE - 1/USEFUL LIFE	3.33%

DEFERRED TAX AND MID-YEAR RATE BASE CALCULATION  
 PROGRAM METHOD SELECTED: REV\_REQ  
 PROGRAM NAI Gas HP vs 10 SEER AC w/1000 participants in 2000

(1)	(2)	(3)	(4)	(5)	(5a)*	(5b)*	(6)	(7)	(8)
YEAR	TAX DEPRECIATION SCHEDULE	TAX DEPRECIATION \$(000)	DEFERRED TAX \$(000)	END OF YEAR NET PLANT IN SERVICE \$(000)	ACCUMULATED DEPRECIATION \$(000)	ACCUMULATED DEF TAXES \$(000)	BEGINNING YEAR RATE BASE \$(000)	ENDING OF YEAR RATE BASE \$(000)	MID-YEAR RATE BASE \$(000)
2005	3.75%	73	4	1,933	67	(29)	2,034	1,963	1,998
2006	7.22%	140	30	1,867	133	1	1,963	1,866	1,914
2007	6.68%	129	26	1,800	200	27	1,866	1,773	1,819
2008	6.18%	120	22	1,733	267	49	1,773	1,684	1,728
2009	5.71%	111	19	1,667	333	68	1,684	1,598	1,641
2010	5.29%	102	16	1,600	400	84	1,598	1,516	1,557
2011	4.89%	95	13	1,533	467	97	1,516	1,437	1,476
2012	4.52%	88	10	1,467	533	107	1,437	1,360	1,398
2013	4.46%	87	10	1,400	600	116	1,360	1,284	1,322
2014	4.46%	87	10	1,333	667	126	1,284	1,207	1,246
2015	4.46%	87	10	1,267	733	135	1,207	1,131	1,169
2016	4.46%	87	10	1,200	800	145	1,131	1,055	1,093
2017	4.46%	87	10	1,133	867	155	1,055	979	1,017
2018	4.46%	87	10	1,067	933	164	979	903	941
2019	4.46%	87	10	1,000	1,000	174	903	826	864
2020	4.46%	87	10	933	1,067	183	826	750	788
2021	4.46%	87	10	867	1,133	193	750	674	712
2022	4.46%	87	10	800	1,200	202	674	598	636
2023	4.46%	87	10	733	1,267	212	598	521	560
2024	4.46%	87	10	667	1,333	221	521	445	483
2025	2.23%	43	(7)	600	1,400	214	445	386	415
2026	0.00%	0	(24)	533	1,467	191	386	343	364
2027	0.00%	0	(24)	467	1,533	167	343	300	321
2028	0.00%	0	(24)	400	1,600	143	300	257	279
2029	0.00%	0	(24)	333	1,667	119	257	214	236
2030	0.00%	0	(24)	267	1,733	95	214	171	193
2031	0.00%	0	(24)	200	1,800	71	171	129	150
2032	0.00%	0	(24)	133	1,867	48	129	86	107
2033	0.00%	0	(24)	67	1,933	24	86	43	64
2034	0.00%	0	(24)	0	2,000	0	43	0	21

\* Column not specified in workbook

(1) YEAR	(2) NO. YEARS BEFORE IN-SERVICE	(3) PLANT ESCALATION RATE	(4) CUMULATIVE ESCALATION FACTOR	(5) YEARLY EXPENDITURE (%)	(6) ANNUAL SPENDING (\$/kW)	(7) CUMULATIVE AVERAGE SPENDING (\$/kW)
1998	-7	0.00%	1.000	0.00%	0.00	0.00
1999	-6	1.78%	1.018	0.00%	0.00	0.00
2000	-5	1.53%	1.033	0.32%	1.72	0.86
2001	-4	2.64%	1.061	0.85%	3.58	3.51
2002	-3	2.62%	1.088	13.85%	78.24	44.42
2003	-2	2.28%	1.113	35.34%	204.20	185.63
2004	-1	2.27%	1.139	49.84%	294.50	434.98

100.00% 582.24

(8) NO. YEARS BEFORE IN-SERVICE	(8) CUMULATIVE SPENDING WITH AFUDC (\$/kW)	(8a)* DEBT AFUDC (\$/kW)	(8b)* CUMULATIVE DEBT AFUDC (\$/kW)	(9) YEARLY TOTAL AFUDC (\$/kW)	(9a)* CUMULATIVE TOTAL AFUDC (\$/kW)	(9b)* CONSTRUCTION PERIOD INTEREST (\$/kW)	(9c)* CUMULATIVE CPI (\$/kW)	(9d)* DEFERRED TAXES (\$/kW)	(9e)* CUMULATIVE DEFERRED TAXES (\$/kW)	(10) INCREMENTAL YEAR-END BOOK VALUE (\$/kW)	(11) CUMULATIVE YEAR-END BOOK VALUE (\$/kW)	
1998	-7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
1999	-6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
2000	-5	0.86	0.03	0.03	0.09	0.07	0.07	(0.01)	(0.01)	1.80	1.80	
2001	-4	3.59	0.12	0.15	0.37	0.46	0.34	(0.06)	(0.07)	3.95	5.75	
2002	-3	44.88	1.54	1.69	4.63	3.40	3.74	(0.72)	(0.79)	82.87	88.62	
2003	-2	190.72	6.55	8.24	19.72	24.80	14.39	18.13	(3.03)	(3.82)	223.91	312.54
2004	-1	459.79	15.86	24.09	47.73	72.53	34.44	52.57	(7.17)	(10.98)	342.23	654.77

24.09

72.53

52.57

(10.98)

654.77

	2005	BOOK BASIS		
		BOOK BASIS	FOR DEF TAX	TAX BASIS
IN SERVICE YEAR				
PLANT COSTS	519	1,778	1,778	1,778
AFUDC RATE	10.30%	148	74	161
		74	74	
				161
		2,000	1,852	1,939

\* Column not specified in workbook



INPUT DATA -- PART 2  
 PROGRAM METHOD SELECTED : REV\_REQ  
 PROGRAM NAME Gas HP vs 10 SEER AC w/1000 participants in 2000

(1)	(2)	(3)	(4)	(5)	(6)*	(7)	(8)	(9)
YEAR	CUMULATIVE TOTAL PARTICIPATING CUSTOMERS	ADJUSTED CUMULATIVE PARTICIPATING CUSTOMERS	UTILITY AVERAGE SYSTEM FUEL COST (C/kWh)	AVOIDED MARGINAL FUEL COST (C/kWh)	INCREASED MARGINAL FUEL COST (C/kWh)	REPLACEMENT FUEL COST (C/kWh)	PROGRAM kW EFFECTIVENESS FACTOR	PROGRAM kWh EFFECTIVENESS FACTOR
1998	0	0	2.00	2.24	2.10	0.00	1.00	1.00
1999	0	0	2.23	2.54	2.38	0.00	1.00	1.00
2000	1,000	1,000	2.45	2.82	2.64	0.00	1.00	1.00
2001	1,000	1,000	2.73	3.26	2.99	0.00	1.00	1.00
2002	1,000	1,000	2.61	3.08	2.88	0.00	1.00	1.00
2003	1,000	1,000	2.60	3.17	2.87	0.00	1.00	1.00
2004	1,000	1,000	2.78	3.42	3.08	0.00	1.00	1.00
2005	1,000	1,000	2.93	3.66	3.28	3.25	1.00	1.00
2006	1,000	1,000	3.01	3.77	3.37	3.34	1.00	1.00
2007	1,000	1,000	3.13	4.02	3.55	3.49	1.00	1.00
2008	1,000	1,000	3.07	3.93	3.46	3.45	1.00	1.00
2009	1,000	1,000	3.15	4.06	3.56	3.60	1.00	1.00
2010	1,000	1,000	3.14	4.12	3.55	3.57	1.00	1.00
2011	1,000	1,000	3.32	4.26	3.77	3.71	1.00	1.00
2012	1,000	1,000	3.38	4.41	3.84	3.77	1.00	1.00
2013	1,000	1,000	3.47	4.54	3.94	3.84	1.00	1.00
2014	1,000	1,000	3.55	4.66	4.02	3.92	1.00	1.00
2015	1,000	1,000	3.58	4.73	4.06	3.95	1.00	1.00
2016	1,000	1,000	3.62	4.81	4.09	4.00	1.00	1.00
2017	1,000	1,000	3.75	4.99	4.24	4.13	1.00	1.00
2018	1,000	1,000	3.93	5.25	4.47	4.35	1.00	1.00
2019	1,000	1,000	4.09	5.51	4.68	4.55	1.00	1.00
2020	1,000	1,000	4.23	5.70	4.85	4.79	1.00	1.00
2021	1,000	1,000	4.32	5.84	4.95	4.88	1.00	1.00
2022	1,000	1,000	4.41	5.99	5.07	4.97	1.00	1.00
2023	1,000	1,000	4.53	6.17	5.21	5.10	1.00	1.00
2024	1,000	1,000	4.64	6.35	5.34	5.23	1.00	1.00

\* THIS COLUMN IS USED ONLY FOR LOAD SHIFTING PROGRAMS WHICH SHIFT CONSUMPTION TO OFF-PEAK PERIODS.  
 THE VALUES REPRESENT THE OFF PEAK SYSTEM FUEL COSTS.

AVOIDED GENERATING BENEFITS  
 PROGRAM METHOD SELECTED: REV\_REQ  
 PROGRAM NAME Gas HP vs 10 SEER AC w/1000 participants in 2000

YEAR	(2) AVOIDED GEN UNIT CAPACITY COS \$(000)	(3) AVOIDED GEN UNIT FIXED O&M \$(000)	(4) AVOIDED GEN UNIT VARIABLE O&M \$(000)	(5) AVOIDED GEN UNIT FUEL COST \$(000)	(6) REPLACEMENT FUEL COST \$(000)	(7) AVOIDED GEN UNIT BENEFITS \$(000)
1998	0	0	0	0	0	0
1999	0	0	0	0	0	0
2000	0	0	0	0	0	0
2001	0	0	0	0	0	0
2002	0	0	0	0	0	0
2003	0	0	0	0	0	0
2004	0	0	0	0	0	0
2005	390	140	20	527	791	286
2006	377	145	21	553	836	260
2007	364	151	22	569	886	219
2008	350	157	22	576	875	231
2009	338	164	23	577	902	199
2010	325	170	22	561	861	218
2011	313	177	23	569	896	187
2012	302	184	24	586	910	188
2013	291	191	24	604	918	192
2014	280	199	25	621	927	197
2015	269	207	25	632	933	200
2016	257	215	26	643	936	205
2017	246	224	27	663	971	188
2018	235	233	27	683	1,026	153
2019	224	242	28	707	1,084	118
2020	213	252	28	728	1,142	81
2021	202	262	30	744	1,163	76
2022	191	272	31	761	1,185	71
2023	180	283	32	860	1,214	141
2024	168	295	33	860	1,245	110

NOM	5,515	4,164	513	13,025	19,700	3,518
NPV	1,678	1,019	131	3,336	5,070	1,095

AVOIDED T&D AND PROGRAM FUEL SAVINGS  
 PROGRAM METHOD SELECTED: REV\_REQ  
 PROGRAM NAME Gas HP vs 10 SEER AC w/1000 participants in 2000

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(8a)*
YEAR	AVOIDED TRANSMISSION CAP COST \$(000)	AVOIDED TRANSMISSION O&M COST \$(000)	TOTAL AVOIDED TRANSMISSION COST \$(000)	AVOIDED DISTRIBUTION CAP COST \$(000)	AVOIDED DISTRIBUTION O&M COST \$(000)	TOTAL AVOIDED DISTRIBUTION COST \$(000)	PROGRAM FUEL SAVINGS \$(000)	PROGRAM OFF-PEAK PAYBACK \$(000)
1998	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	111	0
2001	40	9	49	26	41	67	261	0
2002	39	10	48	25	42	68	246	0
2003	37	10	47	24	44	68	258	0
2004	36	11	46	23	46	69	278	0
2005	34	11	45	22	48	70	300	0
2006	33	11	45	21	50	71	309	0
2007	32	12	44	21	52	72	334	0
2008	31	12	43	20	54	74	328	0
2009	29	13	42	19	56	75	337	0
2010	28	13	42	18	58	76	345	0
2011	27	14	41	18	60	78	354	0
2012	26	14	40	17	63	80	369	0
2013	25	15	40	16	65	81	380	0
2014	24	16	39	15	68	83	390	0
2015	22	16	39	15	71	85	398	0
2016	21	17	38	14	73	87	405	0
2017	20	18	38	13	76	89	421	0
2018	19	18	37	12	79	92	443	0
2019	18	19	37	11	83	94	467	0
2020	16	20	36	11	86	97	483	0
2021	15	21	36	10	89	99	496	0
2022	15	21	36	10	93	103	510	0
2023	14	22	36	9	97	106	525	0
2024	13	23	37	9	101	109	542	0

NOM.	615	368	982	400	1,594	1,994	9,289	0
NPV	247	107	355	161	466	626	2,842	0

\* THESE VALUES REPRESENT THE COST OF THE INCREASED FUEL CONSUMPTION DUE TO GREATER OFF-PEAK ENERGY USAGE. USED FOR LOAD SHIFTING PROGRAMS ONLY.

TOTAL RESOURCE COST TEST  
 PROGRAM METHOD SELECTED: REV\_REQ  
 PROGRAM NAME Gas HP vs 10 SEER AC w/1000 participants in 2000

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
YEAR	INCREASED SUPPLY COSTS \$(000)	UTILITY PROGRAM COSTS \$(000)	PARTICIPANT PROGRAM COSTS \$(000)	OTHER COSTS \$(000)	TOTAL COSTS \$(000)	AVOIDED GEN UNIT BENEFITS \$(000)	AVOIDED T&D BENEFITS \$(000)	PROGRAM FUEL SAVINGS \$(000)	OTHER BENEFITS \$(000)	TOTAL BENEFITS \$(000)	NET BENEFITS \$(000)	CUMULATIVE DISCOUNTED NET BENEFITS \$(000)
1998	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	22	6,991	0	7,013	0	0	111	0	111	(6,901)	(5,811)
2001	0	0	543	0	543	0	116	261	0	378	(166)	(5,939)
2002	0	0	557	0	557	0	116	246	0	362	(195)	(6,078)
2003	0	0	572	0	572	0	116	258	0	373	(199)	(6,207)
2004	0	0	587	0	587	0	115	278	0	394	(183)	(6,323)
2005	0	0	603	0	603	286	115	300	0	701	98	(6,269)
2006	0	0	619	0	619	260	116	309	0	685	65	(6,236)
2007	0	0	638	0	636	219	116	334	0	670	33	(6,221)
2008	0	0	654	0	654	231	117	326	0	674	20	(6,213)
2009	0	0	672	0	672	199	117	337	0	653	(19)	(6,220)
2010	0	0	691	0	691	218	118	345	0	681	(11)	(6,224)
2011	0	0	710	0	710	187	119	354	0	660	(50)	(6,240)
2012	0	0	731	0	731	186	120	369	0	675	(56)	(6,257)
2013	0	31	10,308	0	10,340	192	121	380	0	694	(9,646)	(8,914)
2014	0	0	774	0	774	197	122	390	0	710	(64)	(8,930)
2015	0	0	797	0	797	200	124	398	0	721	(75)	(8,948)
2016	0	0	820	0	820	205	125	405	0	735	(84)	(8,966)
2017	0	0	843	0	843	188	127	421	0	736	(107)	(8,987)
2018	0	0	868	0	868	153	129	443	0	725	(143)	(9,012)
2019	0	0	893	0	893	118	131	467	0	716	(177)	(9,042)
2020	0	0	919	0	919	81	133	483	0	697	(222)	(9,075)
2021	0	0	946	0	946	76	135	496	0	707	(239)	(9,108)
2022	0	0	973	0	973	71	139	510	0	719	(254)	(9,140)
2023	0	0	1,001	0	1,001	141	142	525	0	808	(193)	(9,163)
2024	0	0	1,030	0	1,030	110	146	542	0	798	(232)	(9,188)

NOM	0	54	34,741	0	34,794	3,518	2,976	9,289	0	15,783	(19,011)
NPV	0	27	14,078	0	14,105	1,095	981	2,842	0	4,918	(9,188)

Discount Rate: 8.98 %  
 Benefit/Cost Ratio (Col(11) / Col(6)) : 0.35

PARTICIPANT COSTS AND BENEFITS  
 PROGRAM METHOD SELECTED: REV\_REQ  
 PROGRAM NAME Gas HP vs 10 SEER AC w/1000 participants in 2000

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
YEAR	SAVINGS IN PARTICIPANTS BILLS \$(000)	TAX CREDITS \$(000)	UTILITY REBATES \$(000)	OTHER BENEFITS \$(000)	TOTAL BENEFITS \$(000)	CUSTOMER EQUIPMENT COSTS \$(000)	CUSTOMER O&M COSTS \$(000)	OTHER COSTS \$(000)	TOTAL COSTS \$(000)	NET BENEFITS \$(000)	CUMULATIVE DISCOUNTED NET BENEFITS \$(000)
1998	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0
2000	410	0	6,100	0	6,510	6,726	265	0	6,991	(481)	(405)
2001	829	0	0	0	829	0	543	0	543	285	(184)
2002	828	0	0	0	828	0	557	0	557	271	8
2003	840	0	0	0	840	0	572	0	572	268	182
2004	842	0	0	0	842	0	587	0	587	255	334
2005	851	0	0	0	851	0	603	0	603	248	470
2006	850	0	0	0	850	0	619	0	619	230	586
2007	854	0	0	0	854	0	636	0	636	218	686
2008	857	0	0	0	857	0	654	0	654	203	772
2009	857	0	0	0	857	0	672	0	672	185	844
2010	877	0	0	0	877	0	691	0	691	186	910
2011	876	0	0	0	876	0	710	0	710	166	964
2012	884	0	0	0	884	0	731	0	731	152	1,010
2013	889	0	6,100	0	6,989	9,556	752	0	10,308	(3,320)	96
2014	899	0	0	0	899	0	774	0	774	125	127
2015	904	0	0	0	904	0	797	0	797	108	152
2016	911	0	0	0	911	0	820	0	820	91	172
2017	912	0	0	0	912	0	843	0	843	69	185
2018	918	0	0	0	918	0	868	0	868	50	194
2019	924	0	0	0	924	0	893	0	893	31	199
2020	930	0	0	0	930	0	919	0	919	11	201
2021	936	0	0	0	936	0	946	0	946	(10)	199
2022	942	0	0	0	942	0	973	0	973	(31)	195
2023	948	0	0	0	948	0	1,001	0	1,001	(54)	189
2024	954	0	0	0	954	0	1,030	0	1,030	(77)	181

NOM	21,719	0	12,200	0	33,919	16,282	18,458	0	34,741	(522)
NPV	7,442	0	6,817	0	14,259	8,296	5,782	0	14,078	181

In Service of Gen Unit: 2005  
 Discount Rate : 8.98 %  
 Benefit/Cost Ratio ( Col(6) / Col(10)) 1.01

RATE IMPACT TEST  
 PROGRAM METHOD SELECTED: REV\_REQ  
 PROGRAM NAME Gas HP vs 10 SEER AC w/1000 participants in 2000

YEAR	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	INCREASED SUPPLY COSTS \$(000)	UTILTY PROGRAM COSTS \$(000)	INCENTIVES \$(000)	REVENUE LOSSES \$(000)	OTHER COSTS \$(000)	TOTAL COSTS \$(000)	AVOIDED GEN UNIT & FUEL BENEFITS \$(000)	T&D BENEFITS \$(000)	REVENUE GAINS \$(000)	OTHER BENEFITS \$(000)	TOTAL BENEFITS \$(000)	NET BENEFITS \$(000)	DISCOUNTED NET BENEFITS \$(000)	CUMULATIVE NET BENEFITS \$(000)
1998	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	22	6,100	250	0	6,372	111	261	111	0	0	(6,261)	(5,272)	0
2001	0	0	0	505	0	505	0	116	0	0	378	(128)	(5,371)	0
2002	0	0	0	505	0	505	246	116	0	0	362	(143)	(5,472)	0
2003	0	0	0	514	0	512	258	373	0	0	373	(139)	(5,563)	0
2004	0	0	0	514	0	514	278	115	0	0	394	(120)	(5,634)	0
2005	0	0	0	519	0	519	586	115	0	0	701	182	(5,535)	0
2006	0	0	0	518	0	518	569	116	0	0	685	166	(5,451)	0
2007	0	0	0	521	0	521	554	116	0	0	670	149	(5,382)	0
2008	0	0	0	523	0	523	557	117	0	0	674	151	(5,319)	0
2009	0	0	0	523	0	523	536	117	0	0	653	130	(5,268)	0
2010	0	0	0	535	0	535	563	118	0	0	681	146	(5,216)	0
2011	0	0	0	535	0	535	541	119	0	0	660	126	(5,175)	0
2012	0	31	6,100	539	0	6,574	539	120	0	0	675	136	(5,134)	0
2013	0	0	0	539	0	535	555	121	0	0	694	(5,980)	(6,781)	0
2014	0	0	0	549	0	549	587	122	0	0	710	161	(6,740)	0
2015	0	0	0	556	0	552	598	124	0	0	721	170	(6,701)	0
2016	0	0	0	556	0	556	610	125	0	0	735	180	(6,663)	0
2017	0	0	0	556	0	556	609	127	0	0	736	180	(6,628)	0
2018	0	0	0	560	0	560	598	129	0	0	725	165	(6,598)	0
2019	0	0	0	563	0	563	585	131	0	0	716	152	(6,573)	0
2020	0	0	0	567	0	567	564	133	0	0	697	130	(6,553)	0
2021	0	0	0	571	0	571	571	135	0	0	707	136	(6,535)	0
2022	0	0	0	574	0	574	574	139	0	0	719	145	(6,516)	0
2023	0	0	0	578	0	578	666	142	0	0	808	230	(6,489)	0
2024	0	0	0	582	0	582	652	146	0	0	798	216	(6,466)	0
NOM	0	54	12,200	13,248	0	25,502	12,807	2,976	981	0	0	15,783	(9,719)	(6,466)
NPV	0	27	6,817	4,540	0	11,384	3,937	981	0	0	0	4,918	(6,466)	(6,466)

Discount Rate  
 Benefit/Cost Ratio (Col(12) / Col(7)) :

8.98 %  
 0.43