

Oklahoma Gas
and
Electric Company

**2010 Oklahoma Demand Programs
Annual Report**

**Per Annual Reporting Requirements
Title 165: Oklahoma Corporation Commission
Chapter 35. Electric Utility Rules
Subchapter 41. Demand Programs
165:35-41-7. Reporting**

June 1, 2011



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1.0 Executive Summary

Executive Summary

OG&E is pleased to present to the Oklahoma Corporation Commission, The Comprehensive Demand Program Portfolio annual report for 2010. This is required to be filed by June 1, 2011 per Annual Reporting Requirements Title 165: Oklahoma Corporation Commission Chapter 35. Electric Utility Rules Subchapter 41. Demand Programs 165:35-41-7.

OG&E's demand and energy savings goals for 2010, as filed and approved by the Oklahoma Corporation Commission Cause No. PUD 200900200 and approved by Order No. 573419, were 11,941 kW and 45,492,053 kWh; representing a budget of \$15,401,538. The 2010 actual results achieved for demand and energy savings are 10,485 kW; 47,473,097 kWh; representing a cost of \$12,576,019.

HISTORY:

OG&E began implementation of the Demand Program in July 2008. The initial program was known as the Quick-Start Program. This portfolio contained seven programs, and continued through December 31, 2009. Quick Start allowed OG&E to build a framework to deliver programs to over 700,000 customers in the Oklahoma jurisdiction. The Comprehensive Demand Program was approved and implemented on February 10, 2010. The Comprehensive Demand programs will remain effect through December 31, 2012.

DEMAND & ENERGY SAVINGS:

The 2010 portfolio produced 104% of the energy savings goal and 88% of demand savings goal. These on-going energy savings will accumulate over the life of the measures.

EXPENDITURES:

The Demand Program expenses of \$12,576,019 for 2010 were 82% of the approved annual budget of \$15,401,538. \$11,671,166 of the \$12,576,019 was spent on inducements and \$904,853 for administrative expenses.

IMPLEMENTATION:

OG&E had two existing employees working in the Quick Start Program and they have continued to work in the Comprehensive Demand Program. Due to a restructuring within the company an additional six rate based employees were assigned over to manage the Comprehensive Demand Program Portfolio. In order to begin implementation of the Residential Thermal Efficiency program known as HEEP (Home Energy Efficiency Program), an RFP was issued and a turnkey contractor (CLEAResults) was selected. Frontier Associates created a data base (EnerTrek) for data collection for weatherization, Direct Options created an on line commercial lighting input form for our customers and contracts were executed for two weatherization contractors that work low and fixed income weatherization.

EVALUATION, MEASUREMENT & VERIFICATION:

Global Energy Partners was selected to perform the EM&V for the programs. Over the course of the 3 year program period they will perform a detailed process evaluation and a detailed impact evaluation on each of the programs. Included in this report are the process and impact evaluations and associated recommendations from Global Energy Partners for Program year 2010. The cost for the EM&V work performed in 2010 was \$101,170. Global Energy Partners provided findings and recommendations on all of the programs. There were several references to data collection issues that are being addressed. In addition Global pointed out that in the testimony for low and fixed income weatherization, not all measures were being installed and the energy and demand savings per home were not being achieved. Early on in the program, OG&E realized not all measures were being installed and thus the deemed savings was claimed only on the measures installed. In commercial lighting Global stated that OG&E underestimated the actual savings.

LOST REVENUE:

As part of the approved Comprehensive Demand Programs, OG&E is allowed to recover “lost revenue” for all of the Demand programs with the exception of the education program, although OG&E believes energy education is very important, the Company agreed not to collect lost revenues for the education program. OG&E has reported \$2,844,902 in lost revenues for the demand programs during 2010.

INCENTIVE:

OG&E was able to earn an incentive on the amount of energy efficient reductions that were obtained. This incentive was calculated using the Total Resource Cost Test (TRC) for each program, OG&E was allowed to earn a shared incentive of 15%, based on the net benefit TRC of the programs and the program costs. During 2010, OG&E earned \$2,727,818 in incentive payments. However, in the Settlement Agreement reached in Cause No. PUD 200900200 the incentive was capped at \$2,700,000 for 2010.

RESOURCE PLANNING:

The demand reduction in this portfolio is part of the Integrated Resource Plan (IRP). The results from the Demand programs are an integral part of the Company’s future capacity planning needs. They are included in the integrated Resource Plan (IRP). Every 3 years, OG&E develops demand response programs based on customer needs and dollars available in order to meet the Company’s growing energy demands.

RESULTS:

OG&E believes that the Comprehensive Demand Programs were very successful in 2010. Each program appeared to be properly staffed and most of the programs were properly budgeted. The commercial lighting program had better than expected participation. The fixed income weatherization program started slow. As the word spread of the savings available from participation, the number of customers grew. By year’s end, the anticipated number of fixed income customers weatherized had exceeded the annual budgeted amount. The geothermal program has less participation than expected; this market appears to be a market for high end homes owners or customers that could take advantage of the tax credit.

COST EFFECTIVENESS:

OG&E is required annually to provide the Oklahoma Corporation Commission with an update to the Cost Effectiveness of each of the demand programs. OG&E engaged Frontier Associates to provide this analysis. Based on Frontier Associates new calculations, the report shows that all programs continue to be cost effective and the results of the Total Resource Cost Test show the present value net benefits to be \$39,178,820; \$26,302,560 from Commercial/Industrial and \$12,876,260 Residential.

CONCLUSION:

The Comprehensive Program was approved February 10, 2010, for a 3 year term for calendar years 2010 through 2012. The Demand Program Portfolio performed very well in 2010. Due to the restructuring at OG&E the programs started off slow, but gained momentum throughout the year. Through survey results and customer appreciation notes received, our customers had been very appreciative of our weatherization efforts. The HEEP program has allowed OG&E to educate our customers on energy efficiency in their homes. The commercial lighting program was very well accepted, but will have to be shut down in 2011 unless additional funds can be obtained. The Standard Offer Program (SOP) was targeted at Industrial Customers, however many industrial customers opted out and the commercial sector benefited through the installation of geothermal units and HVAC change outs. The amount of energy saved by the comprehensive demand programs is enough electricity to power 3600 homes annually. OG&E expects to continue with the same momentum in 2011.

2.0 Portfolio Impact

Table 1 summarizes the expenditures for 2010. Please note that in 2010 money was budgeted for the research and development project but no money was actually spent. The R&D projects were in the planning stages.

TABLE 1

Demand Programs Portfolio Summary by Cost Type					
Program Cost Summary	2010 Total Cost				
	Type	%	Budget (\$)	Actual (\$)	%
Inducements		90%	13,422,115	11,671,166	87%
Administration		10%	1,479,423	904,853	13%
Subtotal		100%	14,901,538	12,576,019	100%
Research & Development		100%	500,000	0	0%

Table 2 below is a summary of the money spent by program in 2010.

TABLE 2

Demand Programs Portfolio Summary by Program						
Program Name	Program Number	Program Type	Market	2010		% of Funds Used
				Budget (\$)	Actual (\$)	
Low Income Weatherization	1	Weatherization	Res (All)	6,568,080	6,094,498	92.79%
Fixed Income Weatherization	2	Weatherization	Res (All)	1,824,103	2,447,710	134.19%
Residential HEEP	3	HVAC Inspection or Tune-up	Res (Single-Family)	3,422,222	1,410,056	41.20%
Positive Energy Home	4	New Construction- Incentives	Res (Single-Family)	133,247	115,455	86.65%
Geothermal HVAC	5	HVAC	Res (Single-Family)	833,333	146,805	17.62%
Commercial Lighting	6	Lighting	Small C&I (All)	656,436	1,116,052	170.02%
Standard Offer Program - C&I	7	Custom and Bundled	Small C&I (All)	322,818	164,966	51.10%
Education	8	Energy Audit or Evaluation	Res (All)	1,141,299	1,080,477	94.67%
Research & Development	-	Research & Development	-	500,000	0	0.00%
Total				15,401,538	12,576,019	81.65%

Table 3 below shows the inducements paid by program for 2010.

Table 3

Demand Programs Inducements by Program			
Program Name	Budget	Actual	% of Funds
Low Income Weatherization	\$ 5,911,272	\$ 5,881,907	99.50%
Fixed Income Weatherization	\$ 1,641,693	\$ 2,361,246	143.83%
Residential HEEP	\$ 3,080,000	\$ 1,126,741	36.58%
Positive Energy Home	\$ 119,922	\$ 113,850	94.94%
Geothermal HVAC	\$ 750,000	\$ 145,275	19.37%
Commercial Lighting	\$ 590,792	\$ 1,045,840	177.02%
Standard Offer Program	\$ 290,536	\$ 162,830	56.04%
Education	\$ 1,037,900	\$ 833,477	80.30%
Totals	\$ 13,422,115	\$ 11,671,166	86.95%

Table 4 below shows a breakdown of the administration costs for 2010

Table 4

Demand Programs Administration Costs			
Admin Costs	Budget	Actual	% of Funds Used
EM&V	\$ 398,440	\$ 101,170	25.39%
Marketing	\$ 98,406	\$ 267,639	271.97%
Printing	\$ 14,500	\$ 25,234	174.02%
Professional Services	\$ 132,000	\$ 611,981	463.62%
Employee Expenses	\$ 48,000	\$ -	0.00%
Labor	\$ 800,000	\$ -	0.00%
Total	\$ 1,491,346	\$ 904,854	60.67%

Table 5 below shows the kWh, kW and the dollars spent on the Comprehensive Demand Programs in 2010. Variance explanations for each program are listed on the next page.

TABLE 5

kWh	Energy Savings		
	kWh		% of
	Budget	Actual	Goal
Program			
Low Income Weatherization	15,073,181	8,242,915	55%
Fixed Income Weatherization	4,185,655	3,108,236	74%
Residential HEEP	4,648,919	649,329	14%
Positive Energy Home	187,602	173,302	92%
Geothermal HVAC	3,239,039	627,556	19%
Commercial Lighting	10,778,000	29,754,696	276%
Standard Offer Program - C&I	7,379,657	4,917,063	67%
Education	0	0	-
Total	45,492,053	47,473,097	104%
DEMAND kW	2010		
	kW		% of
	Budget	Actual	Goal
Program			
Low Income Weatherization	3,120.00	1,742.82	56%
Fixed Income Weatherization	866.00	785.24	91%
Residential HEEP	3,284.00	983.15	30%
Positive Energy Home	135.00	124.68	92%
Geothermal HVAC	791.00	153.26	19%
Commercial Lighting	2,757.00	5,991.13	217%
Standard Offer Program - C&I	988.00	704.34	71%
Education	0.00	0.00	-
Total	11,941.00	10,484.62	88%
BUDGET	2010		
	Budget	Actual	% of
	(\$)	(\$)	Goal
Program			
Low Income Weatherization	6,568,080	6,094,498	93%
Fixed Income Weatherization	1,824,103	2,447,710	134%
Residential HEEP	3,422,222	1,410,056	41%
Positive Energy Home	133,247	115,455	87%
Geothermal HVAC	833,333	146,805	18%
Commercial Lighting	656,436	1,116,052	170%
Standard Offer Program - C&I	322,818	164,966	51%
Education	1,141,299	1,080,477	95%
Regulatory	0	0	-
Total	14,901,538	12,576,019	84%

Note: R&D projects are not included in these totals.

Explanations of Demand Program Variances

Low Income Weatherization-

55% - kWh Energy Savings 56% KW Demand Savings 93% Budget Spent

There were 9 weatherization impact measures for the program. One of the largest impact measures was duct sealing, the duct sealing was being performed however, since a duct blaster test was not being performed only a small fraction of the duct sealing saving was being accounted for under infiltration. Modifications are being made to the data base and duct blaster tests are going to be performed on approximately 100 homes to create a statically valid deemed savings value. Due to the cost of the duct blaster test, creating a value representative of all homes should be sufficient and the money that would have been spent on testing can be utilized to weatherize additional homes.

Fixed Income Weatherization-

74% - kWh Energy Savings 91% KW Demand Savings 134% Budget Spent

See explanation above under Low Income Weatherization. In addition, this program gained momentum after the initial promotion by word of mouth, causing this program to exceed the 2010 program budget.

Residential HEEP-

14% - kWh Energy Savings 30% KW Demand Savings 41% Budget Spent

The HEEP program required large upfront costs to get the program rolled out. The savings both in energy and demand are accounted for from the A/C tune-ups and duct repairs. A/C tune-ups can only be performed when the temperature is above 70°, due to the late roll-out only a minimal number of tunes were performed in 2010.

Positive Energy Home-

92% - kWh Energy Savings 92% KW Demand Savings 87% Budget Spent

This program is on track and under budget.

Geothermal HVAC-

19% - kWh Energy Savings 19% KW Demand Savings 18% Budget Spent

This program is on track for the amount of energy and demand savings claimed verse money spent. The high upfront cost continues to be a barrier for customers.

Commercial Lighting-

276% - kWh Energy Savings 217% KW Demand Savings 170% Budget Spent

This program was established during the Quick Start Program and has gained wide acceptance with our customers. This program will have to be discontinued in June 2011 unless additional funds can be made available.

Standard Offer Program-

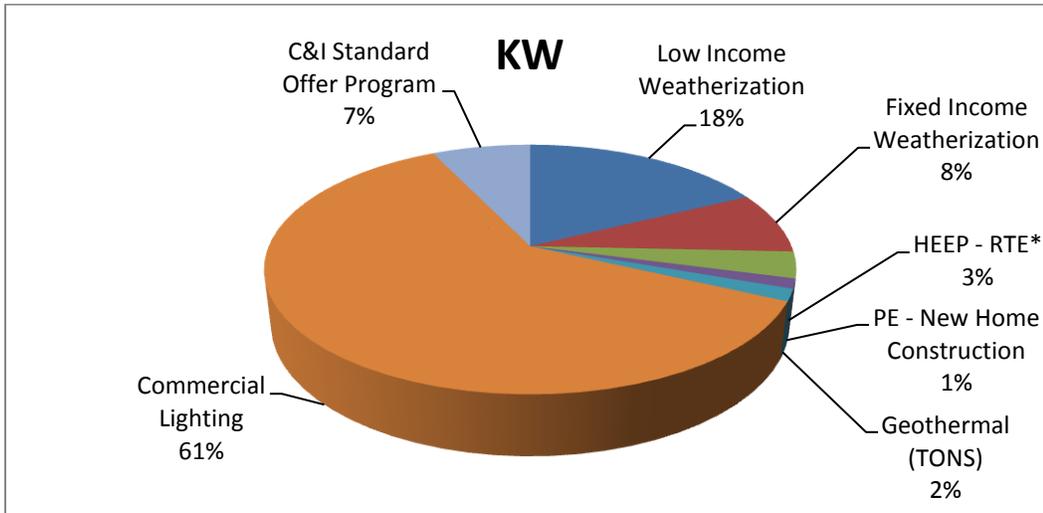
67% - kWh Energy Savings 71% KW Demand Savings 51% Budget Spent

This program is on track and under budget for 2010. The niche market for this program has become the commercial geothermal installations and HVAC equipment upgrades. Due to a restructuring at

OG&E, a sales consultant was not put in place until May 2010. With the current projects in the pipeline, this program will be at the 2 year budgeted spend by the end of 2011.

Chart 1 shows the kW savings by program. 61% of the kW savings for 2010 was from the commercial lighting sector followed by 26% from low income and fixed income weatherization.

CHART 1



3.0 Portfolio Programs

3.1 Low Income Weatherization Program

3.1.1 Program Description

The OG&E Oklahoma Low Income Weatherization Program is a comprehensive long term energy efficiency program targeted to Oklahoma OG&E residential customers that allows the customer to participate in programs to assist in managing energy costs and to begin to be able to utilize price response tariffs. The program targeted OG&E Oklahoma residential customers who own, rent, or lease their home, built prior to 2000, and who have incomes at or below 200% of the Federal Poverty Guidelines, or are owners of multifamily units whose population rental units are 75% occupied by customers certified as Hard-to-Reach per program guidelines. The program is designed to improve the thermal envelope of the dwelling and the use of energy efficient appliances.

OG&E views the Oklahoma Low Income Weatherization Program as a key component in the DSM area. Two contractors, Skyline Energy Solutions and Titan ES, Inc., were chosen to help implement the program. Both contractors received training from OG&E on program requirements, as well as training on EnerTrek® the on-line database provided and supported by Frontier Associates. EnerTrek® is used to record contractor inputs for each home, which resulted in capturing actual kW and kWh savings by measure. OG&E partnered with several agencies to provide weatherization leads for the Oklahoma Low Income Weatherization Program., including Urban League of Greater OKC and Oklahoma Association of Community Action Agency. OG&E also partnered with Central Oklahoma Habitat for Humanity and Rebuilding Together, which enabled these non-profit agencies to provide weatherization services to qualified OG&E customers, based on OG&E's Program requirements. OG&E also partnered with Whirlpool Corporation for EnergyStar refrigerators for qualified customers. Oklahoma Low Income Weatherization Program presentations were made by OG&E member to civic organizations, senior citizens groups, and to church groups throughout the OG&E Oklahoma territory, informing customers of the program.

Contractors started weatherizing homes in late February 2010 in the OG&E Oklahoma service area and completed 3,085 homes as of December 31, 2010. Contractor crews installed key weatherization measures in the homes to upgrade them to energy efficient standards. One of the measures, solar screens, was not fully utilized in program. This was due in part to the consumer not wanting to change the aesthetics of their home and this was not a permanent solution to the problem of solar infiltration. Wall insulation was also not fully utilized in the program, due to the measure being costly to perform and stay within the budgeted dollars. Blower door testing was utilized in each home providing a measurable air leakage reduction, which enabled the Program to capture actual kW and kWh reductions for CFM reduction. Some of the measures installed included: ceiling insulation, air infiltration, caulking, weather- stripping, window pane replacement, door replacement, refrigerator replacement, window unit replacement, compact fluorescent lighting, duct and plenum repair, return air cavity sealing, CO detectors, smoke detectors, water heater blankets, HVAC tune-ups.

OG&E continues to audit the Program in the field on a regular basis to ensure that proper installation procedures and safety standards are followed. Contractors are encouraged to attend and receive additional training for improvements in proper home weatherization methods.

3.1.2 Program Highlights

- The Oklahoma Low Income Weatherization Program was launched February 10, 2010.
- OG&E weatherized 3,086 homes during 2010 at an average cost of \$2,011 per home.
- Deal Construction, a contractor in the Oklahoma Quick Start program, failed to report 111 homes for 2009, resulting in charges incurred in the Oklahoma Low Income Weatherization 2010 program year. The number of homes weatherized, kW and kWh deemed savings will be reported in 2011.
- Online database EnerTrek®, provided and supported by Frontier Associates, was implemented to capture customer information including actual kW and kWh savings by measure installed.
- OG&E weatherized its first low income apartment complex for OKC Housing Authority.

3.1.3 Program Budget, Savings and Participation

TABLE 5

Low Income Weatherization													
2010			Budgeted Savings		Deemed Savings		% of Goal		2010				
Annual Budget	Actual Expenses	% of Budget	Demand kW	Energy* kWh	Demand kW	Energy* kWh	Demand kW	Energy* kWh	Participants			% of Goal	
									Targeted	Actual	Wait List		
\$6,568,080	\$6,094,498	95%	3,120.00	15,073,181	1,742.82	8,242,915	56%	55%	3,000	3,086	0	103%	
*Lifetime Savings													

- The actual savings realized for each low income home was calculated using EnerTrek®, an online database provided and supported by Frontier Associates, which provided actual kW and kWh savings per measure.
- OG&E weatherized 3,086 homes for an annual kWh savings of 8,242,915 and an annual demand savings of 1,743 kW. These annual savings have an average life of 15 years for a lifetime energy savings of 123,643,725 kWh.

3.1.4 Program Events and Training

Highlights of Events:

- Training events during the year included updates to the contractors on weatherization procedures and database enhancements for capturing customer information.
- Civic and community presentations, promoting the OG&E Weatherization Program, were conducted by OG&E member throughout OG&E’s service area.
- OG&E participated in Weatherization Day at the Community Action Agency of OKC.



- OG&E performed post inspections on a random sample of weatherized homes on a monthly basis for completion, proper application, and verification of work performed.
- OG&E weatherized its first low income apartment complex this year -- the OKC Housing Authority.
- Training events during the year included updates to the contractors on weatherization procedures and database enhancements for capturing customer information.
- Online database EnerTrek®, provided and supported by Frontier Associates, was implemented to capture customer information, including actual kW and kWh savings by measure installed.
- OG&E produced two educational weatherization DVD's for customers: 1) Part One-"Be Prepared" , what to expect before weatherization. DVD's were mailed to those that had signed up for the program to let them know who the contractors were. Early in the program we were experiencing a low response and felt this would help the customer identify our contractors when they called to set up an appointment. 2) Part Two-"More Ways to Save" was given to the customer after weatherization, which included tips on additional no-cost or low cost ways to save. We have discovered that most of our Low Income customers do not watch the DVD.
- OG&E created a Weatherization pocket folder that was given to the customer, which included the Part Two DVD, 12-Month To Do List brochure with additional tips, OG&E PowerPlus brochure with additional services offered by OG&E, a Smart Grid brochure explaining the new smart meter technology, Who to Call with products, services, and OG&E contact numbers, and an insert explaining the weatherization programs.
- OG&E implemented ID badges and uniforms as a safety and security feature for the weatherization contractors and crews. This provided the customer a way of identifying the weatherization crews as contractors for OG&E. This has been received extremely well by our customers.
- Civic and community presentations promoting the OG&E Weatherization Program were conducted by OG&E member throughout OG&E's service area. (see Training section – external and internal)
- OG&E partnered with the Urban League of OKC to provide weatherization leads. OG&E pays \$50 for each lead.
- OG&E partnered with two Community Action Agencies to provide leads for weatherization. OG&E pays \$50 for each lead.
- Participated in Weatherization Day at the Community Action Agency of OKC. OG&E had a table top booth at the event, handed out brochures on weatherization and other DSM programs, and discussed OG&E's Weatherization Program with individuals.
- OG&E performed post inspections on weatherized homes on a monthly basis for completion, proper application, and verification of work performed.

Program and member Certification:

- OG&E members received certification on EPA-HUD curriculum for Lead Safety for Renovation, Repair, and Painting Certification.

Training

EXTERNAL TRAINING (contractors, trade allies, consumer groups, etc.)

Date	Class Name	Class Description	Training Location	Sponsor	# attendees (A)
3/30/2010	Blower Door Training	Train contractors on blower door procedures	OKC	OG&E	10
4/15/2010	EnerTrek Training	Training on EnerTrek database	OG&E	Frontier	10
4/17/2010	Live Earth Eco Festival	Promoting DSM program portfolio	Remington	OG&E	10
4/29/2010	Contractor training	Weatherization Techniques and forms	Pauls Valley-Skyline Energy Solutions	OG&E	35
10/15/2010	Weatherization procedures	Review weatherization methods, forms	Pauls Valley-Skyline Energy Solutions	OG&E	8
10/20/2010	Weatherization Day at CAA	Tabletop display	Community Action Agency in OKC	Community Action Agency in OKC	40
12/6/2010	EnerTrek Training	EnerTrek database training for recording weatherization inputs	OG&E	OG&E	4

INTERNAL TRAINING (Utility or Administrator Staff)

Date	Class Name	Class Description	Training Location	Sponsor	# attendees (A)
1/26/2010	Lead Safe Work Practices	Lead Safety for Renovation	City Office	City of Ft Smith	23
3/10/2010	Deemed Savings	Review deemed savings	OG&E	Frontier	5
4/28/2010	EnerTrek database	inputs for online database	OG&E	Frontier	6
12/2/2010	Infrared Camera Training	How to use the IR camera	Energy Technology Center	OG&E	6
12/4/2010	Renewable Energy Sources and the Smart Grid course	Alternative energy sources	OG&E	Bismark State College	1

3.1.5 Challenges and Opportunities

Initially, OG&E was accepting leads from customers on OG&E's LIAP rate. Once this list was exhausted, OG&E made some procedural in-house adjustments to qualify customers based on the 2010 Federal Poverty Guidelines, which changes annually. OG&E removed the requirement to reside at the residence at least 12 months in order to make the program available to a broader base of low income residential customers. Additionally, OG&E partnered with several agencies to obtain qualified leads. OG&E has been able to maintain a steady pace in obtaining and qualifying customers.

An additional challenge the Oklahoma Low Income Program has experienced is the number of unvented combustion space heaters. Due to health and safety, OG&E will not weatherize a home that has unvented combustion space heaters as its main source of heat. The customer may qualify for the program but the home may not qualify due to program restrictions such as this.

3.1.6 Outlook for Continuation, Expansion, Reduction or Termination

The OG&E Weatherization Program showed growth by performing more assessments in 2010 than the prior 18 months of the Quick Start Program. Using the Quick Start to launch this program showed that the program will be able to provide good opportunities for 2011.

3.1.7 Planned or Proposed Changes to Program and Budget

OG&E plans on implementing the duct tool within the EnerTrek® database to capture actual kW and kWh savings associated with this measure. The Duct Blaster is used to record duct air tightness measurements that are used to diagnose and demonstrate leakage problems, estimate efficiency losses from duct leakage, and certify compliance with duct leakage standards such as California's Title 24 Building Energy Efficiency Standards. The tool will be available in 2011.

3.1.8 Program Evaluation:

OG&E Low Income Weatherization Program

Ten percent of the homes that were weatherized under the OG&E Oklahoma Low Income Weatherization program received a post weatherization inspection. All of the post inspections were performed by the OG&E Program Managers. The selection process was purely random, selecting homes weatherized by OG&E contractors. The inspection process involved a walk-through of the home to visually inspect the stated weatherization services that were listed on the invoice and to ensure weatherization work was properly performed.

3.2 Fixed Income Weatherization Program

3.2.1 Program Description

The OG&E Oklahoma Fixed Income Weatherization Program is a comprehensive long term energy efficiency program targeted to Oklahoma OG&E residential customers that allows the customer to participate in programs to assist in managing energy costs and to begin to be able to utilize price response tariffs. The program targeted Oklahoma OG&E residential customers who own their own home, that is single-family, site built, owner-occupied, built prior to 2000, and who have incomes at or below \$35,000, and who are age 65 or older. A “Fixed Income Customer” is a customer whose income has minimal variance during a given time period. These customers typically have relatively limited discretionary income or have little financial freedom to make large expenditures. The program is designed to improve the thermal envelope of the dwelling and the use of energy efficient appliances.

OG&E views the Oklahoma Fixed Income Weatherization Program as a key component in the DSM area. Two contractors, Skyline Energy Solutions and Titan ES, Inc., were chosen to help implement the program. Both contractors received training from OG&E on program requirements, as well as training on EnerTrek® the on-line database provided and supported by Frontier Associates. EnerTrek® is used to record contractor inputs for each home, which resulted in capturing actual kW and kWh savings by measure. OG&E partnered with several agencies to provide weatherization leads for the Oklahoma Fixed Income Weatherization Program., including Urban League of Greater OKC and Oklahoma Association of Community Action Agency. OG&E also partnered with Central Oklahoma Habitat for Humanity and Rebuilding Together, which enabled these non-profit agencies to provide weatherization services to qualified OG&E customers, based on OG&E’s Program requirements. OG&E also partnered with Whirlpool Corporation for EnergyStar refrigerators for qualified customers. Oklahoma Fixed Income Weatherization Program presentations were made by OG&E member to civic organizations, senior citizens groups, and to church groups throughout the OG&E Oklahoma territory, informing customers of the program.

Contractors started weatherizing homes in late February 2010 in the OG&E Oklahoma service area and completed 1,252 homes as of December 31, 2010. Contractor crews installed key weatherization measures in the homes to upgrade them to energy efficient standards. One of the measures, solar screens, was not fully utilized in program. This was due in part to the consumer not wanting to change the aesthetics of their home and this was not a permanent solution to the problem of solar infiltration. Blower door testing was utilized in each home providing a measurable air leakage reduction, which enabled the Program to capture actual kW and kWh reductions for CFM reduction. Some of the measures installed included: ceiling insulation, air infiltration, caulking, weather- stripping, window pane replacement, door replacement, refrigerator replacement, window unit replacement, compact fluorescent lighting, duct and plenum repair, return air cavity sealing, CO detectors, smoke detectors, water heater blankets, HVAC tune-ups.

OG&E continues to audit the Program in the field on a regular basis to ensure that proper installation procedures and safety standards are followed. Contractors are encouraged to attend and receive additional training for improvements in proper home weatherization techniques.

3.2.2 Program Highlights

- The Oklahoma Fixed Income Weatherization Program was launched February 10, 2010.
- OG&E weatherized 1,252 homes in 2010 at an average cost of \$1,973 per home.
- Civic and community presentations highlighting the program were conducted by OG&E member throughout the service area served by OG&E promoting the Oklahoma Fixed Income Weatherization Program. These presentations were well received throughout the OG&E service area.

3.2.3 Program Budget, Savings and Participation

TABLE 6

Fixed Income Weatherization													
2010			Budgeted Savings		Deemed Savings		% of Goal		2010			% of Goal	
Annual Budget	Actual Expenses	% of Budget	Demand kW	Energy* kWh	Demand kW	Energy kWh	Demand kW	Energy* kWh	Participants				
									Targeted	Actual	Wait List	Goal	
\$1,824,103	\$2,447,710	136%	866.00	4,185,655	785.24	3,108,236	91%	74%	833	1,252	0	150%	
*Lifetime Savings													

- The actual savings realized for each Fixed Income home was calculated using EnerTrek®, OG&E weatherized 1,252 homes for an annual kWh savings of 3,108,236 and annual demand savings of 785 kW. These annual savings have an average life of 15 years for a lifetime energy savings of 46,623,540 kWh.

3.2.4 Program Events and Training

Highlights of Events:

- Training events during the year included updates to the contractors on weatherization procedures and database enhancements for capturing customer information.
- Online database EnerTrek®, provided and supported by Frontier Associates, was implemented to capture customer information, including actual kW and kWh savings by measure installed.
- OG&E produced two educational weatherization DVD's for customers: 1) Part One-“Be Prepared”, what to expect before weatherization. DVD's were mailed to those that had signed up for the program to let them know who the contractors were. Early in the program we were experiencing a low response and felt this would help the customer identify our contractors when they called to set up an appointment. 2) Part Two-“More Ways to Save” was given to the customer after weatherization, which included tips on additional no-cost or low cost ways to save. We have discovered that most of our Fixed Income customers do not have a DVD player to watch the DVD.
- OG&E created a Weatherization pocket folder that was given to the customer, which included the Part Two DVD, 12-Month To Do List brochure with additional tips, OG&E PowerPlus brochure with additional services offered by OG&E, a Smart Grid brochure explaining the new smart meter



technology, Who to Call with products, services, and OG&E contact numbers, and an insert explaining the weatherization programs.

- OG&E implemented ID badges and uniforms as a safety and security feature for the weatherization contractors and crews. This provided the customer a way of identifying the weatherization crews as contractors for OG&E. This has been received extremely well by our customers.
- Civic and community presentations promoting the OG&E Weatherization Program were conducted by OG&E member throughout OG&E’s service area. (see Training section – external and internal)
- Participated in Weatherization Day at the Community Action Agency of OKC.
- OG&E performed post inspections on weatherized homes on a monthly basis for completion, proper application, and verification of work performed.

Program and Member Certification:

OG&E member received certification on EPA-HUD curriculum for Lead Safety for Renovation, Repair, and Painting Certification.

Training

EXTERNAL TRAINING (contractors, trade allies, consumer groups, etc.)

Date	Class Name	Class Desc	Training Location	Sponsor	# attendees (A)
3/30/2010	Blower Door Training	Train contractors on blower door procedures	OKC	OG&E	10
4/15/2010	EnerTrek Training	Training on EnerTrek database	OG&E	Frontier	10
4/17/2010	Live Earth Eco Festival	Promoting DSM program portfolio	Remington	OG&E	10
4/29/2010	Contractor training	Weatherization Techniques and forms	Pauls Valley-Skyline Energy Solutions	OG&E	35
10/15/2010	Weatherization procedures	Review weatherization methods, forms	Pauls Valley-Skyline Energy Solutions	OG&E	8
10/20/2010	Weatherization Day at CAA	Tabletop display	Community Action Agency in OKC	Community Action Agency in OKC	40
11/11/2010	Seminar for Seniors	Weatherization	Drumright First Baptist Church	OG&E	30
12/6/2010	EnerTrek Training	EnerTrek database training for recording weatherization inputs	OG&E	OG&E	4
10/21/10	DSM/Energy Tips	Agency board requested presentation	Oklahoma County Senior Nutrition Program Site Manager's Meeting	OG&E	20
11/01/10	DSM/Energy Tips	Promote Weatherization program	Spencer Nutrition Site	OG&E	26
11/29/2010	DSM/Energy Tips	Promote Weatherization program	Penn Nutrition Site	OG&E	21
7/13/2010	DSM	Group requested presentation	Drumright Senior Center	OG&E	17
8/4/2010	DSM	Information sharing meeting	Muskogee Interagency Meeting	OG&E	22
9/14/2010	DSM	Group requested presentation	Drumright Senior Center	OG&E	70
4/8/10	Wind Power / DSM	Explain wind power /DSM	1st Baptist-El Reno-Seniors	OG&E	40
6/30/10	Fixed Income Weatherization/Heat Stress	Explain Weatherization for srs	Byars Senior Center	OG&E	15
7/1/10	Fixed Income Weatherization/Heat Stress	Explain Weatherization for srs	Midwest City Senior Citizens	OG&E	90
7/16/10	Fixed Income Weatherization/Heat Stress	Explain Weatherization for srs	Eagle Heights-Moore-Seniors	OG&E	35
7/19/10	Fixed Income	Explain Weatherization for srs	Choctaw Senior Center	OG&E	40



7/27/10	Weatherization/Heat Stress Fixed Income	Explain Weatherization for srs	Del City Senior Citizens	OG&E	50
7/29/10	Weatherization/Heat Stress Fixed Income	Explain Weatherization for srs	Brand Senior Center - Moore	OG&E	80
8/12/10	Weatherization/Heat Stress Fixed Income	Explain Weatherization for srs	Noble Senior Citizens Center	OG&E	40
8/25/10	Weatherization/Heat Stress Fixed Income	Explain Weatherization for srs	Norman Senior Citizens Center	OG&E	38
12/16/2010	Weatherization	Explain Weatherization for srs	Alva Senior Center	OG&E	35
12/14/2010	Weatherization	Explain Weatherization for srs	Seiling Senior Center	OG&E	30
12/13/2010	Weatherization	Explain Weatherization for srs	Billings Senior Center	OG&E	10
12/13/2010	Weatherization	Explain Weatherization for srs	Garber XYZ Senior Center	OG&E	10
12/7/2010	Weatherization	Explain Weatherization for srs	Woodward Senior Center	OG&E	50
11/11/2010	Weatherization	Explain Weatherization for srs	Resource Alliance Group	OG&E	25
11/2/2010	Weatherization	Explain Weatherization for srs	Waukomis Senior Center	OG&E	15
10/20/2010	Weatherization	Explain Weatherization for srs	OEDA Agency Group	OG&E	20

INTERNAL TRAINING (Utility or Administrator Staff)

Date	Class Name	Class Desc	Training Location	Sponsor	# attendees (A)
1/26/2010	Lead Safe Work Practices	Lead Safety for Renovation	City Office	City of Ft Smith	23
3/10/2010	Deemed Savings	Review deemed savings	OG&E	Frontier	5
4/28/2010	EnerTrek database	inputs for online database	OG&E	Frontier	6
12/2/2010	Infrared Camera Training	How to use the IR camera	Energy Technology Center	OG&E	6
12/4/2010	Renewable Energy Sources and the Smart Grid course	Alternative energy sources	OG&E	Bismark State College	1

3.2.5 Challenges and Opportunities

Early in the Program, OG&E had a slow start in obtaining leads for the Fixed Income Program. Marketing efforts to target this segment, through bill inserts and community presentations, paid off in mid-year. OG&E removed the requirement to reside at the residence at least 12 months in order to make the program available to a broader base of fixed income residential customers. Additionally, OG&E partnered with several agencies to obtain qualified leads. OG&E has been able to maintain a healthy list of qualified customers.

3.2.6 Outlook for Continuation, Expansion, Reduction or Termination

The OG&E Fixed Income Weatherization Program was well received in the community. The Program exceeded its goal in 2010 and continues to grow at a fast pace. The Program will meet its three year program goal before the end of 2011 and will run out of funds by mid-year 2011.

3.2.7 Planned or Proposed Changes to Program and Budget

OG&E plans on implementing the duct tool within the EnerTrek® database to capture actual kW and kWh savings associated with this measure. The Duct Blaster is used to record duct air tightness measurements that are used to diagnose and demonstrate leakage problems, estimate efficiency losses from duct leakage, and certify compliance with duct leakage standards such as California's Title 24 Building Energy Efficiency Standards. The tool will be available in 2011.

3.2.8 Program Evaluation

OG&E Fixed Income Weatherization Program

Ten percent of the homes that were weatherized under the OG&E Oklahoma Fixed Income Weatherization program received a post weatherization inspection. All of the post inspections were performed by the OG&E Program Managers. The selection process was purely random, selecting homes weatherized by OG&E contractors. The inspection process involved a walk-through of the home to visually inspect the stated weatherization services that were listed on the invoice and to ensure weatherization work was properly performed.

3.3 Home Energy Efficiency Program

3.3.1 Program Description

The Home Energy Efficiency Program (HEEP) is an offering that was filed under the name Residential Thermal Efficiency and is approved by the Oklahoma Corporation Commission. HEEP is a sequential four-tier offering to residential customers. Customers pay \$50 to enroll in the program and can sign up for the program through the direct mail insert, e-mail or by calling the external call center.

1. The program begins with an on-site energy audit provided by an OG&E contractor. OG&E has partnered with CLEARResults to deliver the program. Upon completion of the audit, customers receive specific recommendations and information about their home to help reduce their energy use. The value of the audit is \$250.
2. After the energy audit, customers are eligible for a free cooling system service performed by a trained heating and cooling specialist. The value of the cooling system service is \$75; customers receive the service for free.
3. After the cooling system service, customers are eligible for \$300 of duct system repair and tightening.
4. Customers without central heating and cooling are eligible for ENERGY STAR appliance rebates (\$40 per window unit and dishwasher replacement and \$25 per refrigerator or freezer replacement).

3.3.2 Program Highlights

- In January 2010, the RFI was released to the public and OG&E received 10 respondents.
- In February 2010 DSM programs approved by OCC. Immediately thereafter OG&E released the RFP to six companies that responded to RFI that had the capability of delivering the program.
- In March 2010 RFP Proposal Review was performed and CLEARResult Consulting Incorporated was selected and contract negotiations began.
- In April 2010 OG&E Program Managers, Donney Dorton and Gale Lewis, were selected.
- On July 16, 2010 the contract was signed with CLEARResult (CR) to deliver the HEEP Program
- In July 2010 the Home Energy Specialists (HES) performed the first 20 audits.
- In September 2010, OG&E Marketing began Direct Mail and Email solicitations to Oklahoma City metro area residential customers.
- At year end 2010, 1457 audits had been conducted by HES, 477 homes received an a/c tunes, and 375 duct seals had been performed.
- On January 1, 2011 HEEP Program went statewide to all OG&E residential customers, additional HES were added by CR, and a scheduling tool to make it easier to schedule HES in the outer lying areas.
- Beginning with the February 2011 billing cycle, OG&E marketed statewide in the OG&E Currents with \$50 fee waived

- To date, 6456 audits performed by the HES, another 6313 audits scheduled to be performed, 1927 a/c tunes performed by licensed contractors with requests for an additional 6094 to be performed.

3.3.3 Program Budget, Savings and Participation

TABLE 7

Residential HEEP													
2010			Budgeted Savings		Deemed Savings		% of Goal		2010			% of Goal	
Annual Budget	Actual Expenses	% of Budget	Demand kW	Energy* kWh	Demand kW	Energy* kWh	Demand kW	Energy* kWh	Participants				
									Targeted	Actual	Wait List		
\$3,422,222	\$1,410,056	47%	3,284.00	4,648,919	983.15	649,329	30%	14%	10,000	1,460	0	15%	
*Lifetime Savings													

- The deemed savings realized for each home was calculated using 0.3284 kW and 464.89 kWh per home. This number was evaluated and derived by Frontier Associates.
- OG&E had 1,460 on-site energy audits on homes, which included 476 HVAC tune-ups and 374 duct repairs for an annual kWh savings of 649,329 and annual demand savings of 479 kW. These annual savings have an average life of 13 years for a lifetime energy savings of 2,051,977 kWh.

3.3.4 Program Events and Training

- July 13, 2010, OG&E trained CR Michigan call center on OG&E expectations. OG&E used this opportunity to impress upon CR the OG&E “customer first” attitude. This training consisted of approximately 15 people.
- July 19, 2010, OG&E orientation for CLEAResult Home Energy Specialists (HES). OG&E shared with the HES the OG&E company values and beliefs. This training consisted of approximately 10 people.
- On October 20, 2010 HES training on kW and kWh savings by house components. This was to aid the HES understanding of kW and kWh savings associated with different housing components such as adding insulation. HES were able to make better recommendations of low cost and no cost energy efficiency improvements. This training consisted of approximately 10 people.
- November 8, 2010 HES training on Blower Door and Duct Blaster methods and benefits. This helped HES to understand and physically see air infiltration into the home. This makes it easier for the HES to identify potential air leaks in the homes being audited. 15 people attended.

- December 13, 2010 HES training on infrared camera methods and benefits. This allowed HES to understand the thermal efficiency or inefficiencies of homes. This allowed them to see poorly installed or missing insulation and air infiltration leaks again in an effort to help them be aware of potential leaks in the homes they are auditing. Approximately 15 people in attendance.
- March 4, 2011 HES in-home demonstration of Blower Door and Duct Blaster methods and benefits. This training was to emphasize specific duct leaks so HES could identify the duct leakage in the homes being audited. This training emphasized duct leaks and the problems those leaks can present. There were approximately 18 people in attendance.

Highlight of Events:

- In July 2010 OG&E met with the City of Oklahoma City and the Community Action Committee in an effort to coordinate and determine the audit requirements of the City Of OKC's home improvement low interest loan program. The Community Action Committee (administrator of the loan program) did approve and adopt the HEEP Program as meeting the requirements of an energy audit to qualify for the stimulus money provided to the City of Oklahoma City.
- On January 21-23, 2011 the HEEP Program was promoted at Home and Garden Show for free, flyers were distributed to customers about the program and 246 people signed up for the program.
- On February 2, 2011 HEEP Program Promotion with OKC Chamber Of Commerce – Mega Lunch, 38 attended and DSM programs were promoted.
- On February 3-4, 2011 HEEP Program Promotion Leadership Square Atrium Exhibit, eighteen people enrolled in HEEP Program and program material was distributed to everyone that stopped by our booth.
- On February 8, 2011, OG&E made a presentation to the Rotary Club of Sapulpa, 42 in attendance, this helped to spread the word about the OG&E DSM programs to the community leaders in advance of targeted marketing of the HEEP Program
- On February 8, 2011 HEEP Program Promotion Leadership Square Atrium Exhibit, one person signed up for free promotion and program material was given to all that stopped by our booth
- On February 8, 2011 HEEP Program Promotion OKC Thunder BB Game, HEEP Program material was passed out to all who stopped by our booth, 10 people signed up.
- On February 10, 2011 HEEP Program Promotion Neighborhood Alliance Association Meeting at OG&E Tech Center 42 people in attendance, HEEP promotional materials were passed out.
- February 15-16, 2011 HEEP Program Promotion Leadership Square Atrium Exhibit, promotional material was passed out to all who stopped by our booth, 8 people signed up for free program.
- February 15, 2011 HEEP Program Promotion at Oklahoma City Chamber of Commerce Sunset Reception. The free audit was promoted and program materials were passed out.

- February 19, 2011 HEEP Program Promotion at OU Women's BB Game, HEEP Program materials were passed out to all who stopped by our booth and 26 people signed up for the program.
- February 19, 2011 HEEP Program Promotion at OSU Men's BB Game,
- February 22, 2011 HEEP Program Promotion at OKC Thunder BB Game
- On February 23, 2011 a presentation was made to the Ada Rotary Club, 35 community leaders were in attendance and they were informed of the OG&E DSM programs and were specifically instructed on the HEEP Program and the free offer.
- On March 2, 2011, a presentation was made to the Sapulpa Lions Club, 40 community leaders were in attendance and they were informed of the OG&E DSM programs and were specifically instructed on the HEEP Program and the free offer available. Thirty people were in attendance.
- March 5, 2011 HEEP Program Promotion at OSU Women's BB Game, HEEP material was handed out to all who visited the booth.
- On March 31, 2011, a presentation was made to the Sapulpa Kiwanis Club, 50 community leaders were in attendance and they were informed of the OG&E DSM programs.
- On April 12, 2011 HEEP Program Promotion at SchmoozaPalooza Networking Trade Show.

Program and Member Certification

- Both Program Managers are AEE Certified Energy Managers (CEM)
- Donney Dorton is a RESNET Home Energy Rater Trainer
- Gale Lewis is a RESNET Home Energy Rater

3.3.5 Challenges and Opportunities

CLEAResult has met the challenge to economically deliver audits Statewide with a current staff of 18 Home Energy Specialists.

One of the largest challenges was to be able to deliver the tune-ups and duct seals by licensed AC contractors across the OG&E service territory. To date, OG&E has 62 contractors signed up with and trained by CLEAResult to deliver the tune-ups and duct seal services. OG&E has the ability to add additional contractors who might be interested in participating in the program.

A barrier to achieve the program goals concerns timing of getting cooling systems serviced; cooling systems can't be serviced when the external temperature is below 70 degrees. This will require all cooling system service work occur in about 6 to 7 months of the year.

3.3.6 Outlook for Continuation, Expansion, Reduction or Termination

The response to the program has been overwhelming positive as shown in the April customer satisfaction survey where 90% of respondents were either somewhat likely or extremely likely to recommend the program to family and friends. We are very optimistic about achieving program goals and the continuation of the program beyond 2012 would be possible.

3.3.7 Planned or Proposed Changes to Program and Budget

The Home Energy Efficiency Program is approved by the Corporation Commission and the current program expires at the end of 2012. If funding for this program is depleted prior to December 31, 2012, the program may be suspended. If this happens, OG&E will evaluate whether or not there is need and if there are available resources to transfer funds from other programs. Significant customer feedback, either positive or negative, could dramatically impact this program. OG&E should also allow customers six months notice of program discontinuation to allow customers to make adjustments to any upcoming projects.

3.4 Positive Energy – New Home Construction Program

3.4.1 Program Description

Positive Energy - New Home Construction (PE-NHC) is a comprehensive long term new home energy efficiency program targeted to residential customers and builders. The program is designed to assist customers in managing energy costs. The purpose of the program is to make builders and homeowners aware of the benefits of energy efficiency and PE-NHC practices. The program is also designed to increase the overall efficiency, quality and sustainability of customer homes based on the National Association of Home Builders (NAHB) Green Home Building guidelines, the Environmental Protection Agency's ENERGY STAR Homes program, the Residential Energy Services Network's Home Energy Rating System and the Federal Energy Policy Act of 2005 guidelines. Efficiency programs that are recommended by these guidelines include: high efficiency cooling and heating, tighter home construction, high efficiency water heating, higher levels of wall, ceiling, floor and slab insulation, and high efficiency windows. Other components of the NAHB Green Home Building guidelines recommend using recycled building material, adding rainwater collection for lawn care, day lighting, and numerous other "green" building characteristics. PE-NHC design would help to reduce both energy consumption and peak demand for OG&E.

3.4.2 Program Highlights

- OG&E believes that new homes should be built to the highest standards of construction with recognition for energy efficiency, techniques, technology and green materials.
- A new home built and inspected to OG&E Positive Energy guidelines will provide the homeowner opportunities for energy saving, improved durability, and quality not available in standard construction.
- OG&E wants to partner with builders to encourage positive decision making that will provide long term energy savings benefits to new home buyers.
- During the first year of the program, OG&E certified 146 homes.

3.4.3 Program Budget, Savings and Participation

TABLE 8

Positive Energy Home													
2010			Budgeted Savings		Deemed Savings		% of Goal		2010			% of Goal	
Annual Budget	Actual Expenses	% of Budget	Demand kW	Energy* kWh	Demand kW	Energy* kWh	Demand kW	Energy* kWh	Participants				
									Targeted	Actual	Wait List		
\$133,247	\$115,455	153%	135.00	187,602	124.68	173,302	92%	92%	158	146	0	92%	
*Lifetime Savings													

- The deemed savings realized for each Positive Energy Home was calculated using 0.854 kW and 98.917 kWh per home. This number was evaluated and derived by Frontier Associates.
- OG&E certified 146 homes for an annual kWh savings of 173,302 and annual demand savings of 125 kW. These annual savings have an average life of 25 years for a lifetime energy savings of 4,332,550 kWh.

3.4.4 Program Events and Training

Highlights of Events:

- Program Manager has recruited and approved 8 HER’s raters throughout the Oklahoma service territory to perform HVAC load calculations, plan analysis, thermal bypass inspections and blower door/duct blaster testing for certification of OG&E Positive Energy homes. He meets with each of them on an ongoing basis to perform quality assurance on inspections, home testing and certification.
- Program Manager has met with construction trades including insulation companies, HVAC distributors/installers, framers, slab installers, window distributors/installers to help implement improved building science practices for OG&E Positive Energy homes. These meetings have occurred at associate home builders meeting, table top trade shows as well as on the construction sites.
- Program Manager made a presentation for home appraisers to teach them about energy efficient building science methods and techniques.
- The Program Manager has had over 200 meetings with builders to convince them to build OG&E Positive Energy Homes throughout the Oklahoma Service territory. He meets with many of them on a regular basis to insure they build to OG&E stringent standards. He works to educate them about existing and new energy efficient methods and building practices. He has discussed improved building science strategies at home builder meetings throughout our territory as well as meeting with many of them on a 1 on 1 basis.
- OG&E is also a sponsor for the Oklahoma State Home Builders Association Convention where builders are educated about improved building techniques and practices.
- OG&E was a major sponsor for the Oklahoma Green Building summit in 2010. He is a founding member of the Oklahoma State Green Building Committee; he continues to work to put this summit on each year to educate builders, trades, architects, energy engineers, real estate professionals and the public. We brought 125 people to 2 day summit in 2010.



Program and member Certification:

The OG&E program manager is a certified HERS rater for RESNET. He is also certified for Energy Star Version 3.

3.4.5 Challenges and Opportunities

- Convincing builders to spend more money on their homes in a down market while appraisers are not increasing appraisal values for energy efficient/green homes verses standard homes.
- Convincing customers to build a home from an energy efficient and comfort perspective when other features such as granite can be seen and appear more desirable. We only have an opportunity to build a new house right once; we must accomplish this with increasing interest in both builders and consumers.
- Consumers must be convinced to demand energy efficient and comfortable homes that have had third party inspections and testing to insure quality control in energy efficient building science.

3.4.6 Outlook for Continuation, Expansion, Reduction or Termination

OG&E will continue its Positive Energy Home Program through the program year with no major changes. Based on current demand for the program, the budget for customer incentives will run out. A decision will need to be made to seek additional funding or terminate the program.

3.4.7 Planned or Proposed Changes to Program and Budget

No changes planned for 2011.

3.5 Geothermal Heating Cooling and Water Heating Program

3.5.1 Program Description

The geothermal program is a DSM offering approved by the Oklahoma Corporation Commission. Geothermal equipment is widely considered to be the most energy efficient method to heat and cool a home. Geothermal is also considered to be the most comfortable, longest lasting, and lowest maintenance of any system. While geothermal provides unmatched advantages, the system also comes with a significantly higher initial cost. The higher first cost has been a barrier to wide term acceptance of geothermal systems. To help overcome the higher initial cost barrier, OG&E has paid an incentive of \$375 per ton for new or replacement installations of residential geothermal heat pumps. Always considered a product of upper-end custom homes and high end retrofit applications, the OG&E incentive has helped introduce a proven technology to a wider variety of customers.

3.5.2 Program Highlights

- Program became available for residential applications installed after February 10’2010
- 95 homes took advantage of OG&E incentives
- Continued use of OG&E website to educate and promote program
- 30 Habitat for Humanity new and existing homes installed geothermal

3.5.3 Program Budget, Savings and Participation

TABLE 9

Geothermal HVAC													
2010			Budgeted Savings		Deemed Savings		% of Goal		2010				
Annual Budget	Actual Expenses	% of Budget	Demand kW	Energy* kWh	Demand kW	Energy* kWh	Demand kW	Energy* kWh	Targeted Tons	Actual Tons	Wait List	% of Goal	
\$833,333	\$146,805	28%	791.00	3,239,039	153.26	627,556	19%	19%	500	388	0	78%	
*Lifetime Savings													

- The deemed savings realized for each geothermal home was calculated using 0.3955 kW and 1,619.5 kWh per ton. This number was evaluated and derived by Frontier Associates.
- OG&E installed 95 geothermal heat pumps to new or existing homes which added 387.5 tons for an annual kWh savings of 627,556 and annual demand savings of 153 kW. These annual savings have an average life of 20 years for a lifetime energy savings of 12,551,140 kWh.

3.5.4 Program Events and Training

Highlights of Events:

- Oklahoma State Fair / Promote Geothermal Technologies to the public by hosting and manning an informational booth for fair-goers. Field questions from prospective customers, distribute brochures, and promote energy information to the public which will inform homeowners in future HVAC decisions, talking individually with roughly 2000 customers over a 10 day period, further solidifying OG&E's position as a trusted energy advisor to the ratepayers of Oklahoma.
- Green Building Summit '10 / Attended a 2 day informational summit in OKC learning about new technologies while presenting geothermal options and distributing brochures to builder customers and ratepayer attendees. Summit attended by approx 200 builder customers, all interested in the latest in energy saving building techniques and equipment.
- BASCO Parade of Homes Show House / Public open house featuring a brand new home incorporating the latest in building techniques and energy efficient equipment available to consumers on today's "for sale" new home construction market. Over the course of 3 weeks the house is open during the Parade of Homes and viewed by approx 1000 prospective buyers and curious home owners. This "for sale" home help promote the latest in ideas for today's new home buyer. A valuable marketing tool for new products along with geothermal technologies, the Parade of Homes events are always a great way to leave the customers with informational brochures and inform the public of new products.
- COHBA Parade of Homes Show House / Parade of Homes event for the Central Oklahoma area featuring a "for sale" new home viewed over a 3 week period by approx 1500 prospective home buyers and curious future home buyers.
- COHBA Home and Garden Show / A new products event featuring construction ideas for the new home and retrofit market. Open to the public, the Home and Garden show promotes all areas of home construction and décor to an interested future customer. Attended by approx 10,000 customers over a long weekend, the show is a great way to reach interested customers, distribute brochures, and inform the public about geothermal technology.
- Tulsa Home and Garden Show / New products show for the Tulsa area reaching approx 10,000 customers over the course of the event.

Program and Member Certification

Certifications and training for the geothermal industry takes place through IGSHPA. Scheduled training for 2010 was as follows:

October 25 - IGSHPA Technical Conference, Denver CO - Trade show for the geothermal industry worldwide, featuring the latest in products for customers and HVAC dealers. A valuable show for networking and learning new technologies which apply to our local market and ultimately our customers.

October 27 Accredited Drillers and Installers workshop, Denver CO - Learn the latest in drilling technologies which apply to our local market. Learn about upcoming laws and regulations that

will affect the industry focusing on better ways to increase geothermal installations and customer satisfaction.

October 28 Certified GeoExchange Designer Workshop and Conference, Denver CO - Learn the latest in residential geothermal design and installation and network with dealers that are currently in that business. Stay informed on industry trends which will ultimately benefit customers.

3.5.5 Challenges and Opportunities

Geothermal opportunities have been identified as a strategic initiative for OG&E. Because of OG&E's history with the technology, the local manufacturing presence and the energy efficiencies delivered from geothermal OG&E has decided to explore business opportunities.

3.5.6 Outlook for Continuation, Expansion, Reduction or Termination

The Residential Geothermal Program is scheduled to run through December 31, 2012, at which point the program is scheduled for termination. No plans at this time for expansion or reduction.

3.5.7 Planned or Proposed Changes to Program and Budget

No changes planned for 2011.

3.6 Commercial Lighting Program

3.6.1 Program Description

The Commercial Lighting Program provides incentives to OG&E commercial and industrial customers who purchase and install energy efficient indoor and outdoor lighting, lighting controls, occupancy sensors and light emitting diode (LED) exit lights in both retrofit and new construction applications. This program helps customers reduce monthly energy costs while reducing some of the initial cost barrier.

The Commercial Lighting program was a continuation of the Quick Start measure. This measure was designed to reach existing and new customers including large school districts, commercial, and industrial complexes. OG&E continued to recruit and educate customers with additional presentations on the advantages of high efficiency lighting.

3.6.2 Program Highlights

- The Commercial Lighting Program is ahead of what was anticipated for the year ending 2010. OG&E received approval from the Corporation Commission in February 2010 to offer the Commercial Lighting Program to commercial and industrial customers and schools.
- Marketing material was developed to provide information to customers and to provide handout information at trade shows, seminars and other public events.
- An electronic version of the marketing material was also created to further enhance OG&E's correspondence with customers by being able to immediately provide them information on their requests.
- A website was created for the lighting customers to allow them to apply online -- making it more convenient.

3.6.3 Program Budget, Savings and Participation

TABLE 10

Commercial Lighting												
2010			Budgeted Savings		Stipulated Savings		% of Goal		2010			% of Goal
Annual Budget	Actual Expenses	% of Budget	Demand kW	Energy* kWh	Demand kW	Energy* kWh	Demand kW	Energy* kWh	Targeted	Actual	Wait List	
\$656,436	\$1,116,052	189%	2,757.00	10,778,000	5,991.13	29,754,696	217%	276%	918	611	0	67%
*Lifetime Savings												

3.6.4 Program Events and Training

Highlights of Events:

Table top displays, the OG&E Website, and professional group meetings helped promote the awareness of the lighting program to local architects, engineers and maintenance personnel. Lighting surveys were conducted in plants on operational facilities throughout the OG&E territory. This was done in conjunction with manufacturers, distributors and electrical contractors. Presentations were performed for trade groups and professional organizations in various areas of the OG&E territory.

- Lutron Lighting Seminar, OKC, 30 people representing lighting contractors, facility managers, engineers and architects.
Handed out OG&E Commercial Lighting Program brochures, made program presentation and talked to individuals one on one. Positive interaction educating allies on the OG&E Commercial Lighting Program.
- GE Lighting Distributors Seminar, OKC, 17 people representing lighting & electrical contractors. Presented the OG&E Commercial Lighting Program with PowerPoint Presentation. Handed out OG&E Lighting Brochures. Introduction to new contractors on the lighting rebates.
- GMMA Energy Seminar, Muskogee, 35 people representing electricians, building maintenance engineers, manufacturers & facility managers. Handed out OG&E Lighting Brochures and explained the OG&E Commercial Lighting Program with PowerPoint Presentation. Positive results with many questions asked.
- Oklahoma Manufacturers Alliance, OKC, 15 people representing Facility Engineers & Managers. Handed out OG&E Commercial Lighting Brochures and explained the Program with PowerPoint Presentation. Positive reaction from those participating asking several questions.
- International Facility Managers Association, OKC, 15-20 people representing facility managers, building maintenance engineers from local metro area. Handed out brochures and presented the OG&E Commercial Lighting Program with PowerPoint Presentation. Good positive interaction from the group.

3.6.5 Challenges and Opportunities

- Meeting with each contractor/distributor on rebate opportunities.
- Funding for incentives will reach the 3 year program budget limit by the end of June 30, 2011.
- The Commercial Lighting Program has been highly successful in influencing customers to replace inefficient lighting.

3.6.6 Outlook for Continuation, Expansion, Reduction or Termination

OG&E will continue its Commercial Lighting Program through the program year with no major changes. Based on current demand for the program, the budget for customer incentives will run out in June 2011. A decision will need to be made on whether to seek additional funding or terminate the program.

3.6.7 Planned or Proposed Changes to Program and Budget

The commercial lighting program has gained wide acceptance from our customers. Due to the success of this program, the money budgeted for the 3 year life of the program will run out in June 2011 and the program will be shut down unless additional funding can be made available.

3.7 Commercial/Industrial Standard Offer Program

3.7.1 Program Description

The Commercial/Industrial Standard Offer Program (SOP) offers financial incentives for the installation of a wide-range of measures that reduce peak demand. In this program, commercial, industrial, school and public authority customers are eligible to participate in the program and qualify for incentive payments of \$250 per kW saved by energy efficiency projects that significantly reduce customer peak demand. The flexible nature of the program encourages potential participants to customize an energy efficiency solution to meet their specific needs, but still does not place constraints on smaller opportunities such as single motor replacements or HVAC change outs.

In addition to financial incentives, OG&E may also take additional steps to overcome some of the barriers large customers face in investing in energy efficiency equipment by:

- Providing support to customers in the designing of projects and calculating savings estimates.
- Providing customers with a list of qualified ESCOs.
- Encourage energy efficiency planning services, emphasizing consistent and long-term return on investments.

The Standard Offer Program runs on the calendar year, January through December, and is a three-year program targeted for 2010, 2011 and 2012. The 2010 program started late, and did not begin until June due to staffing administration for the program.

3.7.2 Program Highlights

Production for the program is on track and slightly ahead of what was anticipated for the year ending 2010. OG&E received approval from the Corporation Commission in February 2010, to offer the Standard Offer Program to its commercial, industrial, school and public authority customers.

Marketing Materials were developed and printed to provide information to our customers, and to provide handout information at Trade Shows, Seminars and Events. (Sample attached, see in examples). In addition, an electronic version was also created to further enhance our correspondence with customers by being able to immediately provide them information on their requests.

3.7.3 Program Budget, Savings and Participation

TABLE 11

Standard Offer Program - C&I													
2010			Budgeted Savings		Stipulated Savings		% of Goal		2010			% of Goal	
Annual Budget	Actual Expenses	% of Budget	Demand kW	Energy* kWh	Demand kW	Energy* kWh	Demand kW	Energy* kWh	Targeted	Actual	Wait List		
\$322,818	\$164,966	83%	988.00	7,379,657	704.34	4,917,063	71%	67%	66	17	0	26%	
*Lifetime Savings													

3.7.4 Program Events and Training

Highlights of Events

1) Training Programs:

- Company - Honeywell
- Speaker - Kevin Johnson
- Topic - Performance Contracting Opportunities
- Date - November 10th, 2010
- Attendance - 32
- Location - OG&E Technology Center

2) Program and Member Certification:

- 2010 - Training consisted of In-House by Engineers
- 2011 - Enrolled in "Commercial Energy Auditing Course"

3.7.5 Challenges and Opportunities

Challenges

- The largest challenge is "Qualifying the Existing Equipment", finding data and specs sheets on the current equipment, (motors, HVAC, chillers, etc.). This information is vital on the smaller applications, (metering not practical or cost effective), to be able to accurately and effectively compute the kW savings associated with the measure.

Opportunities

The original intent of the SOP, was to directly target the "Large Commercial and Industrial" Rate Class, providing them an opportunity to look at their business or facility from a higher level of Energy Efficiency improvements, and recoup some of their investment costs through the OG&E Incentive of



\$250 per kW saved. This would provide the customer with the ability to look at the process or performance contracting perspective of adopting new energy efficient practices, business solutions, technology and retrofits...

Two Factors Affecting SOP Direction

- 1) At the onset of the SOP, the Industrial Rate Class customers were given the option of opting out of the SOP. 70.5% of the Industrial customers chose to opt out of the program. This directly affected OGE's initial intent of the program, and the ability to achieve the designed results of the program.
- 2) The overall health of the economy affected these larger commercial and industrial customers; causing them to re-position their approach to investments by balancing the reduction in their work forces, adjusting for the slowdown in marketable consumables affecting their rate of production, forcing many facilities to reduce from 2 and 3 shift programs, down to a single shift. This challenged the company's budgets and available dollars for energy improvements and capital expenditures.

OG&E was afforded the opportunity to explore other venues with these customers. It became quickly apparent that these same companies' would have difficulties in larger project retrofits, and be more inclined to do individual measures from cost or salvaging perspective. This adjusted the playing field from the larger ESCO's down to more localized contractor's facilitation the improvements, fixing the broken pieces, and keeping the plant or business operation at a "Day By Need" basis.

The DSM Team developed a new strategy of:

- 1) Targeting ESCO's – (Keeping them in the loop as the marketing place rebuilds)
- 2) Targeting Contractors – (HVAC, Geothermal Distributors & Manufacturers, Motor Distributors & Manufacturers, Electricians, etc).
- 3) Expand the Market Place to Include Public Authority and Schools
- 4) Reduce the sub-metering restriction, since they would be individual measures, (e.g. – 25hp motor for a Premium Efficient 25hp motor), which kW is easily calculated from the electrical information contained on the plates.

OG&E's approach has proven very effective. We hit the ground running with the SOP in June of 2010. In the 7-months we achieved 71.15% of the desired kW reduction in just 58.3% of the time allotted. We are very confident of the continued and even increased success, of the Standard Offer Program for 2011 and 2012.

3.7.6 Outlook for Continuation, Expansion, Reduction or Termination

The Standard Offer Program fills a necessary niche in the commercial and industrial community. The rebate incentive helps facilitate companies with an opportunity to make necessary energy efficient improvements to their facility, which may not have necessarily been performed. (e.g. – they may have to replace a motor, but the SOP incentive may help encourage them to look at, purchase and install a more premium efficient motor).

During 2010, about 35% of the companies taking advantage of the SOP made an energy efficient improvement, which they would not have otherwise made had the incentive not been available. The other 65% were going to make the improvement anyway. The Standard Offer Program proves to be effective by moving 35% of the marketplace.

3.7.7 Planned or Proposed Changes to Program and Budget

If funding for this program is depleted prior to December 31, 2012, the program may be suspended. If this happens, OG&E will evaluate whether or not there is a need and if there are available resources to transfer funds from other programs. Significant customer feedback, either positive or negative, could dramatically impact this program. Many targeted customers have opted out of being eligible for this customer offering. OG&E should also allow customers six months notice of program discontinuation so customers can make adjustments to any upcoming projects.

3.8 Energy Efficiency Education Program

3.8.1 Program Description

The OG&E Energy Efficiency Education Program is designed to help customers make informed decisions about how they use energy and provides alternatives to improve their consumption, thereby decreasing demand and energy usage.

There are three programs included in the OG&E Education Program: LivingWise®, Custom Energy Report and Media.

The program goal is to allow customers to make informed decisions about long term energy efficiency and participate in programs that will help them manage their energy costs and utilize price response tariffs.

Program 1

LivingWise® is a custom designed energy curriculum for fifth grade students in Oklahoma. The “hands-on” LivingWise® program is designed to educate students about energy conservation and efficiency as well as encourage their families to make energy improvements at home. The program is offered at no cost to qualified teachers, schools and school districts.

The LivingWise® kit includes:

- Low flow Showerhead
- Kitchen Aerator
- Limelite® Night Light
- Flow Rate Test Bag
- Energy Cost Calculator
- FilterTone® Alarm
- High-Efficiency Light Bulb
- Water Temperature Card

Program 2

Custom Energy Report (CER) is a self guided online home energy audit offered through the OG&E website. Customers are prompted to input items pertaining to the appliances and energy consuming devices (i.e. ceiling insulation, windows, doors, direction of home, number of individuals living in home, appliances, etc.) in their home. Upon completion of the survey, the customer will receive an e-mail of their personalized energy report providing analysis and recommendations on how to save energy. The report is specific to their house, living styles and choices. Customers also receive energy savings tips customized to their individual criteria and needs. Recommendations are provided that will direct the customer on ways to save energy. The information is relevant, consistent, and fuel-neutral, covering efficient practices, efficient technologies, and the application of conservation programs.

PROGRAM 3

Media – The Education Program provides information to all customers, of all classes, allowing them to make informed decisions about how they use energy. The program also allows customers to look at alternatives to improve their consumption, thereby decreasing demand and energy usage.

3.8.2 Program Highlights

The **LivingWise®** program provided energy efficiency and awareness training for 20,010 students from January 2010 through December 31, 2010, targeting school districts in Oklahoma.

- Created OG&E customized box to improve the generic look for the LivingWise® Kits.
- OG&E utilized its community coordinators along with key contact personnel for promotion of the program.

The **Custom Energy Report** is provided to customers, free of charge, after they complete the home information survey. The report contains electric usage information and cost comparisons based on the information they provide.

- The Custom Energy Report also includes recommendations to help customers use energy wisely and save money on their monthly bills. The report contains specific energy savings tips for their home.
- A follow up survey is sent to those requesting a report, asking for comments and suggestions for improving this service.

3.8.3 Program Budget, Savings and Participation

TABLE 12

Education													
2010			Budgeted Savings		Deemed Savings		% of Goal		2010				
Annual Budget	Actual Expenses	% of Budget	Demand kW	Energy* kWh	Demand kW	Energy* kWh	Demand kW	Energy* kWh	Participants			% of Goal	
									Targeted	Actual	Wait List	Goal	
\$1,141,299	\$1,080,477	99%	0.00	0	0.00	0	-	-	33,136	20,746	0	63%	
*Lifetime Savings													



3.8.4 Program Events and Training

Highlights of Events:

Sept. 1, 2010: Pollution Prevention Week “Energy, Environment & Economics: Supporting Leadership through Sustainability.” OG&E presented its energy efficiency programs to the Oklahoma Dept. of Environmental Quality’s Oklahoma Star Program group. The program recognizes businesses for pollution prevention, energy efficiency and overall environmentally responsible operations. OG&E provided the group of approximately 50 participants with energy efficiency brochures and information about the various DSM programs that are available to customers. OG&E received positive responses from attendees with several who said they learned something about OG&E’s programs that they did not already know.

- Oct. 7, 2010: Tinker Air Force Base, Energy Awareness Month. This event is held annually. OG&E provided brochures featuring its energy efficiency programs and tips to help customers save energy and money. Approximately 500 Tinker Air Force Base (TAFB) employees attended the event. In addition, OG&E provided approximately 200 Compact Fluorescent Light bulbs (CFLs) to attendees. A vast majority of the TAFB employees said they were happy to learn about the OG&E DSM programs and plan to participate and share the information with family, friends and neighbors.
- Nov. 11, 2010: Weatherization programs seminar for senior adults sponsored by the Cimarron Baptist Association in Drumright, OK. Approximately 50 senior citizens attended the seminar to receive information about ways to use energy more efficiently. A variety of collateral material was provided for attendees including energy tips and DSM programs designed to help customers save energy and money. When asked, many of the attendees said they would implement some of the tips they learned during the seminar.

Program and member Certification:

No program or member certifications were received during 2010.

3.8.5 Challenges and Opportunities

OG&E’s success with the LivingWise® program has been through key contacts in each of the school districts. Each of the participating schools within the OG&E territory has embraced the concept and curriculum provided through OG&E and Resource Action Programs.

OG&E has continued to provide updated material to all classifications of consumers throughout the OG&E territory. Challenges to residential, commercial and industrial consumers will be to initiate timely and important energy improvements to homes and businesses. Cost effective

measures should be implemented in a timely manner to maintain lower utilities. Education to the consumer is a key in stressing the importance of energy efficiency in all applications.

3.8.6 Outlook for Continuation, Expansion, Reduction or Termination

OG&E proposes to continue to support and promote the growth of energy awareness throughout its customer base for the remainder of the program.

3.8.7 Planned or Proposed Changes to Program and Budget

No changes planned for 2011.

3.9 Research & Development of Demand Program Projects

3.9a OG&E Solar Inverter Proof of Concept Project

3.9a.1 Project Description:

OG&E believes it may be possible to introduce a smart grid integrated inverter (SGII) program rather than an incentive program. The SGII can potentially provide operational benefits to participants and non participants in the following ways:

- Meter the production without installing expensive metering equipment
- Safer installation by ensuring IEEE standards are met
- Better power quality by choosing a quality inverter
- Allows for power quality improvement as a smart grid device
- Allows to Volt/Var control to lower future resource needs at critical peak periods

The objectives of the project are to:

- 1) Analyse the 'change case' by contrasting an integrated and standardized approach vs. the current state
- 2) Determine system architecture and device requirements necessary to integrate Residential and Small Commercial PV generation and storage systems into the OG&E Smart Grid.
- 3) Determine if commercially available devices/equipment can meet established requirements, or if customization is required.
- 4) Build a lab facility and test, evaluate, and demonstrate PV inverters in the actual OG&E distribution environment. This 'Proof of Concept' lab will support design, operational benefit, and power quality verification.

The proof of concept lab can also be used to demonstrate to regulators and customers the importance of making the right choice for the PV system in order to make the most of the investments by all parties concerned.

3.9a.2 Project Highlights:

In 2010, considerable time was devoted to improving the commercial process and re-staffing efforts as most of the marketing/product development staff was assigned to the smart grid program and required re-staffing for vacancies. Product development began in May with a stage-gate process initiated. During the second half of the year, meetings were scheduled to find a consultant that can assist us on the project. In December 2010, Lockheed Martin was chosen to be our consultant for this project.

3.9a.3 Project Budget:

The \$250,000 that was allocated for this project was not been used in 2010. Preparations have been made to use the entire amount in 2011.

3.9a.4 Outlook for Continuation, Expansion, Reduction or Termination:

SOLAR INVERTER		2011											
Proof of Concept		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Scope of Work Execution; T&C Execution (December 2010)													
Kick Off Meeting													
Energy Tech Center Build Out													
Scope of Work Task 1 - Document Change Case													
Scope of Work Task 2 - Develop High-Level Architecture and Device Requirements													
Scope of Work Task 3 - Set-Up, Test, Evaluate and Demonstrate													
Scope of Work Task OG&E - Additional Inverter Testing													

3.9a.5 Planned or Proposed Changes to Project & Budget:

If additional work is required by Lockheed-Martin in 2011, unused dollars from the geothermal research project will be budgeted to the Solar Inverter Proof of Concept.

3.9b OG&E Ground Source Heat Pump Research Project

3.9b.1 Project Description:

The OG&E Ground Source Heat Pump Research Project is designed to conduct collaborative research with existing geothermal companies and public institutions. Its goal is to reduce the initial investment requirement for geothermal heat pump technology and increase the geothermal heat pump installation infrastructure to improve project life cycle efficiency and commercialize new technology.

OG&E would accomplish the following:

1. Install emerging geothermal technology to reduce the drilling costs associated with geothermal heat pump installation. Meter, analyze and document results and prepare a report summarizing the conclusions and recommendations based on the results of the study.
2. Improve the quality control and standard operating procedures of the geothermal heat pump installation.
3. Conduct research to determine the baseline order to completion cycle time for geothermal heat pump installation. Identify the issues that increase cycle time and cost and recommend solutions to reduce cycle time. Survey geothermal customers following installation for insight on areas for improvement.
4. Utilize the results of the first three areas to develop a training and recruitment program for all elements of the installation process.

3.9b.2 Project Highlights:

In 2010, considerable time was devoted to improving the commercial process and re-staffing efforts as most of the marketing/product development staff was assigned to the smart grid program and required re-staffing for vacancies. Product development began in May with a stage-gate process initiated. Initial talks with several geothermal companies and public institutions began by gauging their interest in participation. A memorandum of agreement was signed between OG&E and Oklahoma State University in December 2010. Oklahoma State University will be providing project design, data analysis, and documentation.

3.9b.3 Project Budget:

The \$250,000 that was allocated for this project has not been used in 2010. Preparations have been made to use the entire amount in 2011.

3.9b.4 Outlook for Continuation, Expansion, Reduction or Termination:

GEOHERMAL HEAT PUMP		2011											
Proof of Concept		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
SOW/Invitation for Collaboration Development													
SOW/Invitation for Collaboration Completed													
Roles and Responsibilities for OG&E and Vendors													
Budget (Rough Draft)													
Project Design Completed by IGSHPA													
Budget (Completed)													
Collaboration Kick Off Meeting for OG&E and Vendors													
Installations Started/Completed													
Monitoring Phase (at least one year)													
Installation Quality Control and Standard Operating Procedure Complete													
Interim Report Development/Completion													
Commission Update on Initial Results													

3.9b.5 Planned or Proposed Changes to Project & Budget:

OG&E is looking to work with collaborators in obtaining in-kind donations to the research project to help mitigate costs of the installations. If successful, unused dollars would go to the solar inverter project.

4.0 Evaluation, Measurement and Verification

4.1 EM&V Overview

Introduction:

The Evaluation, Measurement and Verification Plan is a systematic approach to quantify energy savings. OG&E is using appropriate EM+V for each of the programs in the portfolio.

The 2007 International Performance Measurement and Verification Protocol will be the cornerstone for the OG&E Measurement and Verification Plan.

OG&E has made a considerable effort to address all customers within the OG&E service area and used deemed savings, data and reporting program information and stipulated savings to evaluate and monitor the individual program results.

OG&E identified seven programs in the portfolio that require EM&V in order to qualify the results prior to reporting:

- Low Income Weatherization
- Fixed Income Weatherization
- Home Energy Efficiency (formerly Residential Thermal Efficiency)
- Positive Energy – New Home Construction
- Geothermal Heating, Cooling and Water Heating
- Commercial/Industrial Standard Offer Program
- Commercial Lighting

Section 4.2 outlines the summary of the EM&V activities Global Energy Partners conducted on each of the programs offered in 2010. The full report is included in the appendix 6.1.

4.2 Program Evaluation



Global Energy Partners™

An EnerNOC Company

500 Ygnacio Valley Road Suite 450, Walnut Creek, CA 94596

Phone 925.482.2000 | Fax 925.284.3147

MEMORANDUM

To: Randy Warren, OG&E

From: Craig Williamson, Global

CC: Patrice Ignelzi, Global

Date: May 16, 2011

Re: Summary of findings and recommendations for PY 2010 across all programs

Global Energy Partners (Global) evaluated OG&E's Demand programs for PY 2010, and provided in-depth reports for each program under separate cover. This memo summarizes the findings and Global's recommendations for all the programs. This is intended to provide a top level look at the portfolio evaluation for inclusion in the OG&E report to the OCC. For details about the evaluation of each program, please refer to the individual reports.

Fixed-Income and Low-Income Weatherization

Evaluating the two Weatherization (Wx) programs together, Global reviewed the EnerTrek database used to track the progress of the programs and conducted a field verification of a random sample of 30 program participants. Later this year, when one year of post installation data become available, Global will conduct a billing analysis impact evaluation. The findings are listed below.

Database Findings

- The actual number of participants for each Program is beyond expectations with 4,337 participants in PY 2010, which is 113% of the goal for the year. The Fixed-Income program alone had 150% more participants than expected.
- Calculated energy savings for the Wx Programs totaled 11,350 MWh, which is 59% of what was expected. Calculated demand reductions were 2.53 MW, which is 63% of expected.
- The expected yearly impacts per participant for the Wx Programs are 5,025 kWh and 1.04 kW. The actual per-participant impacts for the two PY 2010 Wx Programs are 2,617 kWh and 0.58 kW. These results are 48% and 44%, respectively, of the expected impacts per participant.
- Since the calculated savings are based on deemed values, it appears that either the average size or number of the units installed in each home was not what was expected.

Program Impact Results

The actual number of participants for each Program is beyond expectations. However, the energy and demand impacts are far less than expected for each Program. Therefore, the average savings per participant is about half of what was expected. Table 1 summarizes these results.

Appendix A **Table 1** *Participants and Calculated Impacts of PY 2010 OG&E Wx Programs*

Program	Participants / Percent of PY 2010 Goal	Energy Savings / Percent of PY 2010 Goal	Demand Savings / Percent of PY 2010 Goal
Fixed-Income	1,253 (150.4%)	3,109 MWh (74.3%)	0.79 MW (90.8%)
Low-Income	3,084 (102.8%)	8,241 MWh (54.7%)	1.74 MW (55.8%)
Combined Wx Programs	4,337 (113.1%)	11,350 MWh (58.9%)	2.53 MW (63.4%)

Field Verification Findings

Among the 30 homes in the sample there were 94 improvements claimed by the contractors. The most commonly installed measures were CFLs and infiltration improvements, which were both installed in all 30 homes visited. Overall, of the 64 non-CFL improvements claimed to have been performed on the 30 homes, 11 (17%) were either not found to have been done, done poorly or only partially, or used ineligible or non-ENERGY STAR equipment. That is a success rate of about 83%, which is quite high considering that in some cases, as many as 14 months could have elapsed since the improvements were made – ample time for alterations by the occupant. Six more improvements (11%) could not be confirmed due to inaccessibility or inability to read equipment nameplates to confirm whether the equipment was ENERGY STAR.

Recommendations - EnerTrek Tracking Database

- Ensure that those database fields that have drop-down lists from which the user can select values have mutually exclusive values and only values that are on current field data collection forms used by the contractors. In addition, use the choice “none” rather than “n/a” if the equipment of interest is not present.
- Include landlord/property manager name and contact information for participants living in multi-family buildings or adult living residences. There were instances while attempting to schedule the field verification visits, where the occupant was unaware of any work having been done, because the landlord made the arrangements while the unit was unoccupied.
- The program plan contained in Gary Marchbanks' testimony before the OCC states that OG&E will partner with eight to 12 contractors for these two programs. In PY 2010, two for-profit and two non-profit contractors were used on these programs. Global recommends that, due to the small number of OG&E staff managing these programs, OG&E stay with fewer contractors, rather than increase to the eight to 12 contractors anticipated to avoid unnecessary complication and the need for additional management oversight.
- It would be worth the additional labor cost to the Programs to develop frequency tables and cross-tabulations of the data in the tracking database at regular intervals (such as quarterly or biannually) to ensure that there are no data anomalies. Another option may be to include validation checks in the data entry screens that will ask the user to verify a value they have entered if it is outside of a pre-set range or is significantly different than other entries in that particular field.
- The area of attic insulation applied by the contractor should be noted in the database. At one site, less than one-third of the available attic area was covered with insulation due to the shape of the home and the arrangement of the framing in the attic. If the contractor was reimbursed based on the floor area, they were overpaid for the performance of that task.

Recommendations - Weatherization Contractors

- Provide clear guidelines to Wx contractors as to where and when measures are to be or can be installed. The contractors should know that OG&E's Wx Programs do not allow more than four CFLs to be installed in a single fixture or that water heater pipe insulation cannot be installed when the water heater has a heat trap installed.
- Provide the Wx contractors with minimum quality or warranty specifications for the equipment used or measures provided.

- Train the Wx contractors to prioritize the implementation of improvements such that the most cost-effective are implemented first, rather than the one that will provide them the largest reimbursement for the lowest effort on their part.
- Redesign the contractor reimbursement process so that the contractor takes on some of the risk associated with measures or improvements not performing satisfactorily.
- Our research indicates that none of the Wx contractors used by OG&E were Building Performance Institute certified. In future contractor selection, we suggest that OG&E require that Wx contractors be so certified (www.bpi.org).

Home Energy Efficiency Program

The evaluation of the Home Energy Efficiency Program (HEEP) for Program Year 2010 included three specific goals:

- To review and validate field deemed savings estimates calculated by CLEAResult using the deemed savings information provided by Frontier Associates LLC.
- To review the savings estimation process used by OG&E.
- To review how the program operates from a process perspective and provide recommendations for improvement in future program years.

Key Results

- CLEAResult has developed a very useful online tool, the Energy Data Management (EDM) dashboard, which can efficiently query the savings and audit data. The EDM also allows OG&E project managers to track scheduled audits and tunes.
- Global has found evidence of issues with the CLEAResult data entry process. Out of a sample of 40 participants with completed AC-Tunes and duct-work, 8 had data entry errors that caused incorrect field savings estimates.
- Global also found evidence of errors in the data translation process. CLEAResult transferred the savings data from a Master Spreadsheet database to the OG&E iAvenue system and eventually to the Energy Data Management (EDM) dashboard. Differences in program savings estimates were noted between different data sources.

Summary of the Analysis

Global reviewed all program data relevant to the savings calculation, plus some additional data provided by the program managers, summarized in Table 2. While overall program savings is significantly behind original goals for 2010, kWh and kW savings per audit are fairly close to those goals for both savings approaches, indicating that after OG&E has caught up on audits, the program should be able to achieve its stated goals.

Table 2 Comparison of HEEP Deemed Savings Estimates

	Program kW	Program kWh	Audits	kW per Audit	kWh per Audit
Reported Savings Approach	336	647,793	1,454	0.23	445.5
Field Savings Approach	456	979,482	1,454	0.31	673.6
Program Goal PY 2010	3,384	4,769,060	10,000	0.34	476.9

Global also provides an independent accounting of program impacts and measure counts using two data sources and two deemed savings methods. The two data sources are the CLEAResult Master database, provided on March 9, 2011, and an extract of data from the EDM dashboard performed on April 6, 2011. The two deemed savings methods are the reported savings estimates and the field savings estimates. It was during this comparison that Global discovered evidence of errors in the data translation process moving from the Master database to the EDM dashboard.

Next, Global performed a cross check of both the methods employed, and the resulting field savings estimates produced by CLEAResult for a sample of HEEP participants. Because a significant number of mistakes were discovered, we also estimate a corrected kW and kWh savings for the program based on the sample. Finally, we provide an estimate of the proportion of errors in the population based on the sample. Table 3 presents the estimate of corrected kW and kWh for the HEEP for PY 2010. The kW and kWh savings estimates in the first column represent the total program savings obtained from the CLEAResult field savings. The corrected estimates are fairly close to the field estimates, but for both kW and kWh, the savings have been underestimated.

Table 3 *Estimated Field kW and kWh Savings*

	Field (CR) Savings	Corrected (GEP) Savings
kW Savings	451	458
kWh Savings	972,113	975,381

Because this is the first year of the HEEP, Global also conducted a process review. The process review included conducting a formal interview with the program managers and reviewing the results of surveys conducted with a sample of PY2010 participants. Global offers recommendations for both impact evaluation analysis and process improvements for the program going forward.

Recommendations for Improving Savings Estimates and Processes

Due to the issues that were uncovered related to data entry of field savings estimates we recommend that OG&E take the following actions to ensure the integrity of the savings estimates in future program years:

- Conduct a mid-year (2011) review of the CLEAResult field kW and kWh calculations to determine if data entry problems have been resolved. If problems have not been resolved then develop a quality control plan that will help CLEAResult improve the data entry process.
- Conduct further analysis to determine the source of the differences between the program savings estimated from the original CLEAResult database and the EDM dashboard. Totals may also have to be generated from the iAvenue database directly to determine the source of the error. If necessary, correct any processes that resulted in errors and ensure that the two databases are in agreement.
- Global also recommends that OG&E consider revising the savings estimates used to report program savings to the OCC using the Frontier savings instead of the reported savings for the AC-Tune measure. Furthermore, we recommend that OG&E consider additional analysis of duct work estimates in order to improve the robustness of the field savings.

The process review also resulted in recommendations to improve the operation of the program in future years.

- Research how changes in the program’s administration, such as waiving the \$50 audit fee for a limited time, have impacted the program’s cost effectiveness and savings.
- Work with the marketing department to get more data on the various marketing campaigns conducted for HEEP. Develop a schedule for receiving reports on survey results and marketing efforts. Regularly schedule meetings to discuss the findings in the reports and work together to determine how to best spend the program marketing budget.

Positive Energy New Home Construction

The evaluation of the Positive Energy New Home Construction program for PY 2010 was intended to provide an accounting of the energy savings reported for customers who participated in the program. Specific objectives of this evaluation were:

- Verify that homes have met program requirement of a HERS rating of less than 70.
- Validate that the deemed savings were applied correctly.
- Recommend improvements to estimating savings during the program year.

Program Impact Results

Each of the qualifying homes was deemed to save 0.854 kW and 1,187 kWh based on the Frontier Potential Study – Phase II Study. With rebates issued to 146 projects in PY 2010, program savings were a reduction of 0.125 MW in peak load and a 173 MWh reduction in energy. Our evaluation showed that the deemed savings were consistently applied to each participant, which is consistent with OG&E’s methodology. However, our examination of the GJM testimony revealed an inconsistency in the deemed per-unit savings. Three different sets of savings values are quoted in the report. Table PE-2 and EPH-5 show per home savings of 0.886 kW and 1,189 kWh. Table EPH-1 and page 22 of the GJM testimony show per home savings of 0.83 kW and 1,145 kWh. Ultimately, OG&E chose to use the savings values implied by Table GJM-1 which are 0.854 kW and 1,187 kWh per home for 158 homes. Note that this is calculated based on total kW savings of 135 kW and 187,602 kWh over 158 homes. Since rebates were only issued to 146 participants, the overall program savings are lower.

Based on the data provided by OG&E, it does not appear that OG&E currently maintains and tracks the level of detail necessary to meet the reporting requirements outlined in Exhibit GJM-10, (page 21, item 8 Reporting). If this data is not maintained electronically in iAvenue or elsewhere, it will be impossible to conduct a full evaluation of the program impacts planned for the PY 2011 program evaluation.

Recommendations for Improving Savings Estimates in Future Program Years

Based on this review we have the following recommendations for the program.

- Document electronically the list of measures and heating fuel type that are put into the home so that an exact calculation of energy savings can be made and used for reporting in future program years. Although the information is provided from the HERS inspection in REM/Rate, it would be better for OG&E to collect and maintain this electronically as part of the program participation documentation for each home.
- Calculate the savings for each individual home instead of assigning a flat deemed savings value. By only using the deemed savings for each home, the program is likely inaccurately estimating the amount of savings that is achieved by the program. Since the savings value OG&E currently assigns reflects savings from minimum efficiency eligibility, it is likely understating the program impacts.

Geothermal Heating, Cooling, and Water Heating Program

Global’s PY 2010 evaluation of the Geothermal Heating, Cooling and Water Heating (GHP) Program included developing two case studies of GHP Program participants and a thorough review of the GHP Program tracking database.

GHP Program Impacts

Table 4 details the goals and accomplishments of the GHP Program in PY 2010. Overall, the GHP Program attained about 20% of its PY 2010 goals. Existing customers were expected to represent about one-quarter of the Program’s participants. In actuality, existing participants represented 43% of PY 2010 participants.

Table 4 Summary of PY 2010 GHP Program Goals and Accomplishments

	PY 2010 Goals			PY 2010 Actuals*		
	Existing	New Construction	Total	Existing	New Construction	Total
Participants	125	375	500	41 (32.8%)	55 (14.7%)	96 (19.2%)
Rebates	\$187,500	\$562,500	\$750,000	\$69,564 (37.1%)	\$77,440 (13.8%)	\$147,004 (19.6%)
Tons Installed	500	1,500	2,000	185 (37.0%)	206 (13.7%)	391 (19.5%)
kW Impacts	-198	-593	-791	-73.2 (37.0%)	-81.5 (13.7%)	-154.7 (19.5%)
kWh Savings	-809,750	-2,429,250	-3,239,000	-299,616 (37.0%)	-333,619 (13.7%)	-633,234 (19.5%)

Note: *Percentages represent proportion of PY 2010 goals (e.g., 55 new construction participants is 14.7% of the PY 2010 goal of 375 new construction participants).

Recommendations

Based on the case studies and our review of the tracking database, we have the following recommendations for the GHP Program.

- Require an indication of whether the hot water generator option is installed in the unit.
- Require the entry of unit cooling capacity in Btu/hour (Btuh) or kBtu/hour rather than tons, since most models are not designated by tons, but rather by kBtu in their model numbers.
- Add additional fields to the tracking database to allow the entry of model numbers and serial numbers for up to three separate GHP units.
- Calculate the rebate amount based on the model number rather than a value entered by a database user.
- Note the type of cooling system replaced in addition to the type of heating system replaced for retrofits..
- Do not provide incentives for the replacement of GHP systems with GHP systems, unless it can be determined that the GHP system being replaced was in need of replacement due to premature equipment or ground loop failure.
- Increase marketing effort to make program better known. The GHP Program currently relies heavily on word-of-mouth for marketing.
 - Tie in the federal tax federal tax credit of 30% on GHP systems placed in service before December 31, 2016.
 - Establish or strengthen relationships with developers and new home builders, since the majority of the installations are expected to result from new construction. Remind them that the modifications required to existing home plans to accommodate GHP systems are minimal and represent an insignificant marginal cost.

Commercial Lighting Program

The Commercial Lighting Program evaluation for PY 2010 included a review of the program database and an impact evaluation based on an engineering review and on-site monitoring for a sample of participants. This program is the only program to receive a full impact evaluation for PY 2010 at this time.

Table 5 shows the goals for participants, demand, and energy savings for the program. In PY 2010, OG&E reported that the program had 611 participants with deemed savings of 5,985 kW and 29,754 MWh, exceeding the goals for deemed savings for both demand and energy with fewer than expected participants.

Table 5 Comparison of Program Goals to Reported Savings

	OG&E Goal	OG&E Reported savings
kW Savings	2,760	5,985
kWh Savings	10,778,000	29,754,696
Number of participants	918	611

Key Results

The analysis provided the following key results:

- As shown in Table 5 above, the Commercial Lighting program reported savings that exceeded its demand and energy savings goals with fewer participants than expected.
- The OG&E reported savings underestimate actual savings. Global's independently developed savings estimates using field data on actual lighting usage and which take into account the interactive effects of lighting on the heating, ventilation and air conditioning (HVAC) system loads are higher than OG&E's reported savings. It does not appear as if the OG&E reported savings takes into consideration the interactive effects.
- There is wide variation in the site-specific realization rates for both demand and energy savings. The range of this variation is greater for the energy savings (ranging from 0.23 to 2.55) than for the demand savings (ranging from 0.68 to 1.21 with one outlier). Since the demand estimates for individual customers tended to be more accurate, this indicates that the savings estimates based on the equipment installed were closer to what Global found. The higher variability in site-specific realization rates for energy savings indicates that the estimates of operating hours were somewhat less accurate, which is common for commercial lighting programs.
- Overall, assuming that the OG&E-reported savings did not include the interactive effect, those savings overestimated the Global-estimated savings somewhat. This was counteracted by the interactive effect, which raised the final savings estimates overall.
- Global identified a couple of instances where not all of the lighting measures were installed; the customer contact acknowledged that some of the more efficient lights were kept in storage for future use. In these cases, Global adjusted the savings to reflect only the installed lights.

Program Impact Results

Table 6 below shows the program-level savings for both demand and energy, including both the OG&E-reported savings and the Global-estimated savings, along with the realization rate.

Because the use of lights affects the level of cooling and heating required in the building, improvements to the efficiency of lighting has two types of impacts: savings in energy used by the lights themselves and changes in energy use for heating, cooling and ventilation (HVAC). The interactive effects on HVAC load are appropriate to include in estimating the total savings associated with lighting improvements.

In the results tables shown below the savings estimated by Global are reported to demonstrate the two types of impact estimates as follows:

- **Lighting only impacts** = the kW and kWh savings in lighting use only, directly stemming from the improvement in efficiency of the lighting measures installed (savings without interactive effects)
- **Lighting plus HVAC impacts** = the combined kW and kWh savings associated with the lighting measures plus the effects of increased or decreased HVAC load resulting from the installation of more efficient lighting (savings with interactive effects)
- **Realization rate** = the ratio of the Global site-monitored savings with the interactive effects included in the OG&E-reported savings

The findings of Global’s analysis, counting only the direct impacts of the participants’ actions on electricity used for lighting (i.e., without interactive effects), suggest that OG&E overestimated the effects of the measures on both kW demand and annual energy use for lighting. Taking into account the interactive effects with the air conditioning, Global’s calculations show slightly more kW and kWh savings than OG&E’s reported savings for the entire program. The realization rate for demand savings is 1.07 and for energy savings is 1.03, meaning that, overall, the interactive effects increased Global’s lighting-only savings estimates, resulting in estimates of total program savings that exceed what OG&E reported.

Table 6 Program-Level Savings—Global-Estimated Savings Compared to OG&E-Reported Savings

Savings	OG&E-Reported Savings	Global-Estimated Savings (Lighting only impacts)	Global-Estimated (Lighting + HVAC impacts)	Program Savings Realization Rate
Demand Savings (kW)	5,985	5,851	6,375	1.07
Energy Savings (kWh)	29,754,696	27,812,688	30,564,780	1.03

Recommendations for Improving Savings Estimates in Future Program Years

Based on this review we have the following recommendations for the program.

- Since it appears that much of the difference between the OG&E-reported savings and Global’s estimates is related to operating hours, the approach used to calculate operating hours should be investigated further to see if there are ways to improve the estimates developed during the project implementation stage.
- Collect information on the type of heating fuel and system to enable reasonable estimates of the interactive effects with HVAC for the deemed savings calculations. These fields can easily be added to the Oklahoma – Retrofit Work Detail Submission Form.
- Make slight improvements to the iAvenue database including the following:
 - Enter the estimated square footage from the data collection form into the database.
 - Enter the description of the building/room location into the database.
 - Add a field for heating fuel type to account for interactive effects in the savings estimates.
 - Correct labels in the database to reflect that the wattage of the lamp is expressed in watts, not kilowatts as it currently indicates.
- Conduct post-installation visits or contacts with the participants to obtain a better count of measures actually installed and operating hours for the area where the lights are installed, then either adjust individual savings values or develop and apply an estimated installation rate to the recorded savings totals. Doing this, OG&E could develop and report more accurate total savings.

C&I Standard Offer Program

Our review of PY 2010 of the C&I Standard Offer Program included conducting case studies of two 2010 program projects. Global verified the savings calculations for the case study customers using an Engineering Review (IPMVP Option A) approach. In using this approach, we checked for the appropriate use of formulas and the accuracy of values used in the formulas such as efficiency level, equipment size, hours of operation and the baseline used. The goal of this review is to provide an early assessment of OG&E’s project savings estimation approach to identify strengths and weaknesses in the savings calculation method.

The case study review allowed us to identify several strengths of the program as well as some weaknesses. Based on this review we recommend the following improvements to the program:

- Develop a new marketing strategy for reaching customers earlier in the decision making process.
- Use the federal minimum standard as the baseline for equipment at the end of its useful life or that is going to be replaced regardless of the program.
- Use manufacturer derived EER values to calculate both baseline and new equipment kW and make sure the EER used in the savings calculation is consistent with the equipment documentation.



- Conduct direct metering of equipment as part of the program's measurement and verification activities and as part of the PY 2011 impact evaluation.

Education Programs

Because OG&E does not claim savings from the Education Programs, Global did not perform any evaluation of these programs.

4.3 Initial Program Ratios

Cost-Effectiveness Test	Program Year - 2010										
	Levelized Cost	Participant Cost Test (PCT)		Ratepayer Impact Measure (RIM)		Utility Cost Test (UCT)		Total Resource Cost (TRC)		Societal Test (ST)	
		NPV (\$000's)	Ratio	NPV (\$000's)	Ratio	NPV (\$000's)	Ratio	NPV (\$000's)	Ratio	NPV (\$000's)	Ratio
Program	\$/kWh										
Low Income Weatherization	0.024	36,103	3.21	-20,034	0.55	6,036	1.34	29,021	2.55	30,985	1.34
Fixed Income Weatherization	0.024	10,116	3.23	-5,564	0.55	1,675	1.34	8,167	2.57	8,712	2.67
Residential HEEP	0.026	8,418	1.73	-5,536	0.66	1,577	1.17	6,275	1.51	6,801	1.56
Positive Energy Home	0.022	770	2.16	182	1.22	638	2.75	1,609	3.33	1,648	3.39
Geothermal HVAC	0.022	4,834	1.75	-2,552	0.73	4,758	3.09	5,169	1.87	5,760	1.97
Commercial Lighting	0.026	19,047	3.82	-6,783	0.72	15,734	9.76	16,826	3.39	18,223	3.59
Standard Offer Program - C&I	0.025	3,673	1.48	-498	0.95	8,002	10.06	5,322	1.78	6,315	1.92
Energy Efficiency Education											
EE Portfolio Total		107,986	2.91	-45,741	0.63	37,616	1.92	74,304	2.28	80,657	2.39
Cost-Effectiveness Test	Next Program Year - 2011										
	Levelized Cost	Participant Cost Test (PCT)		Ratepayer Impact Measure (RIM)		Utility Cost Test (UCT)		Total Resource Cost (TRC)		Societal Test (ST)	
		NPV (\$000's)	Ratio	NPV (\$000's)	Ratio	NPV (\$000's)	Ratio	NPV (\$000's)	Ratio	NPV (\$000's)	Ratio
Program	\$/kWh										
Low Income Weatherization	0.024	10,611	3.86	-5,305	0.52	1,673	1.41	7,007	2.74	7,135	2.77
Fixed Income Weatherization	0.024	4,417	3.72	-1,982	0.57	870	1.50	3,165	2.82	3,220	2.85
Residential HEEP	0.026	2,994	6.05	-750	0.43	-246	0.70	1,331	2.33	1,340	2.34
Positive Energy Home	0.022	650	2.97	-114	0.81	234	1.95	721	2.83	727	2.85
Geothermal HVAC	0.022	757	2.29	-456	0.61	435	2.59	499	1.86	515	1.89
Commercial Lighting	0.026	32,900	5.76	-12,733	16.79	22,641	16.79	24,615	4.54	25,216	4.63
Standard Offer Program - C&I	0.025	4,015	3.33	-1,858	0.55	2,021	8.52	1,688	2.22	1,754	2.27
Energy Efficiency Education											
EE Portfolio Total		112,630	4.63	-22,198	0.62	27,628	4.14	39,025	3.43	39,907	3.48



5.0 Supplemental Information

5.1 Training

Efficiency Education Program

- June 2010: OG&E member provided homes for BPI training certification for nine individuals, to be BPI certified in Building Analysis and Building Shell.
- March 31-2010: Electricity and Greenhouse Gas Reduction
- June 8, 2010: Industrial Greenhouse Gas Emissions
- June 24, 2010: Compressed Air Systems workshop
- September 22, 2010: Reducing Your Industrial Energy Use – A Management Approach
- December 7, 2010: Pumping System Optimization Opportunities to Improve Life Cycle Performance.

6.0 Appendix

Weatherization



November 3, 2010

Local apartment complexes to receive free weatherization

OG&E, Oklahoma City Housing Authority team up to provide home comfort, energy savings to residents in need

A partnership between **OG&E** and the Oklahoma City Housing Authority (OCHA) will help two Oklahoma City apartment complexes for low and fixed income families become more energy efficient.

OCHA developments Ambassador Courts, 800 S.E. 15th St., and Reding Senior Center, 1000 S.W. 38th St., are receiving free weatherization services as part of OG&E's low income and fixed income weatherization program. These services include caulking and weather stripping, attic insulation and installation of more energy-efficient refrigerators.



OG&E contractor Skyline Energy Solutions will be weatherizing Reding Senior Center beginning Wednesday, Nov. 3, and will complete close to 20 apartments per day through Nov 9. They recently completed weatherization of 196 units at Ambassador Courts.

The partnership with the Oklahoma City Housing Authority marks the first time the company has weatherized multi-family residences.

"Many of our residents don't have the means to make their apartments more energy efficient, and we have limited resources as well. The services OG&E provides will help our tenants stay more comfortable and also help them save on their energy bills," said **Mark Gillette**, assistant executive director of planning and development for the OCHA.

OCHA recently installed geothermal systems at Ambassador Courts and Reding Senior Center. With the help of OG&E's rebates for geothermal systems, the agency will be able to install geothermal systems at two additional apartment complexes, Sooner Haven and Oak Grove, this year.

"Geothermal is a much more energy efficient way to heat and cool these homes and provides significant savings on energy bills, but it also can be costly to install," Gillette said. "The rebates OG&E offers have helped us provide geothermal to even more facilities."

According to **Gary Marchbanks**, Manager Sales, apartment dwellers have special energy efficiency challenges.

"Because those living in apartments rely on their landlords for many energy efficiency improvements, they often are limited in what they can do to improve the efficiency of their homes," he said.

Jamie O'Bryant, president of Skyline Energy Solutions, said that crews have the additional challenge of assuring tenants are not disturbed during weatherization work.

"Our process includes completing one set of apartments from opening assessment through final inspection before moving on to the next set," he said. "This allows us to work efficiently with minimal disruption to the tenants. Crews come on site at 8 a.m. and leave by 5 p.m. each day, so they are working when most tenants are not home."

OG&E offers low income and fixed income weatherization to qualified customers in its service territory. Customers can learn more by visiting www.oge.com or calling OG&E Customer Service at (800) 272-9741.

Thank You Notes

Dear Delora,

Just a note to thank you and the crew that came to fix my house. My boys and I are very comfortable now. We can't thank you enough. Thank you for your kindness. May God bless you all for helping the needy. I know our O.G.E. bill will be cheaper now too.

Sincerely,
Aurora Castillo

Aurora Castillo
3032 NW 11
OKC

May tomorrow be a day
of bright sunshine
and happy rainbows -
You are in my thoughts.

OG+E Weatherization Program

Mail Code 207

P.O. Box 321

OKLA. CITY, OK 73101

Re: Betty Hamilton, 523 N. Maple, Guthrie, OK 73044
SKYLING ENERGY SOLUTIONS

WOW!!! I did not know people like this team existed. They really worked!! First, the two-man "insulation crew" were extremely skillful completing their job in a short period of time.

Then came "Ryan's crew" - Each one doing their assigned job in a professional manner, according to the expert inspection of the home by Sean Norton.

Each were mannerly, polite, competent - and answered all my questions. All are an asset to your company and should be commended - and retained with bonuses???

This service by OG+E is greatly appreciated. A couple of questions: ¹What is the current R factor for the attic insulation? ²Would it be possible to obtain a copy of the report listing the home improvements for my files?

Thank You!!

Betty L. Hamilton

523 N Maple St.

Guthrie, OK 73044

9/22/10

Just a note of thanks.
This is a great program.
I can't begin to tell you
how much I appreciate
what it means to me.
The contractors that did the
work (Vir, Jessie & Joshua)
as well as the inspectors Casey
Gonor & Janice O'Bryen, were
very professional. Thank You
Betty K. Moore

Dear O. G. & E. Weatherization Crew:
Clarence and I wish we had
the words to express our
appreciation and thanks for
what O. G. & E. Rised Income
Weatherization Program
provided and for the
crews that did the work.
We can tell a difference already.
We're rather anxious to see
what a difference it will
make in our home this
winter both in comfort
and energy costs.
To the crews who did the
work you were the greatest!
Thanks for a job well
done, and may God bless
you all.

Sincerely,
Clarence & Phyllis Jennings

Clarence Jennings
818 W London St
El Reno, OK

With sincere appreciation
and warmest thanks.

The Jennings

P.S. Please see the crews
get to see this. Thanks

7/26/10

5277 N. Davis Ave
ONC, OK 75127

As soon as money permits
you will always have my
support again.

To the OGE Weatherization
Program.

This past two weeks I was
fortunate enough to be included
in your program. I was
very impressed with every
crew that came out. They
were meticulous in cleaning
up their mess, very expedient
in their work, very courteous,
and did a great job overall
because I can already tell
the difference in the house.

I sincerely thank you and
compliment you on your
choice of companies to handle
your business affairs.

Sincerely,
Ken L. McElroy

Dear OGE Program, 11-1-2010
We are so pleased with the crews
that blew insulation in locked around
things, light bulbs, our kitchen closet
vents, we could not believe this all
being done for us free, we have never
had anything so good. We are really
thankful, all of this needed done but
we just had to do things as we could
afford it. We will never forget this.
It was really a blessing. God
answered our prayers again.
All the men were nice, polite,
and very hard workers.
Thanks so much, we really
do appreciate it all.

We wish the Best
for all of you
Thanks again
Marvin + Elsie Shipley
Alva, Okla.

Home Energy Efficiency Program

January 24, 2011

Mr. Pete Delaney
Chairman, President and CEO
OGE Energy Corp.
P.O. Box 321
Oklahoma City, OK 73101-0321

Dear Mr. Delaney:

Efficiency accompanied by courtesy is a rare combination in today's work world. The courtesy extended to me by **Mr. George Wentzel**, Energy Auditor for OG&E, was truly impressive because of its rarity.

This unsolicited letter of appreciation is written to recognize the EXCEPTIONAL performance, people-skills, and professionalism for a job well done by Mr. Wentzel who came to my home on January 18, 2011 to perform an energy audit for the OG&E Home Energy Efficiency Program. Many recommendations for energy improvements were made. OG&E customers who have the good fortune of having their homes audited by Mr. Wentzel will be in for a real treat!

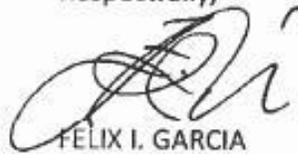
Mr. Wentzel is a caring professional who is customer-focused and takes pleasure in being able to assist others. He is the perfect person for the job because of his knowledge, friendliness, amicable personality, helpfulness, and attention to detail. He makes customers feel thankful to be a part of OG&E. Mr. Wentzel, even though he is a contractor for OG&E, represents your company, its reputation, and image very well with his professional appearance, integrity, expertise, and desire to serve OG&E customers. I simply cannot emphasize enough how impressed we are with OG&E, its services, and personnel.

So you know something about me, I retired in September 2009 from serving this great Nation with the U.S. Department of Defense for nearly 36 years of honorable military and civilian service. My wife and I moved to the wonderful State of Oklahoma because of its friendly people and terrific weather after being stationed in Des Moines, Iowa during my last 10 years of service. We purchased a brand new house in Midwest City, OK to become a part of this pleasant community.

With such high caliber personnel as Mr. Wentzel, OG&E cannot help it, but to continue to succeed. It is a well known fact that a company's success depends in large measure, not only on the quality of its products or services, but also on the quality of the people it hires.

Please accept my very best wishes for continued growth and success to you, your employees, and OG&E.

Respectfully,



FELIX I. GARCIA

624 N. Timber Rd.

Midwest City, OK 73130-3104

Home: 405-259-8285

Email: cristianosolo2@yahoo.com

Peter B. Delaney
Chairman, President and
Chief Executive Officer

OG&E Energy Corp.
P.O. Box 321
Oklahoma City, OK 73101
405-553-3397
www.oge.com

January 26, 2011



Mr. Felix I. Garcia
624 N. Timber Rd.
Midwest City, OK 73130

Dear Mr. Garcia:

Thank you for your letter of January 24 in regards to the work performed at your home by Mr. George Wentzel during your recent OG&E Home Energy Efficiency audit. When we send out contractors on behalf of the company, it is our belief that they carry with them the same dedication to getting the job done and representing OG&E that they would as a member of the company. Your letter is a testimony of our expectations.

Mr. Wentzel's exemplary work habits and professionalism will be recognized through OG&E management as well as to the contracting company.

I also want to thank you for the many years you served our great country! We consider it an honor that you have chosen Oklahoma as the State wherein to spend your retirement years.

A handwritten signature in black ink, appearing to read "Peter B. Delaney".

Peter B. Delaney
Chairman and CEO

Cc: **Danny Harris**, President and COO
Jesse Langston, VP Commercial Operations
Sarah Staton, Managing Director Marketing
Gary Marchbanks, Manager Sales

The OG&E Home Energy Efficiency Program

It's About Saving Energy, Saving Money, and Creating Real Comfort Inside Your Home.

For a limited time, OG&E is offering **an in-home energy audit** for your home through the Home Energy Efficiency Program. This detailed walk-through assessment of your home includes a comprehensive report describing everything from no-cost/low-cost simple changes to long-term recommendations that start saving you money right away! What's more, your home energy specialist will answer questions and explain a wide-variety of factors that contribute to energy efficiency. **The energy audit has a \$250 value but will cost you only \$50*** — items that will be reviewed include:

- Attic insulation
- Heating and cooling system efficiency
- Attic ventilation
- Lighting Efficiency
- Air infiltration
- Duct repair and seal
- Windows

Along with your audit you will also receive:

- A **FREE** air conditioning system inspection and tune-up – a \$75 value.
- A **FREE** air ducts inspection. Plus, you'll get a credit for up to \$300 worth of duct sealing and repairs for air leaks that can save hundreds of dollars a year on your energy costs.
- A **FREE** Home Energy Efficiency Kit filled with tools to help you start improving your home.
- Tips and information to help you save energy and learn about potential tax credits, ENERGY STAR® rebates and other financial incentives to replace appliances, repair systems and reduce energy use.

A Home Energy Efficiency Program audit is your first step toward realizing new energy savings, money savings and to improve the comfort inside your home for years to come – regardless of hot, humid summers or freezing, dry winters.

OG&E wants to be your energy partner

To schedule your home energy audit,

visit oge.com or call 1-877-430-3936

Working **TOGETHER**® to create a comfortable, energy efficient home.

*The home must be built before 2000 and customers cannot have participated in OG&E's Weatherization offering.



HEEP Outreach Kit



- High Density Foam Tape
- Self Adhesive Door Sweep
- Light Switch Insulation
- Outlet Plate Insulation
- Dupont White Airtite Latex Caulk
- "How to Weatherize" instruction sheet
- Rebate Booklet for savings on other energy saving products



Commercial Lighting



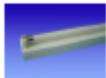
COMMERCIAL LIGHTING

Program Start Date 2-10-2010

WITH ALL YOUR POWER + WHAT WOULD YOU DO?

I. Existing Buildings

1. Replace T12 lamps with T8 or T5 lamps and receive



- \$4 per Fixture for one or two lamp fixtures
- \$8 per Fixture for three or four lamp fixtures

2. Replace HID Fixtures with Fluorescent Fixtures



- \$52 per 400 watt HID fixture replaced
- \$102 per =>750 watt HID fixture replaced

3. Replace inefficient incandescent lamps with hard-wired Compact Fluorescent Lamps (CFL)



- \$8 per fluorescent Fixture of 26 watt or less
- \$11 per fluorescent Fixture of greater than 26 watts

4. Replace inefficient incandescent Exit Fixtures with Energy efficient LED Fixtures



- \$5 per LED Fixture

5. Lighting, Sensors, and Controls not specified above

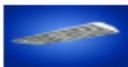


- \$160 per kW of reduced peak demand
 - Includes reflector type screw in CFL



II. New Construction

1. Use DOE's free COM/check program to calculate the kW saved compared to the 2006 International Energy Conservation Code (IECC 2006)



- \$160 per kW saved



<http://www.energycodes.gov/comcheck/>

2. New construction controls same as retrofit controls

Steve Kardokus
405-553-3737
kardoksm@oge.com

**POSITIVE
ENERGY
TOGETHER®**



Commercial/Industrial Standard Offer Program

Tri-Fold Handout

How the Standard Offer Program Works

The **Standard Offer Program** is about helping industrial, institutional, commercial, schools, state agencies and retail enterprises become smarter and more frugal in their energy usage.

Naturally, there are some easy-to-follow guidelines for securing your OG&E rebates, including a description of the upgrade project, costs associated with the project, current and projected energy cost savings for the upgrade, as well as some other basics.

For a complete overview of the **Standard Offer Program** and its participation requirements, go to www.oge.com for complete details.

Saving Energy Means Saving Money

Nothing as good as these Standard Offer rebates can last forever. And once these rebates are gone, they're gone for good. That's why NOW is the time to take advantage of these money-saving electrical upgrade opportunities that can put cash in your pocket and energy and money savings in your future.

For more information about how your business could benefit from the OG&E rebates, contact **Greg Spender** at **405-553-3672**, or at spendegj@oge.com today.

Visit www.oge.com today for more information about your rebate!



Standard Offer

OG&E Rebates Can Generate New Savings For Your Commercial or Industrial Facility

Upgrades to Any Electrical Equipment or System Can Earn Your Business Rebates Now and Monthly Savings from Now On!



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 (405) 553-3672
spendegj@oge.com

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 oklahoma city, ok 73101-0321

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Re-Invest in Your Business and OG&E Will Invest in You.

Now, OG&E is making it easy to upgrade your business infrastructure and put money back in your pocket with the Standard Offer Program, the demand reduction opportunity offered all industrial, institutional, commercial, schools, state government facilities and retail businesses who upgrade to new, more energy efficient systems and processes.

From now through January 1, 2013, OG&E has hundreds of thousands of dollars in rebate money available to those entities who upgrade their infrastructure and can demonstrate verifiable electrical cost savings results back to OG&E.



The More You Save, the More You Can Make!

Naturally, larger consumers of electrical power represent the greatest energy savings potential. But big or small, every business holds the possibility of energy and money savings with your electrical upgrades.

Whether your business is...

- A manufacturer upgrading your chillers or air compression systems;
- An institutional facility switching to new, high-efficiency HVAC equipment;
- A commercial enterprise opting for a more efficient electrical-powered steam system;
- An industrial concern upgrading your various machines with new motors and drives with premium efficient electrical motors;
- A school upgrading your central heat and air system to a geothermal system.
- Other energy-saving facility upgrades in a variety of businesses and applications.

...OG&E can show you how to earn thousands of dollars in rebates NOW, plus enjoy thousands more in monthly energy savings over the life of your investment.



A Commitment to Savings

These rebates are just one aspect of OG&E's commitment to reducing business energy consumption. By lowering the demand for electricity, everyone saves. Here's how...

1. By making your business more energy efficient, you help OG&E avoid the building of expensive new power plants, which helps keep energy costs low.
2. Businesses installing new, high efficiency equipment upgrades will enjoy lower energy bills every month and every season for years to come!
3. When these new systems are installed, businesses providing verifiable, before-and-after energy savings documentation will enjoy significant, one-time cash rebates for their upgrades.
4. Your business will reap the increased productivity and safety of your new, state-of-the-art equipment upgrades for years to come.

POSITIVE ENERGY TOGETHER

OG&E

Energy Efficiency Education Program

Thank You Letters



Stand Watie Elementary School ★ 3517 S. Linn Ave. • Oklahoma City, OK 73119
Office (405) 681-2266 • Fax (405) 686-4056

To whom it may concern:

Thank you so much for letting my class participate in the LivingWise Program. They had a lot of fun and learned a lot. I was surprised that they knew so little about the cost of energy. Having the tools helped the students and their family realize how much energy and water they were using. Most of the families have made efforts to conserve.

Most of my students are from Hispanic homes where the parents don't speak English. So, the students had to help their parents (which was a good thing-the parents got involved in this). I hope they understood everything-it seems like they did. I think they got the message that they could save money if they save energy!

This is the first time I have used this program. I would love to use it again next year, earlier in the year. That way, I could have a parent meeting with an interpreter to help explain it to the parents better. I would have more time to link it to our science lessons, etc. I absolutely think this is a worthwhile program.

Thank you so much,

A handwritten signature in black ink that reads "Marsha Allison".

Marsha Allison
5th grade teacher
Stand Watie elementary

Dear OG&E: Positive Energy Together,

Thank you for the fun kit. I really liked the showerhead in the kit. My family and I were surprised that we wasted 80 gallons a day taking a shower. We also found out that our toilet was leaking. I'd give you an A+ on the kit.

Sincerely,
Fernando

May 26, 2010

Dear OGE,

I thank you so much for providing materials for this program. I am wearing my bracelet as I write to you. When I go home tonight and take a shower, I will save water! With my night light, I will save money! Now that I know how much water I use in one shower, I will shorten my showers. I can't wait to use my new faucet.

Love,
Talen

6.1 Evaluation, Measurement and Verification Details

EVALUATION OF THE OG&E LOW- & FIXED-INCOME WEATHERIZATION PROGRAMS – PROGRAM YEAR 2010

Final Report

Prepared for Oklahoma Gas & Electric

May 26, 2011

Global Energy Partners Project Manager
R. Milward

EXECUTIVE SUMMARY

This document presents the findings of Global Energy Partners' (Global) evaluation of the OG&E Low- and Fixed-Income Weatherization Programs (Wx Programs) for program year (PY) 2010.

The OG&E Wx Programs address the inspection, upgrade, and improvement of the thermal envelope of each participant's dwelling. Upon its completion, the weatherization work should make the house more comfortable for the resident and it should help reduce the rising impact of utility bills. The difference between the two Wx Programs lies only in how a customer qualifies to participate in the Program and the separate participation, energy savings, and demand reduction goals for the two Programs. The 2010 goals for each Program are summarized in .

Table ES-1 Goals for PY 2010 Wx Programs

Program	Participants	Total Energy Savings	Total Demand Savings
Low-Income	3,000	15,073 MWh	3.12 MW
Fixed-Income	833	4,186 MWh	0.87 MW
Combined Wx Programs	3,833	19,259 MWh	3.99 MW

Purpose of the Evaluation

The purpose of this evaluation of the PY 2010 Wx Program was to provide independent validation of the energy savings achieved by customers who participated in the program. Specific objectives of this evaluation were:

- Conduct on-site verification of reimbursed weatherization improvements to establish whether the improvements claimed by the contractors were, in fact, performed.
- Conduct a thorough review of Wx Program tracking database to determine whether any improvements to the record keeping and project tracking process could be made and whether the contractors are providing adequate project and measure information for OG&E Project staff to accurately report impacts and progress.

Summary of the Analysis

Global reviewed the EnerTrek database used to track the progress of the Wx Programs. A majority of the information in this database is entered by the Wx contractors by completing an online form that indicates which improvements they made to individual homes. The database contains algorithms that calculate the energy and demand impacts of each measure implemented using the information entered by the contractors. Global's review included looking for inconsistencies in the data, including outliers (values that appear to be too high or too low compared to other values), missing data, and non-mutually exclusive or ambiguous responses. Global worked with database developer Frontier Associates to fully understand the database, the database fields, the values found in the fields, and analysis and maintenance issues.

Global's field verification involved visiting the homes of a random selection of 30 Wx Program participants. The field verification visits were conducted April 6-9 and 11 and included 20 Low-Income and 10 Fixed-Income participants. While on-site, Global's field verification engineer verified the existence of each of the measures reported as having been made by the contractor. In addition, she measured attic insulation levels,

counted number of CFLs in place, recorded air conditioner and refrigerator model numbers, and other values associated with the particular measures implemented in each house.

Database Findings

- The actual numbers of participants for each Program are beyond expectations with 4,337 participants in PY 2010, which is 113% of the goal for the year. The Fixed-Income program alone had 150% more participants than expected. “Word of mouth” helped bring in many participants, but also created unrealistic expectations by a few participants about what they would receive from OG&E.
- Calculated energy savings for the Wx Programs totaled 11,350 MWh, which is 59% of what was expected. Calculated demand reductions were 2.53 MW, which is 63% of expected. While there was no problem getting customers to participate, the improvements made did not bring in the savings as expected.
- The expected yearly impacts per participant for the Wx Programs are 5,025 kWh and 1.04 kW. The actual per-participant impacts for the two PY 2010 Wx Programs are 2,617 kWh and 0.58 kW. These results are 48% and 44%, respectively, of the expected impacts per participant.
- Since the calculated savings are based on deemed values, it appears that either the average size or number of the units installed in each home was not what was expected. The billing analysis that Global will conduct later in 2011 should be able to provide an indication of where the deemed savings figures are varying from the savings figures calculated in the tracking database.

Program Impact Results

The actual numbers of participants for each Program are beyond expectations. However, the energy and demand impacts are far less than expected for each Program. Therefore, the average savings per participant is about half of what was expected. Both programs exceeded their PY 2010 budgets. Therefore it appears that the per-participant costs are about what was expected. However, since the per-participant impacts were less than the goal, more was being spent per participant for the resulting impacts.

Table ES-2 Participants and Calculated Impacts of PY 2010 OG&E Wx Programs

Program	Participants / Percent of PY 2010 Goal	Energy Savings / Percent of PY 2010 Goal	Demand Savings / Percent of PY 2010 Goal
Fixed-Income	1,253 (150.4%)	3,109 MWh (74.3%)	0.79 MW (90.8%)
Low-Income	3,084 (102.8%)	8,241 MWh (54.7%)	1.74 MW (55.8%)
Combined Wx Programs	4,337 (113.1%)	11,350 MWh (58.9%)	2.53 MW (63.4%)

Field Verification Findings

Among the 30 homes in the sample there were 94 improvements claimed by the contractors. The most commonly installed measures were CFLs and infiltration improvements, which were both installed in all 30 homes visited. Overall, of the 64 non-CFL improvements claimed to have been performed on the 30 homes, 11 (17%) were either not found to have been done, done poorly or only partially, or used ineligible or non-ENERGY STAR equipment. That is a success rate of about 83%, which is quite high considering that in some cases, as many as 14 months could have elapsed since the improvements were made – ample time for alterations by the occupant. Six more improvements (11%) could not be confirmed due to inaccessibility or inability to read equipment nameplates to confirm whether the equipment was ENERGY STAR.

Recommendations for Improving Savings Estimates in Future Program Years

EnerTrek Tracking Database

- Ensure that those database fields that have drop-down lists from which the user can select values have mutually exclusive values and only values that are on current field data collection forms used by the contractors. In addition, use the choice "none" rather than "n/a" if the equipment of interest is not present.
- Include landlord/property manager name and contact information for participants living in multi-family buildings or adult living residences. There were instances while attempting to schedule the field verification visits, where the occupant was unaware of any work having been done, because the landlord made the arrangements while the unit was unoccupied.
- The program plan contained in Gary Marchbanks' testimony before the OCC¹ states that OG&E will partner with eight to 12 contractors for these two programs. In PY 2010, two for-profit and two non-profit contractors were used on these programs. Global recommends that, due to the small number of OG&E staff managing these programs, OG&E stay with fewer contractors as they are now, rather than increase to the eight to 12 contractors anticipated to avoid unnecessary complication and the need for additional management oversight.
- It would be worth the additional labor cost to the Programs to develop frequency tables and cross-tabulations of the data in the tracking database at regular intervals (such as quarterly or biannually) to ensure that there are no data anomalies. Another option may be to include validation checks in the data entry screens that will ask the user to verify a value they have entered if it is outside of a pre-set range or is significantly different than other entries in that particular field – much like the data validation feature available in Microsoft Excel.
- The area of attic insulation applied by the contractor should be noted in database. At one site, less than one-third of the available attic area was covered with insulation due the shape of the home and the arrangement of the framing in the attic. Yet, if the contractor was reimbursed based on the floor area, then the contractor was overpaid for the performance of that task.

Weatherization Contractors

- Provide clear guidelines to Wx contractors as to where and when measures are to be or can be installed. The contractors should know that OG&E's Wx Programs do not allow more than four CFLs to be installed in a single fixture or that water heater pipe insulation cannot be installed when the water heater has a heat trap installed.
- Provide the Wx contractors with minimum quality or warranty specifications for the equipment used or measures provided. For example, in several instances outside caulking appeared to be either nonexistent or severely degraded by weather. This could have been because it was either 1) never applied, 2) applied poorly or in insufficient quantity for the conditions and location, 3) the wrong type of caulking for the conditions and location, or 4) of insufficient quality (too short a warranty).
- Train the Wx contractors to prioritize the implementation of improvements such that the most cost-effective are implemented first, rather than the one that will provide them the largest reimbursement for the lowest effort on their part.
- Redesign the contractor reimbursement process so that the contractor takes on some of the risk associated with measures or improvements not performing satisfactorily. For example, if the contractor uses inferior quality equipment in an effort to reduce their costs, they should be responsible if that equipment fails early. For example, one of the refrigerators installed through the program was not an

¹Direct Testimony of Gary J. Marchbanks (GJM Testimony) on behalf of OG&E," September 15, 2009; part of filing In the Matter of the Application of Oklahoma Gas and Electric Company for an Order of the Commission Approving Comprehensive Demand Programs, Granting Recovery of the Costs of Such Programs and Authorizing a Recovery Rider, Cause No. PUD 200900200.

ENERGY STAR refrigerator. That contractor should not have been reimbursed for that piece of equipment until they replaced it with an ENERGY STAR refrigerator. This could be verified through a check of the database as described above.

- A majority of sites had glass storm doors, used for both security and visual appeal. It would be interesting to research the energy savings benefits of weather stripping these doors since they are in such high use, particularly with the main door open.
- Our research indicates that none of the Wx contractors used by OG&E were Building Performance Institute certified. In future contractor selection, we suggest that OG&E require that Wx contractors be so certified (www.bpi.org).

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INTRODUCTION

This document presents the findings of Global Energy Partners' (Global) evaluation of the OG&E Low- and Fixed-Income Weatherization Programs for program year (PY) 2010.

The Low- & Fixed-Income Weatherization Programs

The OG&E Low- and Fixed-Income Weatherization Programs (Wx Programs) address the inspection, upgrade, and improvement of the thermal envelope of each participant's dwelling. Upon its completion, the weatherization work should make the house more comfortable for the resident and it should help reduce the rising impact of utility bills. The difference between the two Wx Programs lies only in how a customer qualifies to participate in the Program and the separate participation, energy savings, and demand reduction goals for the two Programs. The 2010 goals for each Program are summarized in .

Table 1-1 Goals for PY 2010 Wx Programs

Program	Participants	Total Energy Savings	Total Demand Savings
Low-Income	3,000	15,073 MWh	3.12 MW
Fixed-Income	833	4,186 MWh	0.87 MW
Combined Wx Programs	3,833	19,259 MWh	3.99 MW

The Low-Income Weatherization Program focuses on OG&E customer who own, rent, or lease their homes and who have incomes at or below 200% of the Federal Poverty Guidelines. OG&E anticipates 3,000 participants each year for the program period of 2010 through 2012. The Low -Income Weatherization Program is expected to reduce demand by 3.12 MW and electricity consumption by 15,073 MWh per year. Based on 3,000 participants each year, the average expected savings per home are 1.04 kW and 5,024 kWh per year.²

The Fixed-Income Weatherization Program focuses on OG&E customers who own site-constructed homes constructed prior to 2000 that have been occupied for at least one year, who have fixed incomes of \$35,000 or less, and are at least 65 years of age. OG&E anticipates 833 participants each year for the program period of 2010 through 2012. The Fixed -Income Weatherization Program was expected to reduce demand by 0.87 MW and electricity consumption by 4,186 MWh in 2010. Based on 833 participants each year, the average expected savings per home are 1.04 kW and 5,024 kWh per year.³

In addition to the customer needing to qualify for each of the Wx Programs, the customer's home must meet three out of seven criteria for the customer to be able to participate in the Programs. The seven criteria are:

- The existing attic insulation must not be greater than R-11
- The existing wall insulation must not be greater than R-4
- The existing floor insulation must not be greater than R-0

² Table FIW-5, "Direct Testimony of Gary J. Marchbanks (GJM Testimony) on behalf of OG&E," September 15, 2009; part of filing In the Matter of the Application of Oklahoma Gas and Electric Company for an Order of the Commission Approving Comprehensive Demand Programs, Granting Recovery of the Costs of Such Programs and Authorizing a Recovery Rider, Cause No. PUD 200900200.

³ Table LIW-5, GJM Testimony.

- The home must have single pane windows with no storm windows attached
- The existing heating and cooling systems each must not exceed certain efficiency levels
- Air infiltration problems in the home must be identified through either a visual inspection or by a pre-improvement blower door test.

During PY 2010 OG&E partnered with four contractors to perform the weatherization improvements. The Wx Program is designed such that OG&E will pay each contractor a maximum of \$2,500 per home to make the improvements. OG&E expects that the average contractor payment will be \$1,970 per home.

Purpose of This Evaluation

The purpose of this evaluation of the Wx Programs for PY 2010 was to provide independent validation of the energy savings achieved by customers who participated in the program. Specific objectives of this evaluation were:

- Conduct on-site verification of reimbursed weatherization improvements to establish whether the improvements claimed by the contractors were, in fact, performed.
- Conduct a thorough review of Wx Program tracking database to determine whether any improvements to the record keeping and project tracking process could be made and whether the contractors are providing adequate project and measure information for OG&E Project staff to accurately report impacts and progress.

Organization of This Report

Following this introductory chapter are the following chapters:

- Chapter 2 – Methodology: Describes the data collection process and the evaluation approach.
- Chapter 3 – Verification of Weatherization Improvements: Describes the on-site verification of improvements and the findings of those visits.
- Chapter 4 – Preliminary Program Impact Results: This chapter presents the preliminary program impacts based on Global's analysis of the tracking database. The full program impacts for the PY 2010 Wx Programs will be conducted later in 2011, as a billing analysis.
- Chapter 5 – Conclusions and Recommendations: Summary of the conclusions reached based on the review and analysis of the tracking database and the on-site verification of weatherization improvements.

METHODOLOGY

Global's review of the OG&E PY 2010 Wx Programs included analyzing the EnerTrek Wx Program tracking database and conducting field verification visits of a sample of Wx Program participants. Later in 2011, Global will conduct a billing analysis of participants to determine whether adjustments to the Program's ex-ante savings are needed to reflect realized savings – an approach that satisfies IPMVP Option C.

Description of the Evaluation Approach

Global's evaluation of the PY 2010 Wx Programs involved two approaches. The first was a review of the tracking database used by OG&E Program management to record the weatherization improvements made by the contractors and calculate the energy savings for each participant. The second was to conduct field verification visits to the homes of 30 Wx Program participants.

Tracking Database Review

Shortly after the completion of the 2010 program year, Global requested a copy of the database used by OG&E to track the Wx Programs. Called EnerTrek, this majority of the information in this database is entered by the Wx contractors. They complete an online form that indicates which improvements they made to individual homes. The database contains algorithms that calculate the energy and demand impacts of each measure implemented using the information entered by the contractors.

The analysis of the EnerTrek Wx Programs tracking database included looking for inconsistencies in the data, including outliers (values that appear to be too high or too low compared to other values), missing data, and non-mutually exclusive or ambiguous responses. Global worked with database developer Frontier Associates to fully understand the database, the database fields, the values found in the fields, and analysis and maintenance issues.

Global has requested information on the algorithms used in the database to calculate the energy and demand impacts of each measure for the purpose of evaluating the algorithms. This request is in preparation for the billing analysis that Global will conduct later in 2011.

Global also assessed the total overall energy and demand impacts for each of the Wx Programs based on the data in the database, as well as the savings per participant. While OG&E is likely already aware of these values, Global evaluated them to establish whether the per-participant impacts are in line with expectations.

Field Verification Visits

The field verification involved visiting the homes of a random selection of 30 Wx Program participants. The participants were initially selected such that the ratio of Low-Income to Fixed-Income participants in the sample matched that of the population. The population in this case was the dataset originally provided to Global that included PY 2011 participants. In that original dataset there were 3,561 Low-Income to participants and 1,805 Fixed-Income participants for a total of 5,366 participants. Therefore, the ratio of Low- to Fixed-Income participants was 2:1. Therefore, Global selected 20 Low-Income and 10 Fixed-Income participants as primary sample members from that population, plus additional backups in case we had been unable to contact the primary sample members.

Global's field verification engineer began calling each of the participants two weeks in advance to schedule a verification appointment. The field verification visits were conducted April 6-9 and 11 and included 20 Low-Income and 10 Fixed-Income participants. While on-site, Global's field verification engineer verified the existence of each of the measures reported as having been made by the contractor. In addition, she measured attic insulation levels, counted number of CFLs in place, recorded air conditioner and refrigerator

model numbers, and other needed values associated with the particular measures implemented in each house.

Data Collected to Support the Evaluation

The primary data sources for the evaluation of the Wx Programs were the EnerTrek Program tracking database and the field verification visits.

Program Tracking Database

OG&E's Wx Program Manager supplied Global with data from the EnerTrek tracking database in mid-March 2011. Global analyzed that set of data as described above in Section 0 and used it to select the sample of Wx Program participants for the field verification visits.

It was determined in late April, when the OG&E Wx Program Manager was reviewing Global's memorandum⁴ dated April 19, 2011, that the database supplied to OG&E by its database contractor Frontier Associates in mid-March and then forwarded to Global contained not only PY 2010 participants, but also all Wx Program participants up through mid-March 2011. Since this evaluation focuses only on PY 2010 results, Global requested and subsequently received in early May a data file containing only PY 2010 participants, for both Wx Programs.

The PY 2010 EnerTrek tracking database includes over 108,760 records for 4,337 participants, where each record represents one potential measure or improvement implemented. There are approximately 25 records for each home, depending on the type of home. Even if a measure is not implemented in a home, it appears in the database, except with zero impacts. Therefore, if a home had six weatherization improvements made, then just six of the records for that home have non-zero impacts.

Eliminating records with zero impacts reduces the database to 14,350 records for the 4,337 participants. This provides the starting point for the database review.

The EnerTrek tracking database supplied to Global included the following fields:

- Home number (unique identifier)
- Street address, city, zip, state, phone
- Home type (low-income, fixed-income)
- Resident type (single-family, duplex, multi-family, mobile-home)*
- Floor area (square feet)
- Number of stories*
- Year built
- Cooling equipment type (central AC, window AC)*
- Existing central AC system size (if present)*
- Heating type (heat pump, gas central heat, gas space heat, electric resistance)*
- Number of compact fluorescent lamps (CFLs) installed by wattage (11W, 15W, 23W, 27W)
- Attic R-value*
- Refrigerator size (cubic feet)*
- Count of window air conditioners by cooling capacity (in Btuh)* and number of each replaced
- Pre- and post-implementation air infiltration rates in cubic feet per minute at 50 Pascals (CFM₅₀)

⁴ Titled "Initial Results from the Review of the OG&E Low- and Fixed-Income Weatherization Programs."

- Window area treated with solar screens (as appropriate)
- Water heater fuel type*
- Measure implemented*
- Measure kW savings
- Measure kWh savings
- Total kW savings for home
- Total kWh savings for home
- Weatherization contractor that performed work
- Weatherization contractor's notes

Note: * following a field above indicates a value entered using drop-down list in database

The data for each participant in the EnerTrek tracking database are entered by the participant's contractor. The contractor also has the ability to enter contact information, such as customer contact history, qualification status, etc. Values for many of the fields (noted above with "*") are entered by selecting a value from a drop-down list. This practice reduces data entry errors or multiple instances of the same value appearing due to different spelling or capitalization (e.g., "heat pump" and "Heat pump" can often be perceived by databases as two unique values).

The details of Global's full review of the EnerTrek Wx Programs database are included in Chapter 4.

On-Site Visits

A field engineer from Global visited the homes of a sample of 30 randomly selected Wx Program participants to verify the implementation of home improvements claimed by the Wx Program contractors. Global's engineer arrived at each home with a list from the tracking database of the improvements claimed by the contractor. During her inspection of the home, Global's engineer looked for each of the items on that list and, once located, verified that it was still present. For some improvements, such as attic or pipe insulation, Global's engineer took measurements to verify the claimed quantity of the improvement made.

The details of the sample selection, recruiting and scheduling the visits, the visits themselves, and the findings and observations of the visits are detailed in Chapter 3.

VERIFICATION OF WEATHERIZATION IMPROVEMENTS

Global conducted field verification visits to the homes of 30 Wx Program participants. The primary purpose of the visits was to establish that the weatherization improvements claimed to have been implemented by the Program's contractors were, in fact, implemented. A secondary purpose was to determine the accuracy with which the contractors collected relevant data about participants' homes and entered those data into the tracking database.

Sample Selection

Global determined in consultation with OG&E DSM managers that a sample of size 30 would provide statistically reliable results at a modest cost to the budget. It was further decided to construct the sample such that the breakdown between Low-Income and Fixed-Income participants in the sample matched the breakdown between Low-Income and Fixed-Income participants in the entire population. This breakdown was based on the initial set of participant data, which included PY 2011 participants through mid-March 2011. This initial database contained data on 5,366 Wx Program participants. The ratio of Low-Income to Fixed-Income participants in the initial database was almost exactly 2:1 (3,561:1,805). Therefore, Global randomly selected 20 Low-Income participants and 10 Fixed-Income participants for the field verification visit sample. These represented the "primary" sample members.

In addition, Global picked backup participants in case any of the primary sample members had to be eliminated from the sample either because they couldn't be reached due to a wrong number or because they refused to participate. The number of backup sample members selected was half the number of primary sample members in both Programs.

The corrected database containing only PY 2010 participants had 1,253 Fixed-Income and 3,084 Low-Income participants with a somewhat lower percentage of Fixed-Income participants than the original database, but the sample is still approximately representative. The sample included four Fixed-Income and three Low-Income participants from 2011, but we don't expect that the information garnered from these sites is materially different from what we would have gathered from 2010 participant sites.

Global then checked that first sample to ensure that each weatherization measure was represented in sample in approximately the same proportion as in the population. For example, the walls of 4.3% of all participants were insulated through the Wx Program. Ideally, we would want approximately 4.3% of the members of the sample – or at least one participant in the sample – to have had their walls insulated through the Program. If not, then we'd randomly select another sample and check the measures again. We had to repeat this procedure several times until we had at least one representative of each measure in the randomly selected sample.

Global's field verification engineer began calling the members of the sample by telephone to arrange appointments with them. A number of Low-Income Program participants in the first sample could not be reached by Global's engineer. Therefore, we randomly selected 30 additional Low-Income Program participants and randomized the list, so that there were no designated "primary" or "backup" sample points and Global's engineer could begin calling at the top of the list and work downward. This sample was checked against the population to ensure that each measure was represented in the sample.

Once Global's engineer was in Oklahoma it became necessary to select more sample members for her because she was still having trouble setting up appointments with Low-Income Program participants in the more distant areas, such as the south and the east. To select additional sample points, we first filtered out the Fixed-Income participants; those already included in the first two samples; and those not living in Bryan,

Carter, Johnston, Marshall, or Muskogee counties. From the remaining 333 population members we selected 30 additional members.

At the conclusion of the field visits, Global's field engineer had recruited and visited 19 Low-Income and 11 Fixed-Income participants. These 30 participants are examined more thoroughly in Section 0.

Field Verification Visit Recruiting and Appointment Scheduling

To maximize the likelihood of a Wx Program sample member agreeing to be visited by Global's field verification engineer, Global developed a script for recruiting field verification visit participants. The script can be found in Appendix A. To help visualize the recruiting process in the script, Global created a flow diagram that can be found in Appendix B. The script standardizes the process of confirming that a sample member did in fact participate in the Wx Program and then asking them to participate by allowing a field verification visit from Global's field engineer.

Global's field verification engineer began making phone calls to schedule the field verification visits in late March 2011. Visits were targeted for April 4-9, 2011 (Tuesday through Saturday) and April 11, 2011 (Monday) as follows:

- Wednesday, April 6, 2011 Oklahoma City area
- Thursday, April 7, 2011 Ardmore area
- Friday, April 8, 2011 Ardmore area
- Saturday, April 9, 2011 Oklahoma City/Muskogee areas
- Monday, April 11, 2011 Oklahoma City/Enid areas

Telephone calls to recruit participants and schedule visits such as these can be very time-consuming. For example, on the first day of calling to schedule field visits, Global's engineer made 18 telephone calls with the following outcomes:

- 2 appointments booked and confirmed
- 4 participants wanted a call back closer to the visit date
- 3 wrong numbers
- 1 participant did not recall having weatherization work being completed on their home
- 1 said to coordinate with the "office" (we did not know what that meant, so they were not called back)
- 7 did not answer

Participants wanting to be called back closer to the visit date were accommodated as much as possible. However, if a visit could actually be scheduled, then that would take precedence on the schedule over a participant who had asked to be called back.

Participants not answering calls were called back another day by Global's field engineer. However, we found that customers who did not answer initial calls could rarely be reach by later phone calls.

Once a field visit was scheduled, Global's field visit engineer would typically call the participant to confirm the time of the visit and the address a few days before the visit. A couple of scheduled visits were cancelled at the last moment. However, these were typically due to unforeseen circumstances, such as a family emergency. There was one participant that agreed to a visit, but the participant could not be contacted for several days to confirm the visit, so Global's engineer cancelled the visit and schedule another it its place.

Field Verification Visit Procedure

Global's field engineer arrived at each home at the appointed date and time with a list from the tracking database of the improvements claimed by the contractor as having been implemented. During her inspection of the home, Global's engineer looked for each of the items on that list and, once located, verified that it

was still present. For some improvements, such as attic or pipe insulation, Global's engineer took measurements to verify the claimed quantity of the improvement made.

If Global's engineer could not find a particular improvement, then she would ask the occupant about that improvement. If, for example, the tracking database noted that 20 CFLs had been installed in the home and Global's engineer could locate only fifteen, the occupant would be asked if more CFLs were installed than were currently present in the house. The idea was to collect some anecdotal information from the occupant in a non-confrontational, non-adversarial way to determine the situation of that measure. Global's engineer would also casually inquire about the occupant's satisfaction with the Wx Programs and the contractor that performed the work at their home. Appendix C contains the forms used to collect the data during the on-site verification visits.

After each field visit, Global's field engineer would indicate on each data collection form those improvements or measures that do not match the database. The result of these comparisons can be found in Section 0.

Final Field Verification Sample and Characteristics

Over the five days of field verification visits, Global's engineer visited 30 Wx Program participants. lists the general characteristics of the final members of the Wx Program field verification sample.

The goal was to visit 10 Fixed-Income and 20 Low-Income participants over the 5-day period. However, due to the fluid nature of scheduling visits, in the end Global's field engineer had visited 11 Fixed-Income and 19 Low-Income participants. shows the cities in which each participant lives as well as the date of the visit.

shows the breakout of field visit participants by city and program. As would be expected, the majority of the participants are in the Oklahoma City metropolitan area. The remaining participants are distributed geographically such that they closely represent OG&E's service territory, as can be seen in .

Table 3-1 Field Verification Visit Sample Members

Customer	Program	City	Date of Field Visit	Year of Wx Work
F-1	Fixed-Income	Del City	April 6, 2011	2010
F-2	Fixed-Income	Oklahoma City	April 6, 2011	2010
F-3	Fixed-Income	Kingston	April 7, 2011	2010
F-4	Fixed-Income	Durant	April 7, 2011	2011
F-5	Fixed-Income	Dickson	April 7, 2011	2011
F-6	Fixed-Income	Sulphur	April 8, 2011	2010
F-7	Fixed-Income	Oklahoma City	April 9, 2011	2011
F-8	Fixed-Income	Oklahoma City	April 9, 2011	2010
F-9	Fixed-Income	Enid	April 11, 2011	2011
F-10	Fixed-Income	Oklahoma City	April 11, 2011	2010
F-11	Fixed-Income	Oklahoma City	April 11, 2011	2010
L-1	Low-Income	Oklahoma City	April 6, 2011	2010
L-2	Low-Income	Oklahoma City	April 6, 2011	2010
L-3	Low-Income	Oklahoma City	April 6, 2011	2011
L-4	Low-Income	Oklahoma City	April 6, 2011	2010
L-5	Low-Income	Oklahoma City	April 6, 2011	2010
L-6	Low-Income	Ada	April 7, 2011	2010
L-7	Low-Income	Ardmore	April 7, 2011	2010
L-8	Low-Income	Madill	April 7, 2011	2010
L-9	Low-Income	Ardmore	April 7, 2011	2010
L-10	Low-Income	Ardmore	April 7, 2011	2010
L-11	Low-Income	Ardmore	April 8, 2011	2010
L-12	Low-Income	Ardmore	April 8, 2011	2011
L-13	Low-Income	Paul's Valley	April 8, 2011	2010
L-14	Low-Income	Noble	April 8, 2011	2010
L-15	Low-Income	Oklahoma City	April 8, 2011	2011
L-16	Low-Income	Oklahoma City	April 9, 2011	2010
L-17	Low-Income	Muskogee	April 9, 2011	2010
L-18	Low-Income	Muskogee	April 9, 2011	2010
L-19	Low-Income	Enid	April 11, 2011	2010

Table 3-2 Summary of Field Verification Visits Locations by Program

City	Fixed-Income	Low-Income	Both Programs
Ada		1	1
Ardmore		5	5
Del City	1		1
Dickson	1		1
Durant	1		1
Enid	1	1	2
Kingston	1		1
Madill		1	1
Muskogee		2	2
Noble		1	1
Oklahoma City	5	7	12
Pauls Valley		1	1
Sulphur	1		1
Totals	11	19	30

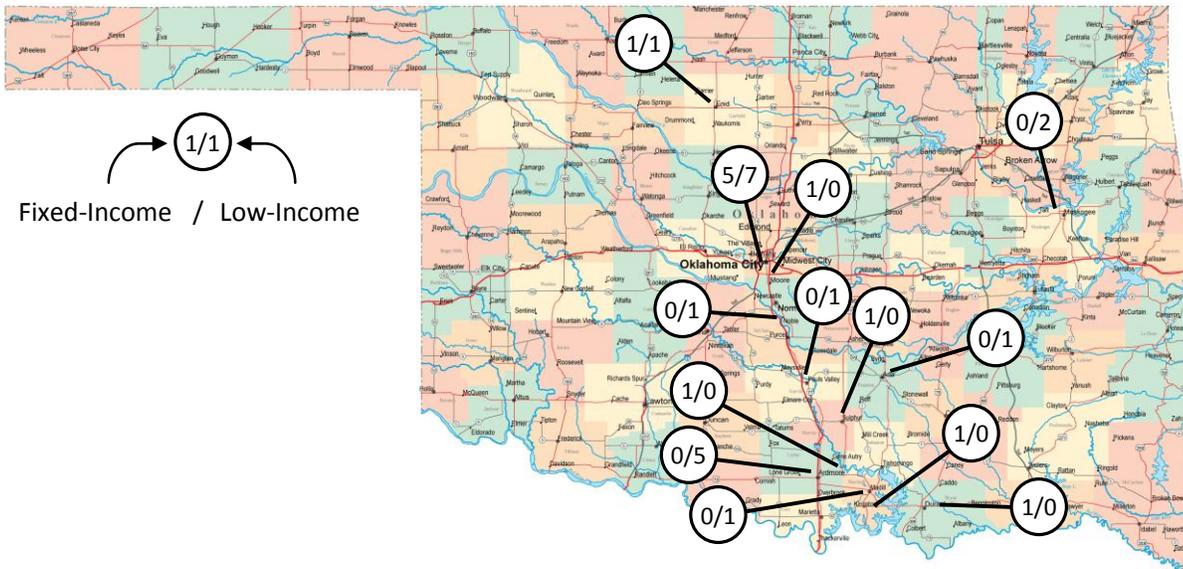


Figure 0-1 Locations of Field Verification Visits

Findings of Field Verification Visits

Among the 30 homes in the sample there were 94 improvements claimed by the contractors. The most commonly installed measures were CFLs and infiltration improvements, which were both installed in all 30 homes visited. lists the measures implemented among the 30 homes in the sample. The table provides for each measure the number of homes or the count of the items – depending on the character of the measure – claimed to have been installed or implemented by the contractor and the number found by Global’s field verification engineer.

Table 3-3 Claimed and Verified Measures Implemented by Program, PY 2010

Measure Implemented	Fixed-Income		Low-Income		Both Programs	
	Claimed	Verified	Claimed	Verified	Claimed	Verified
Attic Insulation by number of homes	4	3	14	9	18	12
Central AC Tune-Up by number of homes	1	1	1	1	2	2
CFLs by count	389	299	390	337	779	636
CFLs by number of homes	11	11	19	19	30	30
Infiltration by number of homes	11	11	19	15	30	26
Pipe Insulation by number of homes	1	1	0	0	1	1
Refrigerator by count	5	3	4	4	9	7
Water Heater Jacket by count	1	1	1	1	2	2
Window AC by count	0	0	2	2	2	2

Overall, of the 64 non-CFL improvements claimed to have been performed on the 30 homes in the sample, 11 (17%) were either not found to have been done, done poorly or only partially, or used ineligible or non-ENERGY STAR equipment. That is a success rate of about 83%, which is quite high considering that in some cases, as many as 14 months could have elapsed since the improvements were made – ample time for alterations by the occupant. Six more improvements (11%) could not be confirmed due to inaccessibility or inability to read equipment nameplates to confirm whether the equipment was ENERGY STAR.

Since the sample contained 23 homes that were weatherized in 2010 and seven homes weatherized in 2011, we tested whether there was any difference in performance of the weatherization between the two years.⁵ We found no significant difference in the proportion of non-CFL improvements that were performed in the two periods (51.4% among PY 2010 participants vs. 50.0% among PY 2010 participants).

The following sections provide detail for each of the eight improvements performed in the sample homes as found by Global’s field verification engineer.

Attic Insulation

Attic insulation was claimed to have been installed in 18 homes, but could be verified in only 11. Of the seven other homes, the claimed insulation was non-existent in one home, only partially covered the attic of a second home, and could not be checked in five homes due to either permanently sealed attic hatches or refusal of the occupant to allow attic access. While the proportion of unverifiable attics among all participants is unclear, this situation is not uncommon.

In every home where the attic was insulated, loose fill insulation was used. In most cases, the blown insulation varied in depth by four to six inches. In some attics this was understandable based on the pitch of the roof and the difficulties that presents in accessing corners and the farther limits of attics. The

⁵ We acknowledge that these are very small samples, so the conclusions are only to highlight a characteristic that we will check into more thoroughly in the future.

consequence of these openings is that conditioned air is able to move between the attic and the interior of the home.

In some homes, the Wx contractors installed attic rulers that allowed easy determination of insulation depths. However, the accuracy of these rulers varied as shown in , where the contractor's attic ruler indicates an insulation depth of 12-inches, while the field engineer's tape shows a depth of about 9.5-inches.

In one home the contractor blew insulation over several ducts which appeared to be disconnected, as shown in . There is also evidence in the photo that the contractor blew insulation over items that were already in the attic rather than removing them or having the occupant remove them.

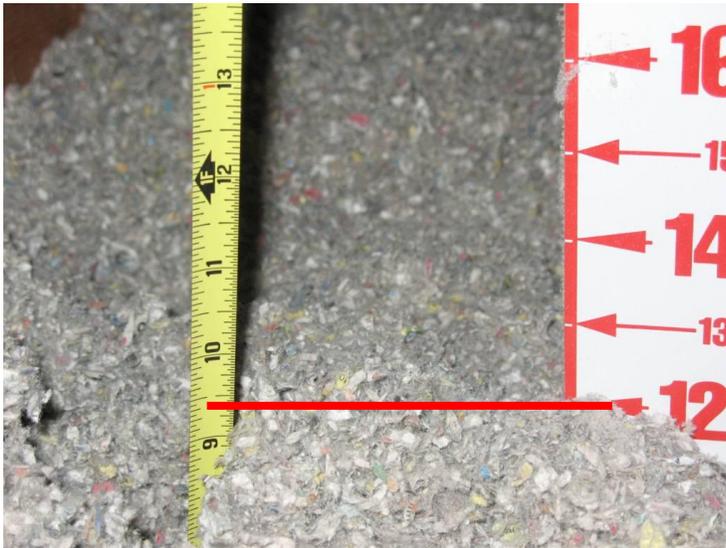


Figure 3-2 *Discrepancy Between Field Engineer's Tape and Contractor's "Attic Ruler"*



Figure 3-3 *Home With Insulation Blown Over Disconnected Ducts. To Left Of Duct 2 Is Continuation Of Duct Work. – Contractor Skyline Energy Solutions*

Central AC Tune-Up

The central AC units of two homes were claimed to have been tuned-up. This measure can involve any of a number of repair items, such as filter replacement, refrigerant addition or removal, coil cleaning, fan replacement, and general cleaning. However, it can be difficult to ascertain whether a central AC unit has

been tuned – one occupant stated she didn't recall the unit in her being tuned up. That particular unit appeared to be over 20 years old, rusted, and indicated a lack of use. At one location the unit was no longer operable even though the contractor indicated that they had either added or removed refrigerant from the unit.

CFLs

Along with infiltration improvements, CFLs were the most often installed Wx measure. The claimed number of CFLs installed in the homes visited by Global's field verification engineer ranged from two up to 52. The total number installed among the 30 homes was 779. The total number found during the visits was 636, which is 18% fewer than claimed. It is unclear why there were so many fewer CFLs found than were claimed to have been installed by the contractors. However, there were some stories about missing CFLs:

- A high percentage of participants had already had at least one contractor-installed CFL burn out. The burned out CFLs were most often installed in ceiling fans.
- A few participants mentioned that their contractors left extra CFLs behind as replacements. These were likely counted by the contractor as having been "installed."
- One participant had removed 90% of the CFLs installed by her Wx contractor because she was unsatisfied with brightness of the lamps.

One of the requirements of the Wx Program for CFL installation was that the location had to be used at least two hours per day; otherwise the cost savings produced by the CFL would not be able to meet the cost of installing the lamp over its lifetime. Another requirement was that the lamps could not be installed in "Hollywood" style fixtures with four or more lamps. These fixtures (which we refer to as vanities) are typically found in bathrooms and mounted either above or beside mirrors. Global's field engineer found that about 6% of the CFLs (40 lamps) were in installed bathroom vanity fixtures with four or more sockets.

Not specifically mentioned as prohibited installations are ceiling fans, which can often hold up to five lamps. Ninety-five percent of the homes visited by Global's field engineer had at least one ceiling fan and typically many more and there were CFLs installed in each one.

Infiltration

The contractors claimed that every home in the sample had infiltration improvements. It was also the measure most commented on by participants, due to their perception that the contractor was going the extra mile to help them.

However, there was one home where there was no evidence of any improvements and several others where there were still so many infiltration problems visible that it was apparent that little effort was made by the contractor to complete the project. Of those, there was a case where the occupant sealed the exterior of the home's windows himself and another home that was still so leaky that the curtains billow even when the windows are closed (see) and a door where the weatherstripping prevents it from closing properly.



Figure 3-4 Billowing Curtains Due to Poor Weatherstripping

There are many activities that fall under the heading of infiltration, including the installation of door sweeps, gaskets installed behind light switches and electrical outlet faceplates, weatherstripping around doors and windows, sealing attic hatches, window pan replacement, and so on. The purpose of any infiltration activity or repair is to reduce the movement of air between the home's conditioned space and the home's unconditioned spaces and outdoors.

Because there are so many different infiltration activities or repairs, this measure was usually observed while inspecting for other measures, such as insulation or when the participant commented on the measure or issue related to sealing or lack thereof. Also because there are so many different infiltration activities or repairs, Global determined at the outset not to try to locate every infiltration activity or repair. Instead Global's field verification engineer attempted to locate and identify only the most obvious and most common infiltration activities or repairs.

One of the most common and most commented upon by home occupants was the sealing of cracks around windows with caulking. However, it was very frequently applied in a very thin film – too thin to have long-term resistance to cracking or degradation. It was also commonly applied over cracking and peeling paint, which further decreases its effectiveness and lifetime, since it was often already separating and gapping. The arrow in shows some of the gaps typically found in the caulking applied around exterior window surfaces. The same was true on the insides of the homes where the caulking also appeared to be degrading quickly.



Figure 3-5 *Typical Gaps Found in Caulking Around Windows*

Pipe Insulation

Insulation of the hot and cold water pipes around water heaters was claimed on just one of the 30 homes in the sample. In that home, even though the insulation met the minimum thickness requirement this measure it should have been ineligible for a rebate to the contractor, since the water heater already had a heat trap installed.

Refrigerator

Contractors indicated that nine of the 30 participants in the sample had been given new refrigerators as part of the Wx Programs. Global's field verification engineer found eight refrigerators. One participant was to receive a new refrigerator, but was in the hospital when the contractor tried to deliver it and the contractor has not attempted to reschedule delivery.

The refrigerators provided to participants through the Wx Programs are required to meet current ENERGY STAR standards. One of the eight delivered refrigerators was not an ENERGY STAR refrigerator. Whether three of the others were ENERGY STAR refrigerators could not be confirmed due to the inability to acquire the units' model numbers.

All participants who received a free refrigerator were very pleased for the upgrade. One participant was provided a new refrigerator yet stored meals in a standup freezer located next to refrigerator, which to participants' admission was hardly used.

A tenth participant has anticipated receiving a new refrigerator, but was told by the contractor that there were no funds available to provide her with one.

Water Heater Jacket

Two participants received water heater jackets. Both were the minimum thickness (2 inches) and were installed on water heaters having capacities of more than 30 gallons.

Window AC

Window AC units were found primarily in low-income homes and most homes had more than one unit. Even with the large number of existing window AC units, just two were replaced among the 30 field verification

homes through the Wx Program. One was determined to be an ENERGY STAR unit, as required by the Program. Whether or not the other unit was an ENERGY STAR unit could not be established because the model number could not be located.

DATABASE REVIEW AND FIELD VERIFICATION RESULTS

Summary of Program as Implemented

summarizes the expected number of participants, energy savings, and demand impacts by each Wx Program in PY 2010.⁶ summarizes the number of participants, energy savings, and demand impacts by each Wx Program in PY 2010 from the EnerTrek tracking database.

The actual numbers of participants for each Program are beyond expectations. However, the energy and demand impacts are far less than expected for each Program. Therefore, it appears that the average savings per participant is not as high as was expected.

Table 4-1 *Expected Participants and Impacts of PY 2010 OG&E Wx Programs*

Program	Expected PY 2010 Participants	Expected PY 2010 Energy Savings	Expected PY 2010 Demand Savings
Fixed-Income	833	4,186 MWh	0.87 MW
Low-Income	3,000	15,073 MWh	3.12 MW
Combined Wx Programs	3,833	19,259 MWh	3.99 MW

Table 4-2 *Participants and Calculated Impacts of PY 2010 OG&E Wx Programs*

Program	Participants / Percent of PY 2010 Goal	Energy Savings / Percent of PY 2010 Goal	Demand Savings / Percent of PY 2010 Goal
Fixed-Income	1,253 (150.4%)	3,109 MWh (74.3%)	0.79 MW (90.8%)
Low-Income	3,084 (102.8%)	8,241 MWh (54.7%)	1.74 MW (55.8%)
Combined Wx Programs	4,337 (113.1%)	11,350 MWh (58.9%)	2.53 MW (63.4%)

The expected yearly impacts per participant for the Wx Programs are 5,025 kWh and 1.04 kW, as shown in .⁷ The actual per participant impacts for the two PY 2010 Wx Programs, also shown in , are 2,617 kWh and 0.58 kW. These results are 48% and 44%, respectively, of the expected impacts per participant.

The CFL, attic insulation, and infiltration measures had the greatest impact on both energy savings and demand reductions. Those three measures alone accounted for about 10,786 MWh and 2.4 MW of savings. These both represent 95% of the total energy and demand impacts of the Wx Program in PY 2010. (See Appendix D for tables detailing the energy and demand impacts by measure.)

⁶ GJM Testimony.

⁷ Based on expected annual figures of 3,833 participants, 19,259 MWh energy savings, and 3.99 MW demand reductions.

Both programs exceeded their PY 2010 budgets and exceeded their participant goals, but did not meet their impact goals. Therefore, it appears that the per-participant costs are about what was expected. However, since the per-participant impacts were less than expected, more is being spent per participant for the resulting impacts.

Table 4-3 *Calculated per-Participant Impacts of PY 2010 OG&E Wx Programs*

Program	Energy Savings per Participant	Demand Reduction per Participant
Expected Impacts	5,025 kWh	1.04 kW
Calculated Fixed-Income Impacts	2,481 kWh	0.63 kW
Calculated Low-Income Impacts	2,672 kWh	0.56 kW
Calculated Wx Program Impacts (Deviation from Expected)	2,617 kWh (47.9%)	0.58 kW (44.2%)

Review of EnerTrek Wx Program Tracking Database

Global’s review of the Wx Program tracking database revealed several interesting details:

- The tracking database contains 42 fields and 14,351 records (non-zero impacts) for 4,337 participants.
- Three Fixed-Income participants lived in non-site-constructed homes – contrary to program requirements.
- Two Fixed-Income participants lived in homes constructed after 1999 – contrary to program requirements.
- The mean home size was 1,335 sq. ft. for Fixed-Income and 1,221 sq. ft. for Low-Income participants.
- The most common type of heating system found in the homes of the participants of both programs is gas forced-air furnaces (66.4%) followed by electric resistance heat (30.2%).
- CFLs are expected to contribute significantly towards overall Wx Program savings goals. In the homes of both Fixed-Income and Low-Income participants, the number of CFLs reported as installed ranged from zero up to 85. We found that it may be difficult to verify the accuracy of the number of CFLs installed because it is very easy for a participant to replace the CFLs with incandescent lamps.
- For several measures, the deemed savings documentation prepared by Frontier Associates do not match the values appearing in the tracking database. Therefore, the next phase of the analysis prior to the billing analysis in fall 2011 will be to evaluate the algorithms used by the database to calculate the energy and demand impacts and compare them to the deemed savings documentation.

Program Observations

While conducting the field verification visits of participants’ homes, Global’s field verification engineer was able to document a number of observations and opinions from the participants as well as provide some of her own observations.

General Opinions of Participants

- OG&E’s Wx Programs were very well received by all participants visited. All felt fortunate to have their electric utility provide such a “great program” and most did not mind all the foot traffic in their home (from contractors, OG&E Program staff, and the Global field verification engineer), because the comfort and savings were well worth it.

- The contractors also received a lot of praise from participants for “going the extra mile” in patching and sealing interior cracks and being very professional. The holistic approach to not only weatherize the home but also provide health and safety measures was also much appreciated. When asked, most participants visited said they noticed an improvement in the comfort of their home as well as lower utility bill since the work was completed.
- A few participants expressed some frustration which ranged from:
 - 1) The quality of work related to infiltration improvement,
 - 2) A lack of communication by the contractor,
 - 3) The number of people that came through their home as a consequence of program participation,
 - 4) That fact that a CFL installed by the contractor had already burned out, or
 - 5) That a specific improvement was not provided, such as refrigerator or window air conditioner.

This last item appeared to be due to the fact that there was a lot of “word of mouth” discussion of the Program between neighbors. As a result, one would hear of a neighbor getting a new refrigerator or window AC unit and decided to participate because they wanted new appliances, too. Then frustration would result from the contractor not installing a new appliance because they ran out of budget due to other improvements to the home.

Observations of Global’s Field Verification Engineer

- The quality of work performed by the Wx contractors in Low-Income homes seemed to be related to the physical or psychological condition of the home or participant, with people in poorer health having had lower quality/quantity work completed regardless of the contractor. For example, in one home in which the occupant was “not all there” and there were dog urine and feces inside the home, the claimed improvements varied the most from what was observed in any home, with very few of the claimed improvements having actually been done.
- Field verification of the actual number of CFLs installed was challenging due to three factors: First, a majority of participants reported at least one CFL had already burned out. Second, obtaining a true count of installed CFLs was difficult due to participants having already removed some lamps for various reasons. Thirdly, many CFLs were placed in fixtures that did not qualify (e.g., more than four sockets), and therefore should not have been installed.
- Attic insulation was one another challenge to collect data on during field verification due to sealed attic hatches, insulation having been blown over the attic hatch, and the inability to access the attic due to obstructions and/or ceiling height.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The impact evaluation of the PY 2010 Wx Program produced a number of findings.

Program Strengths:

- Every participant to whom a field verification visit was made was extremely grateful for the work that was completed and appears to be very pleased with the Wx Programs.
- OG&E's program management has been doing a very good job considering the complexity of these two programs and the fact that they involve a large number of participants as well as a large number of potentially eligible participants.
- The Program Manager is helpful and easy to work with.

Program Weaknesses:

- There appears there may be a disconnect between the deemed savings values and the calculated ex ante savings figures contained in the tracking database. This area will be the next focus of the evaluation prior to the billing analysis later this year.
- Among the participants contacted as part of the field verification visits, the tracking database contained several errors of phone numbers, customer names, and/or house numbers.
- There were cases found among the field visit customers of CFLs having been retrofitted into fixtures that held four or more lamps, which is contrary to the requirements of both Wx Programs.
- Some homes had many more CFLs installed than would be considered "typical" for a single-family home. However, it is very difficult to verify the number of CFLs installed as noted above.
- The fact that the budget is being spent but the savings goals are not being met indicates that the contractors are not aware of the importance of prioritizing the improvements such that the most cost-effective energy-saving improvements are implemented first.

Recommendations

EnerTrek Tracking Database

1. Ensure that those database fields that have drop-down lists from which the user can select values have mutually exclusive values and only values that are on current field data collection forms used by the contractors. In addition, use the choice "none" rather than "n/a" if the equipment of interest is not present.
2. Include landlord/property manager name and contact information for participants living in multi-family buildings or adult living residences. There were instances while attempting to schedule the field verification visits where the occupant was unaware of any work having been done, because the landlord made the arrangements while the unit was unoccupied.

3. The program plan contained in Gary Marchbanks' testimony before the OCC⁸ states that OG&E will partner with eight to 12 contractors for these two programs. In PY 2010, two for-profit and two non-profit contractors were used on these programs. Global recommends that, due to the small number of OG&E staff managing these programs, OG&E stay with fewer contractors as they are now, rather than increase to the eight to 12 contractors anticipated to avoid unnecessary complication and the need for additional management oversight.
4. It would be worth the additional labor cost to the Programs to develop frequency tables and cross-tabulations of the data in the tracking database at regular intervals (such as quarterly or biannually) to ensure that there are no data anomalies. Another option may be to include validation checks in the data entry screens that will ask the user to verify a value they have entered if it is outside of a pre-set range or is significantly different than other entries in that particular field – much like the data validation feature available in Microsoft Excel.
5. The area of attic insulation applied by the contractor should be noted in database. At one site, less than one-third of the available attic area was covered with insulation due the shape of the home and the arrangement of the framing in the attic. Yet, if the contractor was reimbursed based on the floor area, then the contractor was overpaid for the performance of that task.

Weatherization Contractors

1. Provide clear guidelines to Wx contractors as to where and when measures are to be or can be installed. The contractors should know that OG&E's Wx Programs do not allow more than four CFLs to be installed in a single fixture or that water heater pipe insulation cannot be installed when the water heater has a heat trap installed.
2. Provide the Wx contractors with minimum quality or warranty specifications for the equipment used or measures provided. For example, in several instances outside caulking appeared to be either nonexistent or severely degraded by weather. This could have been because it was either 1) never applied, 2) applied poorly or in insufficient quantity for the conditions and location, 3) the wrong type of caulking for the conditions and location, or 4) of insufficient quality (too short a warranty).
3. Train the Wx contractors to prioritize the implementation of improvements such that the most cost-effective are implemented first, rather than the one that will provide them the largest reimbursement for the lowest effort on their part.
4. Redesign the contractor reimbursement process so that the contractor takes on some of the risk associated with measures or improvements not performing satisfactorily. For example, if the contractor uses inferior quality equipment in an effort to reduce their costs, they should be responsible if that equipment fails early. For example, one of the refrigerators installed through the program was not an ENERGY STAR refrigerator. That contractor should not have been reimbursed for that piece of equipment until they replaced it with an ENERGY STAR refrigerator. This could be verified through a check of the database as described above.
5. A majority of sites had glass storm doors, used for both security and visual appeal. It would be interesting to research the energy savings benefits of weather stripping these doors since they are in such high use, particularly with the main door open.
6. Our research indicates that none of the Wx contractors used by OG&E were Building Performance Institute certified. In future contractor selection, we suggest that OG&E require that Wx contractors be so certified (www.bpi.org).

⁸ GJM Testimony.

APPENDIX | A.

FIELD VERIFICATION RECRUITMENT CALL SCRIPT



OG&E Weatherization Program Evaluation Study Recruitment Call Script

Hi, my name is Kim Brown and I'm calling from Global Energy Partners – a contractor to OG&E. I am trying to reach {MR./MRS. LAST NAME} regarding {HIS/HER} participation in OG&E's Weatherization program. Is {HE/SHE} available?

[IF CUSTOMER ANSWERS PHONE OR COMES TO PHONE, GO TO 1]

[IF CUSTOMER NOT AT HOME OR NOT AVAILABLE:] Is there a better time to reach {MR./MRS. LAST NAME} or is there someone else I can speak to about the work done at your home through OG&E's Weatherization program?

[IF SPEAKING TO ALTERNATIVE RESPONDENT OR ALTERNATIVE RESPONDENT COMES TO PHONE, GO TO 1.]

[IF "BETTER TIME," SCHEDULE CALLBACK FOR DIFFERENT DAY/TIME AND THEN TERMINATE CALL.]

[IF "NO," THANK CUSTOMER AND TERMINATE CALL]

1. Hello {MR./MRS. LAST NAME}, my name is Kim Brown and I'm with Global Energy Partners. We have been contracted by OG&E to contact a sample of residential customers that participated in OG&E's Weatherization program for the purpose of assessing how well the energy improvements made to their homes' through that program are performing and to assess their experience with the program in general. Do you recall participating in OG&E's Weatherization program during 2010?

[IF "YES," GO TO 3.]

[IF "NO," GO TO 2.]

2. OG&E's Weatherization program is a program where OG&E provides improvements to the homes of fixed- or low-income customers to make their homes more comfortable and help reduce their utility bills at no charge to the customer. Our records indicate that {NAME OF CONTRACTOR} performed several energy improvements to your home, such as installing compact fluorescent light bulbs, caulking and weather-stripping doors and windows, and possibly also installing attic insulation and other energy and comfort improvements. Does that work sound familiar to you?

[IF "YES," GO TO 3.]

[IF “NO,” TELL THEM THEY CAN CALL DEBBIE McINTIRE AT OG&E (405-553-3597) IF THEY HAVE QUESTIONS, CONCERNS, OR WANT TO AUTHENTICATE YOUR CLAIMS. IF STILL RELUCTANT, THANK CUSTOMER FOR THEIR TIME AND TERMINATE CALL.]

3. **Great. As I mentioned, we are contacting a limited sample of Weatherization program participants to assess how well the energy-improvements made to your home are performing, verify that the improvements the weatherization contractor claimed to have performed were actually performed, determine whether your home has become more comfortable as a result of the improvements, and to assess your experience with the program in general. This would involve me visiting you at your home and taking about 30 minutes of your time to speak with you. This is not a sales call and I will not be collecting any personal information during my visit. Can I schedule an appointment to visit your home?**

[IF “YES,” GO TO 4.]

[IF “NO”:] I assure you {MR./MRS. LAST NAME} that I will not be selling any products or services. The only purpose of my visit is to verify that the improvements the weatherization contractor claimed to have performed on your home were actually performed and to ask you some questions regarding your experience with the program and your opinion of the program in general. Do you have any questions right now about the visit or the purpose of this study?

[IF “YES,” ANSWER QUESTIONS (SEE FAQs), AND THEN GO TO 5.]

[IF “NO”:] Then can I schedule an appointment with you now to visit your home?

[IF “YES,” GO TO 5.]

[IF “NO,” TELL CUSTOMER THEY CAN CALL DEBBIE McINTIRE AT OG&E (405-553-3597) IF THEY HAVE QUESTIONS, CONCERNS, OR WANT TO AUTHENTICATE YOUR CLAIMS. IF STILL RELUCTANT, THANK CUSTOMER FOR THEIR TIME AND TERMINATE CALL.]

4. **Great. Before we set up a date and time, do you have any questions about the visit or the purpose of this study?**

[IF “YES,” ANSWER QUESTIONS (SEE FAQs), AND THEN GO TO 5.]

[IF “NO,” GO TO 5.]

5. **My records indicate that you live at {ADDRESS} in {CITY}. Is that correct?**

[IF “YES,” GO TO 6.]

[IF “NO”:] **Can I get your correct street address then, please?** [RECORD CORRECT STREET ADDRESS AND THEN GO TO 6.]

6. **Is that the address where the weatherization improvements were made?**

[IF “YES,” GO TO 8.]

[IF “NO,” GO TO 7.]

7. **Just to make sure I understand, does this mean that you’re no longer living in the home where the weatherization improvements were made?**

[IF “YES” (NO LONGER IN HOME):] **I’m sorry, but because you’re no longer living in the home where the weatherization improvements were made, we cannot include you in the study. However, please accept our thanks for your willingness to participate. Have a good day.** [TERMINATE CALL]

[IF “NO,” (STILL IN HOME) ATTEMPT TO CLARIFY SITUATION. THE CUSTOMER MUST CURRENTLY LIVE IN THE HOME WHERE THE WEATHERIZATION IMPROVEMENTS WERE MADE TO PARTICIPATE IN THE STUDY. IF CUSTOMER DOES LIVE IN THAT HOME, GO TO 8. IF CUSTOMER DOES NOT LIVE IN THAT HOME, THANK THEM AND TERMINATE CALL.]

8. [SET UP APPOINTMENT. TELL CUSTOMER THAT YOU WILL CALL THEM THE DAY BEFORE YOUR VISIT TO REMIND THEM. YOU MIGHT ASK IF THERE ARE ANY LANDMARKS OR DISTINGUISHING FEATURES OF THE HOME THAT WOULD HELP YOU FIND IT. THANK CUSTOMER AND TERMINATE CALL.]

FREQUENTLY ASKED QUESTIONS

with example responses

1. Why are you doing this study?

OG&E is required by the Oklahoma Corporation Commission to evaluate the effectiveness of energy efficiency programs funded by the ratepayers themselves. In the case of the Weatherization program, OG&E must verify the accurate and complete installation of improvements to ensure they meet program standards for payments to the weatherization contractor. Not every home will be inspected, just a sample.

2. Who is funding the study?

This study is funded by the same source that funds energy efficiency programs in the state of Oklahoma, which is an adder to the bill of every electric and natural gas customer in Oklahoma.

3. How are the results going to be used?

OG&E is required to provide evaluation results to the OCC to verify that the program is cost-effective and performing to expectations. In addition, OG&E can use the information to make adjustments to the program, if necessary, to improve the program and its performance for future participants.

4. How was I selected for this study?

Out of over 5,300 Weatherization program participants in 2010, you were selected randomly. We hope that you will take this opportunity to allow us to visit your home so that we can use the information to improve the program for future participants.

5. Do I have to participate?

Your participation is completely voluntary. However, we hope that you will agree to participate. This study gives you an opportunity to tell us about your experience with the program. If you have any questions or concerns regarding the Weatherization program or my request to visit your home as part of our evaluation of the Weatherization program, you are welcome to call OG&E's Weatherization program administrator Debbie McIntire at 405-553-3597.

6. How long will the visit take?

My visit is expected to take about 30 minutes. The exact time will depend on how many improvements were made to your home, the size of your home, and whether you have any additional questions during my visit.

7. Do I get anything for participating?

Although you will not receive any direct benefit from participating in this study, this study does give you an opportunity to tell us about your experiences with the Weatherization program. This information will help OG&E improve the quality of the products and services it provides to its customers like you.

8. Can you call me back later?

Yes, I would be happy to schedule a time to call you back at a more convenient time.

9. What happens to the information I give you?

The information I collect during my visit to your home will be combined with the information given to us by the other members of the sample whose homes I will visit. We will then produce a report for OG&E and for the OCC that gives them summary information about the results of the study to verify that the program is cost-effective and performing to expectations. In addition, OG&E can use the information to make adjustments to the program, if necessary, to improve the program and its performance for future participants.

10. How do I know that everything I tell you is confidential?

Every person working on this project at Global Energy Partners signs a confidentiality agreement. That means that we promise to keep information about you and the responses that you give us completely confidential. No one outside of the project at Global – or even at OG&E – will have access to the information you provide.

11. How did you get my name?

OG&E provided us with a list of participants in their Weatherization program during 2010. You were then selected at random by Global Energy Partners to participate in this study.

12. Do I have to be present when you visit my home?

Yes, you must be present. There are three reasons for this. First, some of the improvements that were made might be inside your home, such compact fluorescent lamps, low-flow

showerheads, water heater insulation, or attic insulation. Second, we need to ask you questions regarding your experience with the program, including dealing with OG&E and the weatherization contractor. Finally, you will likely have questions during the visit and we want to be able to answer those for you fully, so that you are comfortable with the purpose of the study.

I will call you the day prior to our appointment to remind you and verify your address.

13. When will the study be completed?

The first interim report, which will include the results of the visits I make to the homes of Weatherization program participants, is due May 15, 2011. We are in the first year of a three-year study that will end in May 2013, so there will be many other reports during the next two-and-a-half years.

14. Is there anyone I can call if I have questions/concerns about this study?

Yes. The Weatherization program director at OG&E is Debbie McIntire. She can be reached at 405-553-3597.

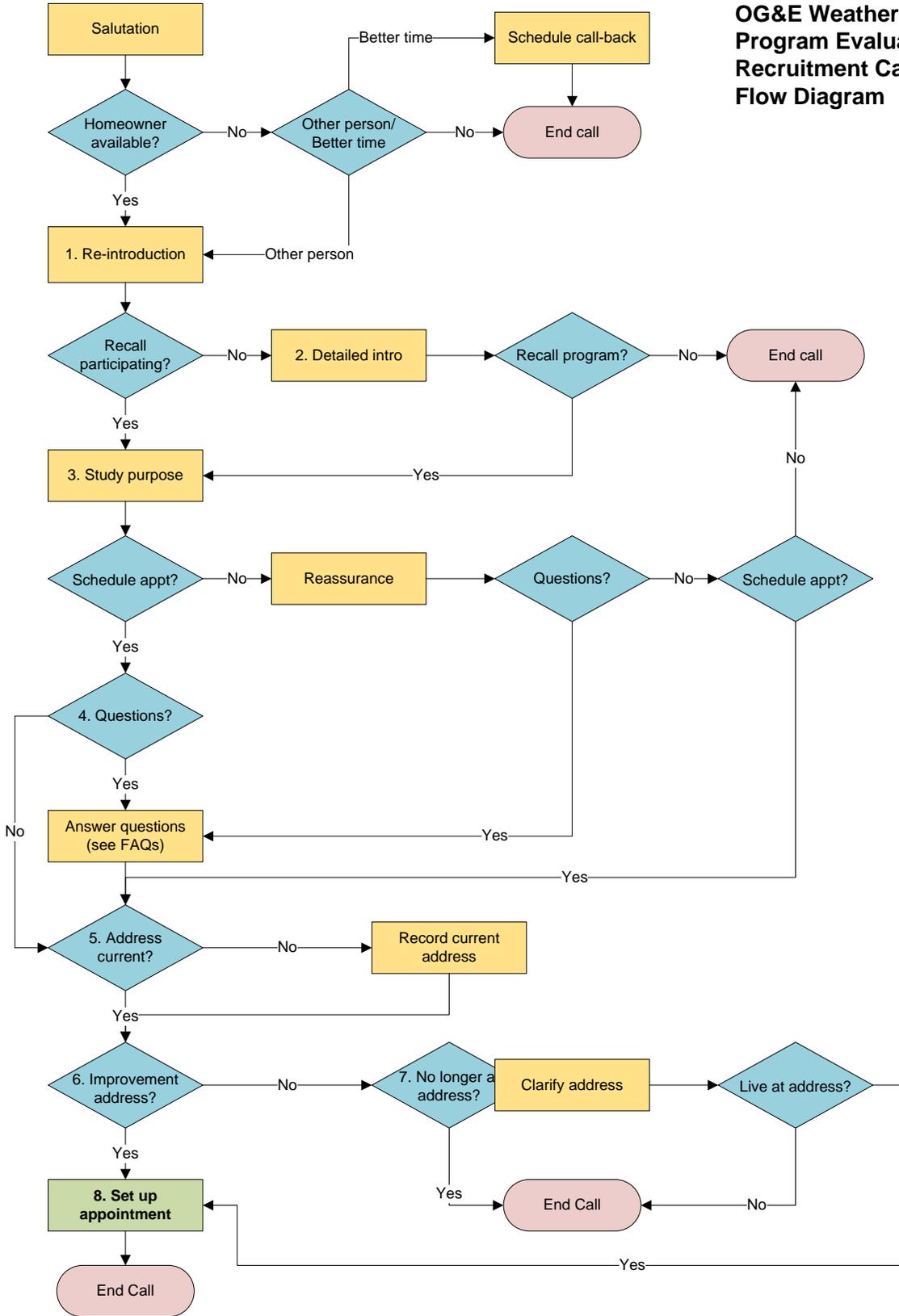
APPENDIX | **B.**



RECRUITMENT CALL FLOW DIAGRAM



**OG&E Weatherization
Program Evaluation
Recruitment Call
Flow Diagram**



ON-SITE DATA COLLECTION FORMS

The table below provides instructions to Global’s field engineer on what data to collect for each Wx improvement implemented in a given home:

Measure Implemented:	What to Record:
15CFL = 9W-12W CFLs	Count of CFLs by wattage group
20CFL = 13W-17W CFLs	Fixtures with 4+ lamps cannot contain CFLs
23CFL = 18W-25W CFLs	
27CFL = 26W-32W CFLs	
AC	Brand & Model number Unit size (Btuh/tons)
Attic Insulation	Insulation thickness (inches) - include all insulation, even “old” insulation Type(s) of insulation
Central AC Tune-Up	Unit size (Btuh/tons)
Duct Efficiency	Foundation type (Slab-on-grade/Crawlspace/Basement) Number of return air registers Type of duct (Sheet metal/Flexible/Fiberboard) AC size (Btuh/tons) Location of air handler (Garage/Closet/Attic/etc.)
Infiltration	<i>-Nothing to note-</i>
PIPE	Water heater fuel type (Natural gas/Propane/Electricity) Length of pipe insulation installed Thickness of pipe insulation installed Whether or not heat trap present Whether all vertical lengths of pipe & 1 st 3 ft of horizontal hot and cold pipes are insulated
Refrigerator	Brand & Model number Size (cubic feet)
Shower Head	Count of showerheads
Solar Screens	Area of each window covered by screens and direction faced by window (e.g., 40 sf facing East, 15 sf facing West, etc.)
WALL	Area of wall insulated Exterior wall type (Brick/Stucco/Vinyl/Metal/etc.)
Water Heater Jacket	Thickness of insulation (inches) Water heater fuel type (Natural gas/Propane/Electricity) Capacity of water heater tank (gallons)
Window AC - Any Btu	Brand & Model number Count of units Note whether unit has “louvered” sides

Below is an example of the first page of the 2-page field verification form that was populated with customer-specific data from the tracking database prior to the site visit. Global’s on-site field verification engineer then used it to determine if the weatherization improvements claimed to have been installed by the

weatherization contractor were, in fact, installed. The values in the tracking database were entered by the contractors.

OG&E Weatherization Programs - Field Verification						
Cust Name: _____			Phone: _____			
Street: _____			Wx Prog: _____			
Cross-Street: _____			Home#: _____			
City-Zip: _____			Wx Contractor: _____			
Appt Date: _____		Appt Time: _____		Duration: _____		
Database Values	OK	Correction	Measures Installed	OK	Correction	
Home Type: Single Family			1) 20CFL			
Floor Area: 1,700			2) Attic Insulation			
Stories: 1			3) Infiltration			
Year Built: 1946						
Cooling Type: Central AC						
Heating Type: Gas Central Heat						
CFL (9-12W): 0						
CFL (13-17W): 25						
CFL (18-25W): 0						
CFL (26-32W): 0						
Attic Ins (In): _____		Type: _____				
Ref Size (Ft ³): n/a						
WinAC1 (Btu): 0						
WinAC2 (Btu): 0						
<p>Wx Notes: WATERHEATER NEEDS FRESH AIR NEW DOOR 23 7/8 X 79 1/2--FURNACE NEEDS FRESH AIR DOOR SEALED 3FT X 3FT SHEETROCK FOR BACK OF FURNACE CLOSET--CAULK 2 SLIDING DOORS OUTSIDE--SEAL CRACK IN KITCHEN CEILING-- CRACK ABOVE DOOR IN KITCHEN--SEAL VENT PIPE IT STOVE--SEAL KITCHEN SINK--SEAL BATHROOM SINK AND TUB AND PLUMBING AND TOILET--SEAL MASTER BATHROOM SINK CAULK BASE OF SHOWER ANDCRACK AT WINDOW IN BATHROOM--CRACK AT DOOR IN MASTER BEDROOM--SEAL ATTIC HATCH AND CRACK AT HATCH--IN BLUE ROOM SEAL CRACK ABOVE DOOR</p>						
<p>Meas Notes: <Space for field verification engineer to make notes></p>						

Below is an example of the second page of the 2-page field verification form. This page listed the repairs made as part of the "infiltration" measure listed in the right column of page 1, along with the quantity and units, which allowed Global's field engineer to verify what repairs were actually made.

OG&E Weatherization Programs - Field Verification				
Repair Item	Measure Type	Units	Unit Type	Notes
1) Seal plumbing fixtures - toilet(s)/sink(s) in bath/kitchen/washer/dryer	Infiltration	1	per can	
2) Seal/caulk around tub	Infiltration	1	per tube	
3) Door install for water heater closet	Infiltration	1	each	
4) Fresh air vent pipe with cap	Infiltration	2	each	
5) Door - weatherstripping Rigid/with rubber seal installed to front/back door	Infiltration	2	each	
6) Door Sweep(s) installed	Infiltration	2	each	
7) Sheetrock repair and seal penetrations in walls	Infiltration	6	sq. ft.	
8) Seal attic hatch opening	Infiltration	1	each	
9) Seal furnace/water heater closet	Infiltration	1	each	
10) Seal/caulk between door assemblies & respective jambs/framing	Infiltration	2	each	
11) Window - Seal/caulk outside to prevent moisture penetration	Infiltration	10	each	
12) Latches for sealing furnace/water heater closet	Infiltration	1	each	
13) Renovate Right Lead Based Paint Pamphlet	SFTY	1	each	
14) Mold and Moisture Pamphlet	SFTY	1	each	
15) OG&E Education Sheet	SFTY	1	each	
16) OG&E Weatherization DVD	SFTY	1	each	
17) Carbon monoxide detector	SFTY	2	each	
18) Smoke detector	SFTY	5	each	
19)				
20)				

CALCULATED IMPACTS BY MEASURE

The data in the following tables summarize by Wx Program and climate zone the calculated savings in the EnerTrek database for each implemented Wx measure. For all measures except water heater jackets, water heater pipe insulation, refrigerators, and CFLs, the savings are a function of the climate zone, among other factors.

The CFL, attic insulation, and infiltration measures had the greatest impact on both energy savings and demand reductions, according to the calculated figures in the tables. Those three measures alone accounted for about 10,786 MWh and 2.4 MW of savings. These both represent 95% of the total energy and demand impacts of the Wx Program in PY 2010.

Central AC Tune-Up									
Climate Zone	N	Sum kW	Mean kW	Min kW	Max kW	Sum kWh	Mean kWh	Min kWh	Max kWh
Fixed Income	21	3.72	0.18	0.15	0.24	6,980	332	280	448
7	1	0.18	0.18	0.18	0.18	372	372	372	372
8A	20	3.54	0.18	0.15	0.24	6,608	330	280	448
Low Income	150	25.74	0.17	0.09	0.21	48,522	323	186	434
7	15	2.19	0.15	0.09	0.21	4,526	302	186	434
8A	135	23.55	0.17	0.12	0.21	43,996	326	224	392
Grand Total	171	29.46	0.17	0.09	0.24	55,502	325	186	448

Window AC									
Climate Zone	N	Sum kW	Mean kW	Min kW	Max kW	Sum kWh	Mean kWh	Min kWh	Max kWh
Fixed Income	57	7.96	0.14	0.06	0.29	13,657	240	99	499
6	6	0.79	0.13	0.07	0.27	1,355	226	116	464
7	1	0.11	0.11	0.11	0.11	195	195	195	195
8A	50	7.06	0.14	0.06	0.29	12,107	242	99	499
Low Income	267	37.24	0.14	0.05	0.50	63,903	239	83	856
6	53	8.36	0.16	0.05	0.50	14,349	271	83	856
7	35	4.70	0.13	0.05	0.27	8,060	230	83	464
9	4	0.67	0.17	0.08	0.24	1,144	286	133	406
8A	175	23.51	0.13	0.05	0.30	40,351	231	83	511
Grand Total	324	45.20	0.14	0.05	0.50	77,559	239	83	856

CFLs									
Climate Zone	N	Sum kW	Mean kW	Min kW	Max kW	Sum kWh	Mean kWh	Min kWh	Max kWh
Fixed Income	1,294	146.19	0.11	0.00	0.24	1,319,539	1,020	37	2,196
Low Income	3,067	278.43	0.09	0.00	0.21	2,490,471	812	21	1,850
Grand Total	4,361	424.62	0.10	0.00	0.24	3,810,010	874	21	2,196

Central AC Replacement									
Climate Zone	N	Sum kW	Mean kW	Min kW	Max kW	Sum kWh	Mean kWh	Min kWh	Max kWh
Low Income	2	0.58	0.29	0.25	0.33	1,674	837	737	937
6	1	0.25	0.25	0.25	0.25	937	937	937	937
8A	1	0.33	0.33	0.33	0.33	737	737	737	737
Grand Total	2	0.58	0.29	0.25	0.33	1,674	837	737	937

Oklahoma Gas and Electric Company

Attic Insulation									
Climate Zone	N	Sum kW	Mean kW	Min kW	Max kW	Sum kWh	Mean kWh	Min kWh	Max kWh
Fixed Income	878	387.69	0.44	0.04	1.88	870,460	991	85	7,834
6	47	18.57	0.40	0.10	1.43	64,851	1,380	288	4,985
7	159	53.78	0.34	0.04	1.78	143,699	904	85	4,305
9	16	6.10	0.38	0.08	1.56	13,514	845	230	4,134
8A	652	307.10	0.47	0.05	1.88	644,982	989	112	7,834
8B	4	2.14	0.53	0.11	1.30	3,415	854	246	1,732
Low Income	2,256	864.11	0.38	0.03	2.88	2,498,691	1,108	70	8,442
6	102	55.01	0.54	0.10	2.23	177,397	1,739	269	8,442
7	409	158.30	0.39	0.03	1.98	486,803	1,190	71	8,295
9	15	6.02	0.40	0.11	1.72	16,357	1,090	308	2,576
8A	1,718	636.94	0.37	0.03	2.88	1,803,063	1,050	70	8,388
8B	12	7.84	0.65	0.21	1.38	15,071	1,256	451	2,650
Grand Total	3,134	1,251.80	0.40	0.03	2.88	3,369,151	1,075	70	8,442

Infiltration									
Climate Zone	N	Sum kW	Mean kW	Min kW	Max kW	Sum kWh	Mean kWh	Min kWh	Max kWh
Fixed Income	1,250	229.32	0.18	0.00	1.43	821,446	657	7	7,830
6	102	34.74	0.34	0.10	0.83	115,363	1,131	203	5,167
7	235	71.05	0.30	0.01	1.43	175,901	749	15	6,502
9	37	8.59	0.23	0.10	0.53	24,854	672	154	5,934
8A	872	113.46	0.13	0.00	0.87	501,731	575	7	7,830
8B	4	1.47	0.37	0.12	0.59	3,596	899	288	1,428
Low Income	3,036	486.91	0.16	0.00	1.56	2,785,343	917	1	14,100
6	180	71.31	0.40	0.04	1.07	268,732	1,493	156	5,753
7	633	149.92	0.24	0.00	1.25	625,963	989	1	14,100
9	28	9.16	0.33	0.13	1.38	40,982	1,464	160	8,453
8A	2,176	253.99	0.12	0.00	1.56	1,832,051	842	1	13,099
8B	19	2.53	0.13	0.01	0.45	17,616	927	60	4,091
Grand Total	4,286	716.23	0.17	0.00	1.56	3,606,789	842	1	14,100

Water Heater Jacket									
Climate Zone	N	Sum kW	Mean kW	Min kW	Max kW	Sum kWh	Mean kWh	Min kWh	Max kWh
Fixed Income	56	0.28	0.01	0.01	0.01	3,808	68	68	68
Low Income	340	1.70	0.00	0.01	0.01	23,120	68	68	68
Grand Total	396	1.98	0.00	0.01	0.01	26,928	68	68	68

Pipe Insulation									
Climate Zone	N	Sum kW	Mean kW	Min kW	Max kW	Sum kWh	Mean kWh	Min kWh	Max kWh
Fixed Income	46	0.64	0.01	0.01	0.01	2,024	44	44	44
Low Income	306	4.28	0.01	0.01	0.01	13,464	44	44	44
Grand Total	352	4.93	0.01	0.01	0.01	15,488	44	44	44



Refrigerator									
Climate Zone	N	Sum kW	Mean kW	Min kW	Max kW	Sum kWh	Mean kWh	Min kWh	Max kWh
Fixed Income	274	9.78	0.04	0.01	0.06	71,259	260	88	467
Low Income	1,038	44.00	0.04	0.01	0.07	318,821	307	88	507
Grand Total	1,312	53.78	0.04	0.01	0.07	390,080	297	88	507

Showerhead									
Climate Zone	N	Sum kW	Mean kW	Min kW	Max kW	Sum kWh	Mean kWh	Min kWh	Max kWh
Low Income	2	0.00	0.00	0.00	0.00	380	190	190	190
Grand Total	2	0.00	0.00	0.00	0.00	380	190	190	190

Solar Screen									
Climate Zone	N	Sum kW	Mean kW	Min kW	Max kW	Sum kWh	Mean kWh	Min kWh	Max kWh
Fixed Income	4	0.22	0.06	0.00	0.14	979	245	2	630
8A	4	0.22	0.06	0.00	0.14	979	245	2	630
Low Income	7	0.31	0.04	0.01	0.09	808	115	28	271
6	2	0.04	0.02	0.01	0.03	178	89	51	127
7	1	0.09	0.09	0.09	0.09	41	41	41	41
8A	4	0.19	0.05	0.01	0.06	590	148	28	271
Grand Total	11	0.54	0.05	0.00	0.14	1,787	162	2	630

ABOUT GLOBAL

Global Energy Partners is a premier provider of energy and environmental engineering and technical services to utilities, energy companies, research organizations, government/regulatory agencies and private industry.

Global's offerings range from strategic planning to turn-key program design and implementation and technology applications.

Global is a wholly-owned subsidiary of EnerNOC, Inc. committed to helping its clients achieve strategic business objectives with a staff of world-class experts, state of the art tools, and proven methodologies.

Global Energy Partners
500 Ygnacio Valley Road, Suite 450
Walnut Creek, CA 94596

P: 925.482.2000
F: 925.284.3147
E: gephq@gepllc.com

EVALUATION OF OG&E'S HOME ENERGY EFFICIENCY PROGRAMS – PROGRAM YEAR 2010

Final Report

Prepared for Oklahoma Gas & Electric

May 19, 2011

Global Energy Partners Project Manager
K. Marrin

This report was prepared by

Global Energy Partners
500 Ygnacio Valley Blvd., Suite 450
Walnut Creek, CA 94596

Principal Investigator(s):

K. Marrin
B. Ryan
J. Shishido
C. Williamson

EXECUTIVE SUMMARY

This report contains a description and results of the evaluation of the Home Energy Efficiency Program (HEEP) – Program Year 2010 conducted by Global Energy Partners.

The HEEP is designed to help residential customers improve the efficiency of their home's thermal envelope. The program provides walk-through audits to residential customers for \$50. If the customer has a central air conditioner, the program also provides a free AC tune up, valued at \$75. In addition to the tune-up, contractors also perform duct inspections and minor repairs on duct work valued at up to \$300. For customers without central air, the program offers rebates for Energy Star appliances and room air conditioners. The program is implemented by the third party contractor, CLEARresult.

The program's goal is to conduct 30,000 audits over the initial 3 years of the program. This translates to 10,000 audits each year. In 2010 OG&E completed 1,454 audits, 477 tune ups and 374 duct repairs through the program. Increased marketing efforts in early 2011 have resulted in more than 10,000 audits completed or scheduled from the start of the program through the third week of March for PY2011.

Savings Estimates

Throughout the report we reference several types of deemed savings estimates for the HEEP. The first type of savings estimate is what we refer to as the "reported savings." These deemed savings estimates are used to determine overall program savings as reported to the Oklahoma Corporation Commission (OCC) and are based on the data in Exhibit 3 of the Direct Testimony of Gary J Marchbanks on behalf of OG&E¹⁷ (GJM Testimony) in table RTE-1. The reported savings represent average per customer savings estimates for each measure.

The second type of savings estimate we will refer to as the "Frontier savings." These deemed savings estimates were developed by Frontier Associates LLC for OG&E¹⁸ and can be found in Appendix C of the GJM Testimony. The Frontier savings estimates are more detailed than the reported savings and account for variation in weather zone, tonnage, air-handler location, home size and other variables. The final type of savings estimate only applies to the duct work measures and is based on the HEEP Duct Seal/Repair and Deemed Savings Study conducted by OG&E which updated the frontier savings estimates¹⁹. We will refer to these as "updated frontier savings."

While three types of deemed savings estimates exist, only two combinations are used to estimate overall program savings: 1) the reported savings for all measures and 2) a combination of the Frontier savings for AC Tune-up, the updated Frontier savings for duct work. Because the second combination is what

¹⁷ "Direct Testimony of Gary J. Marchbanks on behalf of OG&E," September 15, 2009; part of filing In the Matter of the Application of Oklahoma Gas and Electric Company for an Order of the Commission Approving Comprehensive Demand Programs, Granting Recovery of the Costs of Such Programs and Authorizing a Recovery Rider, Cause No. PUD 200900200.

¹⁸ "Deemed Savings, Installation & Efficiency Standards" Frontier Associates LLC, July 27, 2009; Appendix C of the filing in the Matter of the Application of Oklahoma Gas and Electric Company for an Order of the Commission Approving Comprehensive Demand Programs, Granting Recovery of the Costs of Such Programs and Authorizing a Recovery Rider, Cause No. PUD 200900200.

¹⁹ "HEEP Duct Seal/Repair and Deemed Savings Study" conducted by OG&E. The study estimated Duct System Efficiency (DSE) factors which were used to update the Frontier savings estimates in appendix C of the GJM testimony. The study was provided by Donney Dorton on 8/05/2010.

CLEAResult calls the “field savings,” we will refer to these two deemed savings estimates as reported savings and field savings, respectively, in the remainder of the report.

Key Results

- CLEAResult has developed a very useful online tool, the Energy Data Management (EDM) dashboard, which can efficiently query the savings and audit data. The EDM also allows OG&E project managers to track scheduled audits and tunes.
- Global has found evidence of issues with the CLEAResult data entry process. Out of a sample of 40 participants with completed AC-Tunes and duct-work, 8 had data entry errors that resulted in incorrect field savings estimates.
- Global also found evidence of errors in the data translation process. CLEAResult transferred the savings data from a Master Spreadsheet database to the OG&E iAvenue system and eventually to the Energy Data Management (EDM) dashboard. Differences in program savings estimates were noted between different data sources.

Purpose of the Evaluation

The purpose of this evaluation of the HEEP for program year 2010 is to provide a basic verification of the savings estimates and methods currently employed by OG&E and the implementation contractor CLEAResult. Global also provides a simplified process review and recommendations. Specific objectives of this evaluation were:

- To review and validate field deemed savings estimates calculated by CLEAResult using the deemed savings information provided by Frontier Associates LLC
- To review the savings estimation process used by OG&E
- To review how the program operates from a process perspective and provide recommendations for improvement in future program years

Summary of the Analysis

Global’s first step was to review all program data relevant to the savings calculation, plus some additional data provided by the program managers. This review included: deemed savings methods, contractor rebate forms, individual customer audits, CLEAResult savings calculations and methods, OG&E customer audit spot checks, and OG&E savings calculation spreadsheets. The collected data was used to summarize program savings and audits in Table ES-1, which provides a summary of the program accounting, comparing the reported savings for PY 2010, to the field savings for 2010, to PY 2010 goals. While overall program savings is significantly behind original goals for 2010, kWh and kW savings per audit are fairly close to those goals for both savings approaches indicating that after OG&E has caught up on audits, the program should be able to achieve its stated goals.

Table ES-1 Comparison of HEEP Deemed Savings Estimates

	Program kW	Program kWh	Audits	kW per Audit	kWh per Audit
Reported Savings Approach	336	647,793	1,454	0.23	445.5
Field Savings Approach	456	979,482	1,454	0.31	673.6
Program Goal PY 2010	3,384	4,769,060	10,000	0.34	476.9

Global also provides an independent accounting of program impacts and measure counts using two data sources and two deemed savings methods. The two data sources are the CLEAResult Master database, provided on March 9, 2011, and an extract of data from the EDM dashboard performed on April 6, 2011. The two deemed savings methods are the reported savings estimates and the field savings estimates. It was during this comparison that Global discovered evidence of errors in the data translation process moving from the Master database to the EDM dashboard.

Next, Global performed a cross check of both the methods employed, and the resulting field savings estimates produced by CLEAResult for a sample of HEEP participants. Because a significant number of mistakes were discovered, we also estimate a corrected kW and kWh savings for the program based on the sample. Finally, we provide an estimate of the proportion of errors in the population based on the sample. Table ES-2 presents the estimate of corrected kW and kWh for the HEEP for PY 2010. The kW and kWh savings estimates in the first column represent the total program savings obtained from the CLEAResult field savings. The corrected savings in the second column represents the estimate of savings obtained by expanding the corrected savings estimates from the sample of participants to the population using the ratio estimation technique. The corrected estimates are fairly close to the field estimates; however, for both kW and kWh, the savings have been underestimated.

Table ES-2 Estimated Field kW and kWh Savings

	Field (CR) Savings	Corrected (GEP) Savings
kW Savings	451	458
kWh Savings	972,113	975,381

Because this is the first year of the HEEP, Global also conducted a process review. The process review included conducting a formal interview with the program managers and reviewing the results of surveys conducted with a sample of PY2010 participants. Global offers recommendations for both impact evaluation analysis and process improvements for the program going forward.

Recommendations for Improving Savings Estimates and Processes

Due to the issues that were uncovered related to data entry of field savings estimates we recommend that OG&E take the following actions to ensure the integrity of the savings estimates in future program years:

- Conduct a mid-year (2011) review of the CLEAResult field kW and kWh calculations to determine if data entry problems have been resolved. If problems have not been resolved then develop a quality control plan that will help CLEAResult improve the data entry process.
- Conduct further analysis to determine the source of the differences between the program savings estimated from the original CLEAResult database and the EDM dashboard. Totals should also be generated from the iAvenue database directly to determine the source of the error. If necessary, correct any processes that resulted in errors and ensure that the two databases are in agreement.
- Global also recommends that OG&E consider revising the savings estimates used to report program savings to the OCC using the Frontier savings instead of the reported savings for the AC-Tune measure. Furthermore, we recommend that OG&E consider additional analysis of duct work estimates in order to improve the robustness of the field savings.

The process review also resulted in recommendations to improve the operation of the program in future years.

- Research how changes in the program’s administration, such as waiving the \$50 audit fee for a limited time, have impacted the program’s cost effectiveness and savings.
- Work with the marketing department to get more data on the various marketing campaigns conducted for HEEP. Develop a schedule for receiving reports on survey results and marketing efforts. Regularly schedule meetings to discuss the findings in the reports and work together to determine how to best spend the program marketing budget.

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INTRODUCTION

1.1 The Home Energy Efficiency Program

The Home Energy Efficiency Program (HEEP) is one of the eight approved programs that make up OG&E's comprehensive demand side management portfolio. The HEEP target market encompasses all residential customers within OG&E's Oklahoma service territory. Originally only customers with homes built before 2000 were eligible, however, OG&E received several participation requests from customers with newer homes and felt they could perform the audit and still achieve savings. Currently there is no age of home restriction. While a central air conditioner (CAC) is not a program requirement, the program is targeted toward residential customers with CAC. The program is intended to help residential customers identify and implement energy efficiency measures that improve the efficiency of their home's thermal envelope and maximize the efficiency of their current HVAC equipment. The program will also offer appliance rebates for those customers without central air conditioners. The program is implemented by the outside contractor, CLEAResult.

The program consists of four interactive parts.

The first part of the program is a comprehensive on-site energy audit to identify areas for thermal efficiency improvement within the participants' homes. The audit generates a report for both the participant and OG&E identifying areas of needed improvement and cost estimates. The participant also receives a free energy efficiency kit. The maximum cost of the audit is \$250 and the customer is required to pay \$50 of that cost.

The second part of the program is offered to customers that have received an energy audit and have central air conditioning. These customers may participate in an air conditioner tune-up program at no additional charge. OG&E offers a \$75 incentive paid to licensed HVAC contractors for the tune-up. The tune-up includes: checking refrigerant charge, cleaning of indoor and outdoor coils, checking filters, and an inspection of the overhead ductwork. The customer is responsible for any additional repairs of the HVAC equipment not covered as part of the tune-up. CLEAResult enrolls, manages, and trains qualified HVAC contractors to perform both the ac-tune ups and the duct repair and sealing in the following component.

The third component of the program is offered at the time of the tune-up. If the AC contractor can easily access the plenum and it has not been sealed, the plenum is sealed with the participant's permission. If the tune-up contractor also determines that overhead ductwork needs repair then repairs are either scheduled or performed. In that case, OG&E will pay up to \$300 directly to the contractor for repair and/or sealing of ducts within the home. This typically consists of a plenum seal, duct repair, or a cleaning of the evaporator coil.

The fourth and final component of the program is offered to customers that complete the energy audit but do not have a central air conditioning unit. These customers are offered appliance rebates for Energy Star Window AC units, refrigerators, and freezers. OG&E offers a \$40 rebate for qualifying Window AC units, a \$25 rebate for qualifying refrigerators, and a \$25 rebate for qualifying freezers.²⁰ Original goals for rebates are 1,500 window AC units, 500 refrigerators, and 100 freezers; however OG&E can exceed those coupon goals if necessary.

²⁰ OG&E project managers noted that the program is marketed as an audit with a free tune-up, and really is not geared toward customers without CAC, but the rebates were included in order to make the program available for everyone. Rebate goals are intentionally low since it is unlikely to make up a significant portion of savings.

The program's key measures of success are kWh and kW saved per audit. The program's goal, as stated in the GJM Testimony, is to conduct 30,000 audits over the initial 3 years of the program, which translates to 10,000 audits each year. The program claims savings from five measures, with the audit being the initial point of contact with each customer. OG&E will not claim any savings from either the audit, or the home energy efficiency kit distributed during the audit. The five measures eligible for savings are:

- Refrigerant adjustment of greater than +/- 5% during the AC Tune-up
- Plenum seal – sealing of everything readily accessible at the air handler with mastic or putty, without crawling into the attic
- Single duct repair – includes the reconnecting of an open or unhooked duct to the plenum or register, or reopening a crushed or kinked duct.
- Clean evaporator coil – a coil will be cleaned if it has been clogged to the point that air will not pass through the duct.
- Rebate in homes with no CAC – window ac, refrigerator, freezer

The energy and demand (kWh and kW) reported deemed savings for each measure are established in the GJM Testimony and are listed below:

- Any Duct Seal Performed (Single Duct Repair, Plenum Seal, or Coil Cleaning) per unit, 0.70 kW and 1536.40 kWh
- AC Tune Up per qualified Unit (at least 5% change in Refrigerant), 0.330 kW and 327.7 kWh
- Window AC, per redeemed coupon, 0.168 kW and 136.00 kWh
- Energy Star Refrigerator, per redeemed coupon, 0.020 kW and 113.00 kWh
- Energy Star Freezer, per redeemed coupon, 0.007 kW and 56.00 kWh

Due to a delayed launch, the HEEP did not make its goals for 2010 completing only 1,457 audits during that program year. The unreachd 2010 goals have been spread across 2011 and 2012 to maintain a smooth work flow in future program years. Increased marketing efforts in early 2011 have resulted in more than 10,000 audits completed or scheduled from the start of the program through the third week of March for PY2011. The program also completed 220 qualified tune-ups during 2010, with 374 units receiving duct seals, and no redeemed appliance coupons. There are 1,064 customers scheduled to receive a tune-up in 2011, tune-ups will begin when temperatures are above 69 degrees.

The original tune-up goal was 67% of audit customers; OG&E is currently achieving around 90% which is much more than anticipated. In part, this is because if customers have more than one AC unit, they tune up all the units, which is a change from the original plan. The additional tune-ups improve customer satisfaction, but use up budget up more quickly. OG&E is currently "hammering out the details" to ensure that they will be able to achieve the 30,000 audit goal by PY2012. They also plan to request additional funding to cover the cost of the added tune-ups.

Table 1-1 contains a summary of the expected participation and impacts.

Table 1-1 Summary of Expected Participation and Impacts²¹

Inputs	Audits	Duct work	AC Tune Up	Window AC	Refrigerator	Freezer
Annual kW Impact	0.000	0.700	0.330	0.168	0.020	0.007
Annual kWh Impact	0.00	1,536.40	327.70	136.00	113.00	56.00
Participation Goals	10,000	1,675	6,700	1,500	500	100

There are several types of deemed savings estimates associated with the HEEP.

- The first type of savings estimate is presented in Table 1-1 and is what we refer to as the “reported savings” which represents average per customer savings estimates for each measure.
- The second type of savings estimate we will refer to as the “Frontier savings” which is more detailed than the reported savings and accounts for variation in weather zone, tonnage, air-handler location, house size and other variables.
- The final type of savings estimate only applies to the duct work measures and is based on an OG&E study that updated the frontier savings estimates. We will refer to these as “updated frontier savings.”

While three types of deemed savings estimates exist, only two combinations are used to estimate program savings 1) the reported savings for all measures and 2) the field savings which is a combination of the Frontier savings for AC Tune-up and the updated Frontier savings for duct work.

1.2 Purpose of This Evaluation

The purpose of this evaluation is to provide a basic verification of the savings estimates and methods currently employed by OG&E and the implementation contractor CLEAResult. Global also provides a simplified process review and recommendations. The primary goals of the evaluation are to: 1) review and validate field deemed savings estimates calculated by CLEAResult using the deemed savings information provided by Frontier Associates LLC in the GJM Testimony and the details of the HEEP Duct Seal/Repair Deemed Savings Study, 2) to review the savings estimation process used by OG&E, and 3) to review the process aspects of the program and provide recommendations for improvement in future program years. The evaluation activities included:

1. Data Gathering – Global reviewed all program data relevant to the savings calculation, plus some additional data provided by the program managers. This included: deemed savings methods, contractor rebate forms, individual customer audits, CLEAResult savings calculations and methods, OG&E customer audit spot checks, and OG&E savings calculation spreadsheets.
2. Review of CLEAResult savings calculations – Global performed a cross check of both the methods and the estimates produced by CLEAResult for a sample of HEEP participants. Because a significant number of mistakes were discovered, Global also estimated a corrected deemed kW and kWh savings for the program based on the sample. Finally Global provides an estimate of the proportion of errors in the population based on the sample.
3. Review of OG&E savings estimation process – Global performed an independent accounting of program impacts and measure counts using two data sources and two deemed savings methods. The two data sources are the CLEAResult Master database, provided on March 9, 2011, and an
4. extract of data from the EDM dashboard performed on April 6, 2011. The two deemed savings methods are the reported savings estimates and the field savings estimates.

²¹ This is the table used to calculate the kW and kWh as it is being applied to the program. The original goals are the same for each year.

5. Estimation of program impacts – Global first performed the independent accounting of program savings and measures based discussed in activity three. Then we estimated an adjusted kW and kWh savings for the entire HEEP program based on the correction factors estimated during activity two.
6. Process review – The process review included conducting a formal interview with the program managers and reviewing the results of surveys conducted with a sample of PY2010 participants.
7. Recommendations – Global offers recommendations for both impact evaluation analysis and process improvements for the program going forward.

This evaluation provides OG&E with an adjusted estimate of program savings based on a review of the current methods employed by CLEAResult and the program managers. The evaluation also provides suggested improvements in two specific areas; first in the savings estimation process, and second in future impact evaluation efforts.

1.3 Organization of This Report

This report is organized into the following chapters:

- Chapter 2 presents the method used to complete the impact evaluation. It includes a description of the data sources, the approach, and the sample selection process.
- Chapter 3 presents the impact evaluation results and includes an independent accounting of program impacts and the CLEAResult verification results.
- Chapter 4 presents the process review and includes a description of the data sources, approach, and findings.
- Chapter 5 presents Global’s conclusions and recommendations based on the findings of both the impact evaluation and the process review.

IMPACT METHOD

2.1 Data Collected to Support the Evaluation

Global collected a variety of data to support the impact evaluation which was obtained either from the OG&E or from CLEAResult. The utility data was used to review the process that OG&E currently uses to calculate the overall savings for the HEEP. The CLEAResult data was used to review the methods used and savings estimates that are produced for the HEEP.

2.1.1 CLEAResult Data

CLEAResult, the implementation contractor for the HEEP, provided information both on the methods they currently use to estimate impacts and details related to the calculations themselves. The first piece of information they provided was a document that detailed the methods they use to perform the kW and kWh savings calculations using the field savings estimates and tables. We were able to review this document and confirm that their documented approach does conform to the approach laid out in the GJM Testimony and the subsequent HEEP Duct Seal/Repair and Deemed Savings Study.

CLEAResult also provided their master database which included a listing of every AC Tune performed or scheduled up to March 9, 2011. The data was provided in this format because it was not available within the internet-based tool at the time. The entire master database was subsequently input into iAvenue and the EDM dashboard. The database also included the savings estimates for each measure installed by participant. CLEAResult also provided copies of the contractor rebate forms for a sample of customers which are used by the contractors to enter the information gathered during their visit and document the measures taken. The information in the rebate form is then used to calculate the field savings for each measure. With the data provided Global was able to duplicate the calculations for a sample of participants in order to review and validate CLEAResult's results.

2.1.2 Utility Data

OG&E program managers provided their spreadsheet and calculations for summarizing the total kW and kWh field savings and the total reported savings from the program. The savings data was pulled from the CLEAResult EDM online dashboard on April, 6 2011. The data extracted from the EDM should be identical to the data provided by CLEAResult in March in the master database.

2.1.3 Program Staff Interviews

Through weekly meetings and status updates, Global conducted informal interviews with the OG&E program managers. During the meetings, Global gathered information regarding any program issues as they arose, general program activities, program goal tracking, developments with the implementation team and tracking software, and program changes. Through access to the CLEAResult EDM dashboard Global further tracked scheduled audits and AC tunes and viewed information on completed audits and AC tunes.

2.2 DESCRIPTION OF THE EVALUATION APPROACH

The evaluation approach first provides OG&E with an independent accounting of key variables for PY 2010. We compared the program data from two data sources in two ways. We summarized the field savings, reported savings, and the number of installed measures, at the measure level and the overall program level using both the raw data provided by CLEAResult, and the raw data provided by OG&E extracted from the EDM dashboard. In principal, these two datasets should be identical, because they represent the same participants and the same AC Tunes. However, the two datasets did show discrepancies in both the total

number of tunes completed and the measure-level savings estimates. This indicates that during the translation from the spreadsheet database to the EDM dashboard, some variables changed or were lost.

Global next performed a validation of CLEAResults calculations and methods. Using a sample of 40 program participants, Global duplicated the savings calculations using the field savings method to validate both the process CLEAResult uses and the correctness of their calculations. We carefully checked the document which described the methods used to calculate field savings estimate for each participant supplied by CLEAResult to ensure that it conformed to the field savings method presented in the GJM Testimony. We also confirmed that CLEAResult used the updated Frontier savings estimates values from the HEEP Duct Seal/Repair Deemed Savings Study.

Next, we repeated the field savings calculations for each sample participant and compared them to the field savings estimates provided by CLEAResult. We found that eight of the 40 sample participants displayed calculation errors; therefore Global calculated corrected savings for those 8 participants. Because of the presence of several calculation errors, we calculated an estimate of the corrected population savings expanded from the sample using a technique called ratio estimation. Again based on sample incidence, Global also calculated an estimate of the total proportion of the population with errors.

2.3 Sample of Participants Selected for Evaluation

During PY 2010, OG&E completed a total of 407 AC Tune-ups that yielded savings. Each of these visits had the potential to claim savings from one to four measures; a change in the refrigerant charge, a cleaned evaporator coil, a plenum seal, or an un-kinked or reconnected duct. Because it is not realistic to duplicate calculations for all participants, Global determined that duplicate field savings calculations should be performed on a small sample of participants and subsequently selected a stratified random sample of 40 participants. The sample was designed with two strata, and was stratified based on the number of measures installed because the goal of the verification was to identify calculation errors either due to systematic misapplication of the deemed savings formulas or simple data entry error. The sample was not designed to estimate savings or error rates to a particular level of precision.

Table 2-1 shows the distribution of installed measures for each stratum. Stratum two consists of a random sample of 5 of the 10 participants that had all four measures, and stratum one is a random sample of 35 of the remaining 397 participants with one to three measures.

Table 2-1 Distribution of Measures in Sample Participants

Stratum	Participants in Sample	Refrigerant Charge	Coil Clean	Plenum Seal	Duct Work
Stratum 1	35	19 (54%)	5 (14%)	32 (91%)	15 (43%)
Stratum 2	5	5 (100%)	5 (100%)	5 (100%)	5 (100%)

PROGRAM IMPACT RESULTS

3.1 Summary of Results

The major findings on the impact evaluation are:

- Reported savings estimates and field savings estimates differ both in magnitude and in accuracy. A review and revision of savings estimates used to calculate program savings for the OCC is appropriate.
- While CLEAResult seems to be doing an excellent job providing OG&E with useful tools for accessing the audit reports and savings estimates, improvements need to be made in the data entry and data transfer processes.
- There are discrepancies between the CLEAResult master database and the reports generated from the EDM online dashboard.
- Eight data entry errors were discovered during an independent review of 40 participant field deemed savings calculations. However, data entry errors seem to have a relatively minor effect on overall program savings.

3.2 Comparison of Deemed Savings Estimates and Program Goals

The following table provides a comparison of key variables for PY 2010. The collected data was used to summarize overall program savings and audits in Table 3-1 which compares reported savings for PY 2010, to field savings for 2010, to PY 2010 goals.

Table 3-1 Comparison of HEEP Deemed Savings Estimates

	Program kW	Program kWh	Audits	kW per Audit	kWh per Audit
Reported Savings Approach	336	647,793	1,454	0.23	445.5
Field Savings Approach	456	979,482	1,454	0.31	673.6
Program Goal PY 2010	3,384	4,769,060	10,000	0.34	476.9

While overall program savings is significantly behind original goals for 2010, savings per audit for both the reported and field savings are relatively close to the initial program goals.

As for the comparison of the reported savings to the field savings, the field estimates are higher than the reported estimates for both the kW and kWh savings. It is appropriate to use average per customer savings, like the reported deemed savings, to estimate program savings in initial program years. However, it is also appropriate to revise savings estimates as more refined approaches are developed during the course of the program. Because the Frontier savings represent an estimate that accounts for specific information about each house, they will more accurately represent the measure savings for each home. In addition, the updated frontier savings, which are used to estimate savings for duct work measures, rely on the HEEP Duct Seal/Repair and Deemed Savings Study which included before and after duct blaster tests for a small sample of houses. Even

though the sample used in the study was small, the estimates of savings are likely to be more accurate than a simple per customer average across all measures.

3.3 Independent Accounting of Program Impacts

We summarized the program data using the raw data provided in the CLEAResult database and compared the results to those provided by OG&E program managers calculated from the data residing in the EDM Dashboard. Table 3-2 uses the reported deemed savings method to compare the two source files by providing a summary of the kW and kWh savings and number of measures by measure. The discrepancies indentified by comparing the CLEAResult master spreadsheet to the online database are highlighted in blue in the table on the right.

Table 3-2 Comparison of Program Savings Using the Reported Savings Method

Source: CLEAResult Master Spreadsheet N=475 Method: Reported Savings			Source: EDM Online Dashboard N=471 Method: Reported Savings		
Value	OG&E Reported Deemed Savings	Total Measures	Value	OG&E Reported Deemed Savings	Total Measures
Tune kW	75	228	Tune kW	75	228
Tune kWh	74,716	228	Tune kWh	74,716	228
Duct kW	262	374	Duct kW	261	373
Duct kWh	574,614	374	Duct kWh	573,077	373
Total Program kW	337	602	Total Program kW	336	601
Total Program kWh	649,329	602	Total Program kWh	647,793	601

Table 3-3 uses the field deemed savings method to compare the field savings between the two source files. Again, we provide a summary of the kW and kWh savings and number of measures by measure. The discrepancies indentified are highlighted in blue in the table on the right.

Table 3-3 Comparison of Program Savings Using the Field Estimates

Source: CLEAResult Master Spreadsheet N=475 Method: Field Savings			Source: iAvenue Online Dashboard N=471 Method: Field Savings		
Value	Field Deemed Savings	Total measures	Value	Field Deemed Savings	Total measures
Tune kW	43	228	Tune kW	49	228
Tune kWh	81,209	228	Tune kWh	90,413	228
Coil Clean kW	51	47	Coil Clean kW	51	47
Coil Clean kWh	111,184	47	Coil Clean kWh	111,184	47
Plenum Seal kW	256	345	Plenum Seal kW	256	345
Plenum Seal kWh	566,934	345	Plenum Seal kWh	566,999	345
Duct Work kW	101	150	Duct Work kW	100	149
Duct Work kWh	212,786	150	Duct Work kWh	210,886	149
Total Program kW	451	770	Total Program kW	456	769
Total Program kWh	972,113	770	Total Program kWh	979,482	769

There is an obvious discrepancy in both the number of participants, 475 vs. 471, and the number of measures. However the Table 3-3 also shows that there are some additional discrepancies in the savings estimates that are unrelated to the number of measures. These discrepancies are most likely driven by either improperly entered savings for individual participants, or a formatting glitch that affected some of the values and not others during the translation process.

3.4 Clearesult Verification Findings

Global performed a cross check of both the methods and field deemed savings estimates produced by CLEAResult for a sample of HEEP participants. Global carefully reviewed a document provided by CLEAResult that detailed the methods they use to perform the kW and kWh savings calculations using the field savings estimates and tables.²² We were able confirm that their documented approach did conform to the approach laid out in the testimony and the subsequent Duct Savings Study conducted by OG&E.²³

The main goal of the verification was to determine if there were any systematic errors due to a misapplication of the field deemed savings method, or if there were substantial discrepancies due to data entry errors. While no systematic discrepancies were uncovered, we did find eight data entry related errors.

3.4.1 Description of discrepancies

In order to verify the CLEAResult field savings Global duplicated the field savings estimates for the sample of 40 participants. We developed a calculator that maps the Frontier Associates savings tables to the key input variables on the contractor rebate forms. Figure 3-1 displays a screen shot of the calculator. The key inputs from the rebate forms are entered into the 'Characteristics' table and the calculations use look-up tables to estimate the deemed savings for each installed measure.

²² Document information: OG&E Home Energy Efficiency Program: Deemed Savings Calculations for HEEP. File name: "OG&E HEEP Deemed Savings (9-27).pdf". Provided by Chris Spencer, CLEAResult on 3/11/2011

²³ Subsequent studies refers to the "HEEP Duct Seal/Repair and Deemed Savings Study" conducted by OG&E that estimated updated Duct System Efficiency (DSE) factors. The study was provided by Donney Dorton on 8/05/2010.

Figure 3-1 Global Deemed Savings Calculator

Characteristics	
County:	Adair
Building Type:	Single Family
Number of Stories:	1
System Coverage:	Entire Structure
Foundation Type:	Slab
Tonnage:	2.0
Air Handler Location:	Interior
Heating Equipment Type:	Gas
A/C Tune Up?	No
Δ Refrigerant Charge > 5%?	No
Evaporator Coil Cleaned?	No
Plenum Sealed?	No
Duct Repair?	No
Number of Ducts Fixed:	0

Select a characteristic from each of the 8 drop-down menus on the left.

Answer the six questions to the left.

A/C Tune Up Calculations		
Weather Zone	kW Savings	kWh Savings
8	0	0

Evaporator Coil Calculations					
DSE	Demand (kW)	Energy Cool (kWh)	Energy Heat (kWh)	kW Savings	kWh Savings
40	0.016	24	4	0	0

Plenum Sealed Calculations					
DSE	Demand (kW)	Energy Cool (kWh)	Energy Heat (kWh)	kW Savings	kWh Savings
18.0	0.016	24	4	0.00	0

Duct Repair Calculations					
DSE	Demand (kW)	Energy Cool (kWh)	Energy Heat (kWh)	kW Savings	kWh Savings
14	0.016	24	4	0.00	0

Total		
kW Savings	kWh Savings	
0.00	0	

Rebate Amount:	
0.00	A/C Tune Up
0.00	Cleaned Blower and Evaporator Coil
0.00	Sealed Return and Supply Plenum
0.00	Reconnected/Repaired Duct(s)
\$0.00	

By developing an automated calculator, we were able to efficiently and accurately double check each of the sample participants' field deemed savings calculations and identify eight discrepancies. Table 3-4 displays the discrepancies for each of the eight participants including the CLEAResult field deemed savings estimate (labeled "CR") and the corrected field deemed savings estimate (labeled "GEP").

Table 3-4 Corrected Deemed Savings Estimates

HEEPN	AC Tune kWh		Coil Clean kWh		Plenum Seal kWh		Duct Repair kWh		Total Participant kW		Total Participant kWh	
	CR	GEP	CR	GEP	CR	GEP	CR	GEP	CR	GEP	CR	GEP
127	226	336									3,552	3,442
162					1,242	1,449			0.62	0.72	1,242	1,449
393	393	434									393	434
432			2,760	2,360	1,863	1,593	1,380	1,180	2.18	2.7	6,339	5,469
471					1,296	1,728			0.97	1.3	1,296	1,728
610			3,280	0	1,845	1,125	1,804	3,850	3.78	3.14	7,209	5,255
696							396	792	1.1	1.38	1,521	1,917
750	448	392							0.24	0.21	448	392

While the magnitude of the corrections was not large in most cases, the number of errors was substantial. Upon further investigation and manipulations using the savings calculator, Global discovered the drivers of the error for five out of the eight participants. Table 3-5 lists those drivers. Sources for the errors found in the remaining three participants could not be pinpointed.

Table 3-5 Drivers of Errors in Deemed Savings Estimates

HEEPN	Error Driver
162	The original calculations used the wrong tonnage. The form lists 3.5. The original calculations used 3.0.
432	The original calculations used the wrong air handler location. The form lists Attic/Garage. The original calculations used Crawlspace/Basement.
471	The original calculations used the wrong tonnage. The form lists 4.0. The original calculations used 3.0.
696	The original calculation only counted 2 duct repairs in the estimated savings calculations even though there were four. However, only two should be counted for the rebate.
750	The original calculations used the wrong tonnage. The original data lists 3.5. The original calculation used 4.0. The form does not list a tonnage. According to the audit report, the tonnage is 2.5. Using this value, the kW and kWh savings are 0.15 and 280, respectively.

3.4.2 Corrected Savings Estimates

Because of the number of errors, Global felt it would be helpful to use the sample to estimate the corrected savings for the population. This provides OG&E with information about how large the effect of the errors might be on the overall program field savings estimates.²⁴ We estimated the total corrected kW and kWh savings for the population using a technique called ratio estimation. Ratio estimation takes advantage of the correlation between two variables, in this case CLEAResult’s estimate of savings and Global’s corrected estimate of savings, to obtain increased precision.

Table 3-6 compares the total field savings calculated by CLEAResult in the first column, with the estimate of the corrected field savings calculated by Global in the second column. The corrected field savings estimates

²⁴ Recall that the sample was not specifically designed to estimate corrected savings, however, because the sample was statistically valid the ratio estimate technique can be used. Relative precision of the estimate is very small because of the very high correlation between the estimates of savings generated by CLEAResult and the corrected estimates calculated by Global.

are fairly close to the CLEAResult estimates, indicating that the effect of the errors on overall savings is likely quite small, however, in both the kW and kWh estimates our analysis shows that the savings are underestimated. We also provide the upper and lower bounds at 90% confidence, the ratio used to make the adjustment, and the relative precision. Appendix A contains the detailed calculations used to estimate the corrected savings.

Table 3-6 Corrected Field Deemed Savings Estimates

	Field (CR) Savings	Corrected (GEP) Savings	Lower Bound	Upper Bound	Relative Precision Corrected Savings	Ratio of Corrected to Field Savings
kW Savings	451	458	449	466	1.78%	1.015
kWh Savings	972,113	975,381	963,600	987,161	1.21%	1.003

3.4.3 Estimated Proportion of Participants with Errors

Global is also able to provide an estimate of the total proportion of the population that might be affected by errors like those found in the sample. After calculating the total proportion of participants in the sample with errors, it is possible to expand that estimate to the population and provide an estimate of the total number of errors that might be present in the population. The total estimated proportion of the population with errors is 17.7% ± 9.82%.²⁵ Appendix A also contains the detailed calculations used to estimate the proportion of the population with errors.

²⁵ Recall that the sample was not designed specifically to estimate the proportion of errors that are present in the population to any specific degree of precision; however, because the sample was statistically valid the estimate can be calculated. The estimate of the proportion with errors is not very precise due to the small sample size.

PROCESS REVIEW

4.1 Data Collected to Support the Process Review

Global used two primary data sources to support the process review. The first was a formal interview with the program managers. The second was a review of the customer satisfaction surveys conducted by OG&E during the 2010 program year. OG&E completed three surveys for 2010 program participants, the first survey was sent to 25 of the first participants to receive both an audit and tune up. The other two were completed during January of 2011 and February of 2011 respectively, the later surveys addressed the enrollment and audit processes only.

4.2 Description of the Approach

The approach for the 2010 process review included a careful review of the PY 2010 survey results and both formal and informal interviews with the program managers.

4.3 Process Review Findings

Highlights of the process review include the following:

- OG&E program manager's perception based on internal surveys is that satisfaction among program participants and contractors is high.
- Customers are responding well to the increase in advertising/marketing in PY2011.
- One reason the marketing has been successful is that OG&E waived the \$50 audit fee in February which resulted in a very large gain in scheduled audits.
- Project managers should have better information on the relative success of different marketing efforts, including information on how many participants respond to each strategy.
- Some changes have been made in the program – conducting tune-ups on more than one unit and allowing participants with homes built after 2000. These changes are favorable from a process point of view because they have increased participation rates and have likely had a positive impact on customer satisfaction.
- Some customers do not see the value of a walk-through audit (no tests are performed). This may be one reason why waiving the fee was so popular, and may be barrier to participation in the future.

4.3.1 Program Marketing

During its initial year marketing efforts related to the HEEP were minimal. The main marketing campaign consisted of an email sent to customers who participated in the Custom Energy Report (online audit) program. This year (2011) OG&E has completed a much wider variety of marketing efforts, including direct mail and mass market advertising which has resulted in an excellent response from OG&E customers. Unfortunately, program managers do not have access to data that demonstrate how customers responded to individual marketing efforts. This information could be very useful in future years in order maximize the effectiveness of marketing campaigns.

A particularly effective strategy was undertaken in February when OG&E waived the \$50 fee and offered the audits for free. This approach was extremely successful and increased participation tenfold, with 8,618

audits scheduled in February in comparison to 888 audits scheduled in January. Responses tapered off in March, with 1,606 audits scheduled in the first 3 weeks of the month.

The implementation contractor CLEAResult provides half-day training session for the HVAC contractors that participate in the program, which currently includes about 35 contractors. The OG&E project managers anticipate many additional contractors will be needed this summer with the nearly 10,000 audits already scheduled. CLEAResult trains technicians on what to do during the audit, the tune-ups, and the duct repair work. They also train technicians and office personnel on how to complete paperwork and fill in the rebate forms.

The response from HVAC contractors thus far has been good. OG&E has made a concerted effort to include as many contractors as possible in the program. They want the program to increase business for the contractors, and therefore it is very important that they are not perceived as taking business away from contractors.

4.3.2 Customer Satisfaction

The HEEP managers feel the response from customers has been overwhelmingly good. OG&E has conducted more than 3,000 audits so far and has only received a handful of complaints. When a complaint is received the project team works hard to address complaints immediately and ensure that, for the most part, customers are satisfied with the final outcome.

While the program managers get the impression that overall customer satisfaction is high, some customers have been less enthusiastic about having to pay \$50 for a walk through audit. OG&E does not provide any testing as part of the audit, and some customers have noted that they do not think that it is worth it. This was one reason why the program waived the \$50 audit fee during the month of February, and may be why that resulted in such an overwhelming response.

The survey data supports the program managers' view. The mean satisfaction rating respondents gave to various aspects of the program range from 8.02 – 9.33 on a 10-point scale. There is also a small group of customers that were dissatisfied with the program. The verbatim comments of these customers are consistent with the information provided by the program managers – some issues arose with the contractors but were resolved, and some customers feel that a walk-through audit does not provide enough value. In addition, there were some verbatim complaints about the contractor not being local, and it taking a long time to get an appointment scheduled.

The information provided by the program; the information packet, the auditor's report and the Home Energy Efficiency kit were all given high satisfaction ratings as well. The information that is the most helpful in the Home Energy Efficiency kit is the 12 month To Do List Brochure, the program booklet, and the Becoming a Smarter and Thriftier Energy User hand out. The tax credit brochure was rated as helpful by only 6% of the customers. More research is necessary to determine ways the tax credit information can be improved or whether it should be eliminated.

The survey results show that the main reason customers are participating in the program is to improve the efficiency of their homes and lower their energy bills.

CONCLUSIONS AND RECOMMENDATIONS

The evaluation of the Home Energy Efficiency program for PY 2010 produced a number of findings. These findings provided the basis for Global's assessment of the savings calculations and information tracking practices, as well as recommendations for improving the accuracy of savings estimates for use in future program years.

5.1 Assessment of Savings Calculations and Tracking for PY 2010

- OG&E and CLEAResult have worked together to establish a process that allows contractors to collect the information necessary to estimate field kW and kWh which conforms to the deemed savings calculations presented in the GJM Testimony.
- OG&E field kW and kWh savings estimates are higher than the reported savings for the program and we believe also represent more accurate estimates of actual savings due to the additional information about each home that is taken into account.
- CLEAResult has applied the savings calculation methods correctly in the estimation of field kW and kWh estimates for all measures.
- CLEAResult has developed a very useful online tool, the Energy Data Management (EDM) dashboard, which can efficiently query the savings and audit data. The EDM also allows OG&E project managers to track scheduled audits and tunes.
- Global has found evidence of issues with the CLEAResult data entry process. Out of a sample of 40 participants with completed AC-Tunes and duct-work, 8 had data entry errors that caused incorrect field savings estimates. We estimate that this translates to $17.7\% \pm 9.82\%$ of the entire population having similar data entry related errors.
- Global also found evidence of errors in the data translation process. CLEAResult transferred the savings data from a Master Spreadsheet database to the OG&E iAvenue system and eventually to the EDM dashboard. At some point during the process errors (or differences) in the data resulted in different savings estimates across the two data sources.

5.2 Recommendations for Improving Savings Estimates and Processes

- Consider calculating AC-tune savings for the program and OCC filing using the Frontier estimates rather than the current reported estimates. The Frontier estimates reflect more of the specifics about each house, whereas the reported savings are a simple per customer average, and will more accurately estimate measure savings.
- Consider using some portion of the PY2011 impact evaluation budget to conduct before and after duct-blaster tests on a small sample of participants with duct work. This PY 2011 sample data can be added to the existing data from the OG&E Duct Savings Study to improve the robustness of the updated frontier savings estimates.
- Conduct a mid-year review of the CLEAResult field kW and kWh calculations to determine if data entry problems have been resolved. If problems have not been resolved develop a quality control plan that will help CLEAResult improve the data entry process.
- Conduct further analysis to determine the source of the differences between the program savings estimated from the original CLEAResult database and the EDM dashboard. Totals should also be

generated from the iAvenue database directly to determine the source of the error. If necessary, correct any processes that resulted in errors and ensure that the two databases are in agreement.

- Research how waiving the \$50 fee for a limited time impacts the cost effectiveness of the program to determine if this should be repeated each year to jump start enrollments.
- Address the change in the age of home eligibility requirement in the PY2011 impact evaluation to determine if the energy savings support this change.
- Work with the marketing department to get more data on the various marketing campaigns conducted for HEEP. Develop a schedule for receiving reports on survey results and marketing efforts. Regularly schedule meetings to discuss the findings in the reports and work together to determine how to best spend the program marketing budget.
- If it is difficult getting good information from marketing on how campaigns affected participation, add questions to the participant survey asking about awareness of advertising and the impact of advertising on the decision to participate.

Appendix A

DISCUSSION OF IMPACT ANALYSIS

RATIO EXPANSION

We used a technique called ratio expansion to estimate the corrected savings for the population from the sample of participants. Ratio estimation can take advantage of the correlation of the variable of interest y (the corrected field savings for the sample) with another variable x (the initial field savings for the sample) to obtain increased precision. When x and y are sufficiently correlated the relative variance of the estimated ratio is less than the relative variance of the estimate of y. We first estimate the ratio in equation 1.1 by dividing the sample mean of the corrected values from the sample, \bar{y}_{st} by the sample mean of the initial savings values \bar{x}_{st}

$$(1.1) \quad r_{st} = \frac{\bar{y}_{st}}{\bar{x}_{st}}$$

where

- r_{st} = the ratio for a stratified random sample
- \bar{y}_{st} = the mean of the corrected field savings for a stratified random sample
- \bar{x}_{st} = the mean of the initial field savings for a stratified random sample.

Then, we can calculate the estimated corrected population mean \bar{y}_{st} by multiplying the ratio from 1.1 by the actual population mean \bar{X} as shown in equation 1.2. Similarly, we can estimate the corrected population total $\hat{T}_{y_{rst}}$ as shown in equation 1.3.

$$(1.2) \quad \bar{y}_{st} = r_{st} \bar{X}$$

$$(1.3) \quad \hat{T}_{y_{rst}} = r_{st} X$$

where

- \bar{X} = mean of the initial savings values in the population
- X = total of the initial savings values in the population

Equations 1.4 and 1.5 show the equations to calculate the variances of the estimated mean and total respectively.

$$(1.4) \quad s_{\bar{y}_{rst}}^2 = \sum_{h=1}^L \left[\frac{W_h^2 \left(1 - \frac{n_h}{N_h}\right)}{n_h} \right] (s_{yh}^2 + r^2 s_{xh}^2 - 2r\hat{\rho}_h s_{yh} s_{xh})$$

$$(1.5) \quad s_{\hat{T}_{y(rst)}}^2 = \sum_{h=1}^L \left[\frac{N_h^2 \left(1 - \frac{n_h}{N_h}\right)}{n_h} \right] (s_{yh}^2 + r^2 s_{xh}^2 - 2r\hat{\rho}_h s_{yh} s_{xh})$$

where

- N_h = number of customers in the population in stratum h
- W_h = weight of stratum h

- n_h = number of customers in the sample in stratum h
- s_{yh}^2 = sample variance of y in stratum h
- s_{xh}^2 = sample variance of x in stratum h
- $\hat{\rho}_h$ = sample correlation coefficient of x and y in stratum h

Equations 1.6 and 1.7 show the equations to calculate the standard error of the sample mean and total respectively.

$$(1.6) \quad s_{\bar{y}_{rst}} = \sqrt{s_{\bar{y}_{rst}}^2}$$

$$(1.7) \quad s_{\hat{T}_{y(rst)}} = \sqrt{s_{\hat{T}_{y(rst)}}^2}$$

Finally equations 1.8 and 1.9 show the equations used to estimate the confidence intervals, or the upper and lower bounds, for the estimate of the population mean and population total.

$$(1.8) \quad CI = \bar{y}_{rst} \pm Z_{\alpha/2} s_{\bar{y}_{rst}}$$

$$(1.9) \quad CI = \hat{T}_{y(rst)} \pm Z_{\alpha/2} s_{\hat{T}_{y(rst)}}$$

PROPORTION OF POPULATION WITH ERRORS

In order to estimate the proportion of the population with errors, p_{st} , and the associated confidence intervals we first calculate the estimate of the proportion of errors using formula 1.10.

$$(1.10) \quad p_{st} = \sum_{h=1}^l \left(W_h \frac{n_{eh}}{n_h} \right)$$

where

n_{eh} = number of errors in the sample in stratum h

Next we calculate the variance of the proportion for the stratified sample using equation 2.11.

$$(1.11) \quad s_{p_{st}}^2 = \frac{1}{N^2} \times \sum_{h=1}^L \left[\frac{N_h^2 (N_h - n_h)}{N_h - 1} \right] \left(\frac{p_h q_h}{n_h} \right)$$

where

p = the proportion of errors in stratum h

q_h = $1 - p_h$

Equations 1.12 and 1.13 show the equations used to calculate the standard error of the proportion and the confidence intervals respectively.

$$(1.12) \quad s_{p_{st}} = \sqrt{s_{p_{st}}^2}$$

$$(1.13) \quad CI = p_{st} \pm Z_{\alpha/2} s_{p_{st}}$$

ABOUT GLOBAL

Global Energy Partners is a premier provider of energy and environmental engineering and technical services to utilities, energy companies, research organizations, government/regulatory agencies and private industry.

Global's offerings range from strategic planning to turn-key program design and implementation and technology applications.

Global is a wholly-owned subsidiary of EnerNOC, Inc. committed to helping its clients achieve strategic business objectives with a staff of world-class experts, state of the art tools, and proven methodologies.

OG&E Positive Energy New Home Construction Program –
Program Year 2010

Final Report

Prepared for Oklahoma Gas & Electric

May 27, 2011

Global Energy Partners Project Manager
Bridget Kester

This report was prepared by

Global Energy Partners
500 Ygnacio Valley Blvd., Suite 450
Walnut Creek, CA 94596

Principal Investigator(s):

B. Kester
A. Sanchez
J. Shishido
K. Marrin
P. Ignelzi

EXECUTIVE SUMMARY

This report contains description and results of the impact evaluation of the Positive Energy New Home Construction Program – Program Year 2010 conducted by Global Energy Partners.

The Positive Energy New Home Construction Program (PE-NHC) offers financial incentives to encourage home builders and homeowners to incorporate energy saving measures in the construction of new homes. In this program, new home builders are eligible for an incentive payment of \$759 per home meeting program requirements.

The program is targeted at newly constructed single family residences in the OG&E service territory. The program requires homes to reach the Federal Energy Policy Act of 2005 (EPACT 2005) goal of 50% energy reduction, which translates into a HERS rating of less than 70, as well as including at least four non-HVAC “green” measures. A lower HERS rating indicates a more energy efficient home. In order to achieve this rating recommended efficiency measures include: high efficiency cooling and heating, tighter home construction, high efficiency water heating, higher levels of wall, ceiling, floor and slab insulation, and higher efficiency windows. Other “green” recommendations include using recycled building material, adding rainwater collection for lawn care, and day lighting. The PE-NHC program is an expansion of OG&E’s Positive Energy Homes Program. The difference is that the PE-NHC program encourages additional “green building” components, such as water conservation, using recycled building materials, and use of low volatile organic compounds materials. The PE-NHC goes beyond the Oklahoma-adopted IECC 2006 residential new construction building codes and is fuel neutral.

In order to calculate the home’s energy savings OG&E uses REM/Rate to calculate a baseline based on a typical code-built home in the OG&E service territory. The code-built home has a HERS Index of 100. An ENERGY STAR home would have an Index of 85 and a PE-NHC home would have an Index below 70. Generally speaking if a home exceeds the EPACT 2005 target of 50% less usage, a HERS rating of less than 70 is achieved²⁶.

Key Results

- OG&E issued rebates to 146 projects in the PE-NHC program and reported total program savings of .125 MW reduction in peak load and 173 MWh in annual energy for PY 2010. It may be that actual savings were underestimated using the deemed savings from the Frontier Potential Study – Phase II report since most homes exceeded the minimum efficiency requirement but were all assigned the same savings value. In the PY 2011 impact evaluation we will look at the level and variation in savings across individual homes.
- The program uses a deemed savings approach for reporting program savings. Based on our evaluation it appears that everything is in order and the deemed savings are applied in the manner in which it was outlined in the GJM Marchbanks testimony.
- The deemed savings values are exactly the same for every participant. This is unlikely to be an accurate reflection of all the savings, since the homes probably do not all have exactly the same construction or equipment or size. The variation we saw in the REM reports and HERS ratings supports this supposition. Therefore we will do further analysis next year to see if improvements can be made to the deemed savings.

²⁶ For more information on the program see the “Direct Testimony of Gary J. Marchbanks on behalf of OG&E,” September 15, 2009; part of filing In the Matter of the Application of Oklahoma Gas and Electric Company for an Order of the Commission Approving Comprehensive Demand Programs, Granting Recovery of the Costs of Such Programs and Authorizing a Recovery Rider, Cause No. PUD 200900200.

- Since the allocated savings are the same, the deemed savings achieved by the program could potentially be underestimated.
 - In our sample, the as-designed homes exceeded the 50% EPACK 2005 target in all except one case. The one case did, however, meet the HERS standard for eligibility. Since the 50% EPACK target exceeds the minimum HERS standard for eligibility, it suggests that the homes will have higher savings than the reported savings.
 - The range for exceeding the 50% target was 0.1 MMBtu/year and 13.4 MMBtu/year with an average of 3.6 MMBtu/year beyond the 50% target.

Purpose of the Evaluation

The purpose of this evaluation of the Positive Energy New Home Construction program for program year 2010 (PY 2010) was to provide an accounting of the energy savings reported for customers who participated in the program. Specific objectives of this evaluation were:

- Verify homes met program requirement of HERS rating of less than 70.
- Validate deemed savings were applied correctly.
- Recommend improvements to estimating savings during the program year.

The goal of this review was to provide an early assessment of OG&E's savings estimation approach to identify strengths and weaknesses in the savings calculation method. It was not to make an assessment of the overall program savings or to independently estimate per-home savings.

Summary of the Analysis

Our review of the program included conducting a savings accounting analysis. For PY 2011, a more detailed analysis approach using Energy Simulation Modeling is planned. For the evaluation of PY 2010 we did not estimate program impacts separately from the deemed savings estimates currently in use since an established independent verification of the savings is currently in place.

Working with the OG&E program manager, we reviewed the project details of the 146 PY 2010 participants and selected a random sample of 40 participants. Once the sample sites were selected, OG&E provided the available data on the project including kW and kWh savings estimates from the iAvenue database and verification of the savings through copies of the REM/Rate Source Energy and Emissions Report and 2005 EPACK Energy Efficient Home Tax Credit Report.

The data allowed Global to conduct the impact assessment for the sample using a savings accounting approach. In using this approach, we reviewed the data provided and checked for the accuracy of homes passing the threshold for the program requirements and that the deemed savings values were applied consistently across the participants.

Program Impact Results

Each of the qualifying homes was deemed to save 0.854 kW and 1,187 kWh based on the Frontier Potential Study – Phase II Study²⁷. With rebates issued to 146 projects in PY 2010, program savings were .125 MW reduction in peak load and 173 MWh reduction in energy. Our evaluation showed that the deemed savings were consistently applied to each participant, which is consistent with OG&E's methodology.

However, our examination of the GJM testimony revealed an inconsistency in the deemed per-unit savings. Three different sets of savings values are quoted in the report. Table PE-2 and EPH-5 shows per home savings of .886 kW and 1,189 kWh. Table EPH-1 and page 22 of the GJM testimony shows per home savings of .83 kW and 1,145 kWh. Ultimately, OG&E chose to use the savings values implied by Table GJM-1 which is .854 kW and 1,187 kWh per home for 158 homes. Note that this is calculated based on total kW savings of

²⁷ Deemed savings are from Table GJM-1 in the GJM testimony.

135 kW and 187,602 kWh over 158 homes. Since rebates were only issued to 146 participants, the overall program savings are lower.

Based on the data provided by OG&E, it does not appear that OG&E currently maintains the level of detail electronically in iAvenue to conduct a full evaluation of the program impacts planned for the PY 2011 program evaluation.

Recommendations for Improving Savings Estimates in Future Program Years

Based on this review we have the following recommendations for the program.

- Document electronically the list of measures and heating fuel type that are put into the home so that an exact calculation of energy savings can be made and used for reporting in future program years. Although the information is provided from the HERS inspection in REM/Rate, it would be better for OG&E to collect and maintain the data from the REM/Rate Source Report electronically as part of the program participation documentation for each home. In doing so, we will be able to run building simulations in the analysis of PY2011.
- Calculate the savings for each individual home instead of assigning a flat deemed savings value. By only using the deemed savings for each home, the program is likely inaccurately estimating the amount of savings that is achieved by the program. Since the savings value OG&E currently assigns reflects savings from minimum efficiency eligibility, it is likely understating the program impacts.

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INTRODUCTION

The Positive Energy New Home Construction Program

This report contains description and results of the impact evaluation of the Positive Energy New Home Construction Program – Program Year 2010 conducted by Global Energy Partners.

The Positive Energy New Home Construction Program (PE-NHC) offers financial incentives to encourage home builders and homeowners to incorporate energy saving measures in the construction of new homes. In this program, new home builders are eligible for an incentive payment of \$759 per home meeting program requirements.

The program was targeted at newly constructed single family residences in the OG&E service territory. The program requires homes to reach the Federal Energy Policy Act of 2005 (EPACT 2005) goal of 50% energy reduction, which translates into a HERS rating of less than 70, as well as including at least four non-HVAC “green” measures. A lower HERS rating indicates a more energy efficient home. In order to achieve this rating recommended efficiency measures include: high efficiency cooling and heating, tighter home construction, high efficiency water heating, higher levels of wall, ceiling, floor and slab insulation, and higher efficiency windows. Other “green” recommendations include using recycled building material, adding rainwater collection for lawn care, and day lighting. The PE-NHC program is an expansion of OG&E’s Positive Energy Homes Program. The difference is that the PE-NHC program encourages additional “green building” components, such as water conservation, using recycled building materials, and use of low volatile organic compounds materials. The PE-NHC goes beyond the Oklahoma-adopted IECC 2006 residential new construction building codes and is fuel neutral.

In order to calculate the home’s energy savings OG&E uses REM/Rate to calculate a baseline based on a typical code-built home in the OG&E service territory. The code-built home has a HERS Index of 100. An ENERGY STAR home would have an Index of 85 and a PE-NHC home would have an Index below 70. Generally speaking if a home exceeds the EPACT 2005 target of 50% less usage, a HERS rating of less than 70 is achieved²⁸.

Qualifications to participate in program

In order for a new home to participate in the program, certain requirements must be met, including the following:

- New construction
- Single family and multi-family homes not greater than three stories tall
- Energy efficiency eligibility for the EPACT 2005 50% level calculated by Residential Energy Services Network (RESNET) approved software
- HERS Index of 70 or less (lower index = lower energy consumption) calculated by RESNET approved software
- Minimum of four non-HVAC green measures as defined by the National Association of Home Builders' (NAHB) Green Building standards, the US Green Building Council's (USGBC) Leadership

²⁸ “Direct Testimony of Gary J. March banks on behalf of OG&E,” September 15, 2009; part of filing In the Matter of the Application of Oklahoma Gas and Electric Company for an Order of the Commission Approving Comprehensive Demand Programs, Granting Recovery of the Costs of Such Programs and Authorizing a Recovery Rider, Cause No. PUD 200900200.

in Energy and Environmental Design for Homes (LEED for Homes), or other Local, Regional or National green programs deemed appropriate by OG&E . Eligible measures will fall in the five general categories of Location and Linkages, Sustainable Sites, Water Efficiency, Materials and Resources, and Indoor environmental Quality. Exception: Geothermal (Ground source heat pumps) HVAC with water heating equipment (desuperheater) can be counted as one of the four non-HVAC measures.

- Provide Duct layout design using Manual-D. (Note that although mentioned in the testimony, it is extremely rare that this is done since the general contractors do not have the expertise to complete.)
- Enrollment with a third party HERS rater to provide the HERS Index and Federal Tax Credit calculations, Pre-drywall inspections, and Final component inspections including a Blower Door test and Duct Blaster testing.
- List of the four "green" measures, detailed specifications, a plan for implementation and third party verification of each measure. (Note that in order to achieve the overall HERS rating requirement, each home already has more than four green measures installed. Therefore separate documentation of the green measures has not been done since it is already covered by the other measures included in the REM/Rate reports.)
- All of the above provided prior to construction.

Verification of compliance with program requirements

The program has a very explicit set of measures and conditions that qualify a home for the program rebate. As described in the testimony, the following takes place when certified by the HERS rater:

- ENERGY STAR Thermal Bypass Checklist completed by third party
- Pre-drywall inspection of pipe insulation, venting, and other components and practices that may be hidden by drywall
- Inspection checklist that catalogs the four OG&E pre-approved green measures under the "Green" part of the program (or Certification by an OG&E approved "Green" building program or the NAHB Green program).
- Final inspection by a third party of attic insulation and other components including a blower door test and a duct blaster test.
- Final verification of the installation of Green components or Certification from an OG&E approved Green Program.

Purpose of This Evaluation

The purpose of this evaluation of the Positive Energy New Home Construction program for program year 2010 (PY 2010) was to provide an accounting of the energy savings reported for customers who participated in the program. Specific objectives of this evaluation were:

- Verify homes met program requirement of HERS rating of less than 70.
- Validate deemed savings were applied correctly.
- Recommend improvements to estimating savings during the program year.

The goal of this review was to provide an early assessment of OG&E's savings estimation approach to identify strengths and weaknesses in the savings calculation method. It was not to make an assessment of the overall program savings or to independently estimate per-home savings.

Organization of This Report

- Chapter 2, Methodology

- Chapter 3, Program Impact Results
- Chapter 4, Conclusions and Recommendations

METHODOLOGY

Data Collected to Support the Evaluation

The savings accounting method used for the evaluation of PY 2010 relied heavily on various data. This section outlines the data used and how they were applied to the evaluation method.

Program Staff Interviews

We interviewed the program manager, Steve Sullivan, for details on how the program is run, marketed, and what level of savings the program achieved. The information gained during the interview was extremely helpful in evaluating PY 2010, but also in helping create a plan for next year's evaluation.

Utility Data Utilized

The iAvenue database is the main repository of data related to the PE-NHC program. Included in the database are the following; the items with * were used in the review that Global conducted:

- * Install #, Installation number
- * CA#, Unique identifier, (used to pull the sample)
- Home location information
- Rate category
- * Date completed
- * Total kW saved (based on deemed savings)
- * Total kWh saved (based on deemed savings)
- kWh lost revenue factor
- kWh lost revenue (in dollars)
- kWh saved per month
- kWh lost revenue per month (in dollars)
- Rebate amount
- Rebate recipient

Third Party Data Utilized

The third party data was conducted by the Home Energy Rater (HERS rater) and was used to verify qualification for the program. The HERS rater conducted the verification steps outlined in Section 1.1.2. The information is stored in the following reports:

- 2005 EPACT Energy Efficient Home Tax Credit Report from REM/Rate
- Source Energy and Emissions Report from REM/Rate
- ENERGY STAR Version 2 Home Report from REM/Rate

Description of the Evaluation Approach

Our review of the program included conducting a savings accounting analysis. For PY 2011, a more detailed analysis approach using Energy Simulation Modeling is planned. For the evaluation of PY 2010 we did not make any independent estimate of program impacts for this program year since an established independent verification of the savings is currently in place. Rather, we focused on whether the documentation confirms third-party verification of the homes' eligibility compliance, the reported savings comply with the program's rules for use of the approved deemed savings, and the data maintained by OG&E comply with the reporting requirements stated in the GJM testimony.

Working with the OG&E program manager, we reviewed the project details from the iAvenue database of all the participants to ensure that all the fields were filled out completely. We then selected a random sample of 40 participants. Once the sample sites were selected, OG&E provided the verification of the savings through scanned copies of the REM/Rate Source Energy and Emissions Report and 2005 EPACT Energy Efficient Home Tax Credit Report.

The data allowed Global to conduct the impact assessment for the sample using a savings accounting approach. In using this approach, we reviewed the data provided and checked for the accuracy of homes passing the threshold for the program requirements and that the deemed savings values were applied consistently across the participants. The REM/Rate Reports showed the expected energy use for a baseline home as well as the participating home as it was designed. By comparing the two, we could determine if the home qualified for the program and if the requirements were met. The goal of this review was to provide an early assessment of OG&E's savings estimation approach to identify strengths and weaknesses in the savings calculation method. It was not to make an assessment of the overall program savings or to independently estimate per-home savings; these are planned for impact evaluation of the PY 2011 program.

Sample of Projects Selected for Evaluation

A simple random sample of 40 sites was selected to represent the entire population. Since all of the homes had the same savings attributed to each home, we did not need to do a stratified random sample to increase accuracy.

PROGRAM IMPACT RESULTS

Summary of Program Impacts

Our analysis showed that all of the sample points were qualified to participate and met the requirements of the program. Extrapolating from the statistically representative sample to the entire participant population suggests that all participants in the program qualified and met the requirements of the program. Therefore the deemed savings from the Frontier Report Phase II were accurately applied to each site, consistent with the OG&E reported total program savings of .125 MW reduction in peak load and 173 MWh reduction in annual energy.

Description and Findings of the Analysis

Each of the qualifying homes was deemed to save 0.854 kW and 1,187 kWh based on the Frontier Potential Study – Phase II Study²⁹. With rebates issued to 146 projects in PY 2010, program savings were .125 MW reduction in peak load and 173 MWh reduction in energy. Our evaluation showed that the deemed savings were consistently applied to each participant, which is consistent with OG&E’s methodology. In addition our evaluation determined that all participants were qualified to receive a rebate. In our sample, the as-designed homes exceeded the 50% EFACT 2005 target in all except one case. The one case did, however, meet the HERS standard for eligibility.

However, our examination of the GJM testimony revealed an inconsistency in the deemed per-unit savings. Three different sets of savings values are quoted in the report. Table PE-2 and EPH-5 shows per home savings of .886 kW and 1,190 kWh. Table EPH-1 and page 22 of the GJM testimony shows per home savings of .83 kW and 1,145 kWh. Ultimately, OG&E chose to use the savings values implied by Table GJM-1 which is .854 kW and 1,187 kWh per home for 158 homes. Note that this is calculated based on total kW savings of 135 kW and 187,602 kWh over 158 homes. Since rebates were only issued to 146 participants, the overall program savings are lower.

Table 3-1 OG&E’s deemed savings values in program planning document

Location in testimony and appendices	Annual kW savings per home	Annual kWh savings per home
Inferred from Table PE-2	0.886	1,190
Inferred from Table EPH-5	0.886	1,190
Table EPH-1	0.83	1,145
Page 22 of direct testimony	0.826	1,145
Inferred from Table GJM-1	0.854	1,187

Note: Values inferred from tables were calculated from projected total program savings divided by projected total program participants.

Based on the data provided by OG&E, it does not appear that OG&E currently maintains the level of detail electronically in iAvenue to conduct a full evaluation of the program impacts planned for the PY 2011 program evaluation.

²⁹ Deemed savings are from Table GJM-1 in the GJM testimony.

CONCLUSIONS AND RECOMMENDATIONS

The impact evaluation of the Positive Energy New Home Construction program for PY 2010 produced a number of findings, described in Chapter 3. These findings provided the basis for Global's assessment of the savings calculations and information tracking practices, as well as recommendations for improving the accuracy of savings estimates for use in future program years.

Assessment of Savings Calculations and Tracking for PY 2010

- The program data in iAvenue is complete and accurate for each participant, for each of the fields included in that database. Every single project in the sample showed compliance with the HERS efficiency requirements for eligibility. The deemed savings calculated from Table GJM-1 are accurately applied to each participant.
- The iAvenue database does not contain all of the fields indicated in the GJM testimony, although it is available through paper copies of REM/Rate reports.
- It may be that actual savings might be underestimated using the deemed savings from the Frontier report since most homes exceeded the minimum requirement. In the PY 2011 impact evaluation we will look at what savings the installed measures are actually achieving for each individual home.
- The program manager is excited about the program and he seems to take pride in providing satisfaction to the program participants.
- According to the program manager, members of the Central Oklahoma Home Builders Association are aware of the program and promote it to other members.
- The recorded savings values are exactly the same for every participant. While this is what OG&E proposed in testimony for reporting participant savings, it is unlikely to be an accurate reflection of all the savings, since the homes are unlikely to all have exactly the same construction or equipment or size. The variation we saw in the REM reports and HERS ratings supports this supposition. Unfortunately, the program does not maintain electronically any information about the specific equipment or shell measures installed.
- Although certified by a HERS rater, electronic documentation is not available to indicate which efficiency level of equipment, insulation, or other measures were taken to achieve the more efficient home. This is necessary to run building simulation models for the analysis of program year 2011.
- Documentation of deemed savings is missing. In the GJM testimony deemed savings per home are inconsistently stated throughout the testimony document and appendices. We could not tell why there are different values or the basis for their change. In talking with the program manager it appears the values provided by Frontier contained different deemed savings values and so the ones chosen were to remain consistent with the other programs. Knowing the basis for the savings estimate will be important for the PY 2011 impact evaluation in which the assignment of the savings by OG&E will be examined.
- The program currently uses the values implied by the total expected program savings in Table GJM-1 in the GJM testimony divided by the number of expected participant (158 homes), which is .854 kW and 1,187 kWh per home.

- Table PE-2 (Direct testimony) and EPH-5 (Exhibit GJM-4) implies per home savings of .886 kW and 1,189 kWh.
- Table EPH-1 (Exhibit GJM-4) and page 22 of the GJM testimony shows per home savings of .83 kW and 1,145 kWh.

Recommendations for Improving the Accuracy of Savings Estimates

- Document electronically the list of measures that are put into the home so that an exact calculation of energy savings can be made and used for reporting in future program years. Although the information is provided from the HERS inspection in REM/Rate, it would be better for OG&E to collect and maintain this electronically as part of the program participation documentation for each home. In particular, we recommend adding the following items of information to the electronic tracking system for this program:
 - Key building characteristics and measures included in the REM/Rate Source Report.
 - Indicate any other measures installed to meet the compliance requirements.
 - Indicate the HVAC fuel. All-electric homes can be expected to achieve different kWh savings than homes with natural gas heat.
- Calculate the savings for each individual home instead of assigning a flat deemed savings value. By only using the deemed savings for each home, the program is likely inaccurately estimating the amount of savings that is achieved by the program. Since the savings value OG&E currently assigns reflects savings from minimum efficiency eligibility, it is likely understating the program impacts.

ABOUT GLOBAL

Global Energy Partners is a premier provider of energy and environmental engineering and technical services to utilities, energy companies, research organizations, government/regulatory agencies and private industry.

Global's offerings range from strategic planning to turn-key program design and implementation and technology applications.

Global is a wholly-owned subsidiary of EnerNOC, Inc. committed to helping its clients achieve strategic business objectives with a staff of world-class experts, state of the art tools, and proven methodologies.

Global Energy Partners
500 Ygnacio Valley Road, Suite 450
Walnut Creek, CA 94596

P: 925.482.2000
F: 925.284.3147
E: gephq@gepllc.com

REVIEW OF THE OG&E GEOTHERMAL HEATING, COOLING, AND WATER HEATING PROGRAM – PROGRAM YEAR 2010

Participant Case Studies

Report 1334-4-1

May 26, 2011

Global Energy Partners Project Manager
R. Milward

EXECUTIVE SUMMARY

This document details the evaluation of OG&E's Program Year (PY) 2010 Geothermal Heating, Cooling and Water Heating (GHP) Program by Global Energy Partners (Global). Global's evaluation included developing two case studies of GHP Program participants and a thorough review of the GHP Program tracking database. This report starts with an overview of the program, then moves on to the case studies, and concludes with a summary of the Program's impacts, findings of the tracking database review, and recommendations to improve the Program.

Methodology

Our review of the PY 2010 GHP Program included conducting case studies of two program participants. Prior to selecting and interviewing the case study subjects, the OG&E Program Manager supplied Global with the GHP Program tracking database containing the Program's PY 2010 participants. The tracking database includes names of participants; contact and address information; project type (retrofit/new construction); GHP unit make, model, and capacity; HVAC and well contractor; kW and kWh savings; and incentive paid.

Global interviewed the two case study participants by telephone and noted their responses. Additionally, Global requested and received from OG&E billing data for the two case study participants. Analyzing the billing data has different limitations for each case study participant. The retrofit customer receives only electricity from OG&E. Therefore, the gas savings he reports are anecdotal and cannot be confirmed without requesting months of natural gas bills from him. The new construction customer has lived in his new home since September 2010, so there is limited data and nothing against which to compare his consumption.

In addition to the case studies, Global conducted a thorough review of the GHP Program's tracking database. This included, among other checks, determining whether the indicated unit capacity (in tons) matched the unit's model number and whether the rebate awarded was correct given the unit's capacity.

GHP Program Impacts

Table details the goals and accomplishments of the GHP Program in PY 2010. The goals are based on the testimony of Gary Marchbanks before the OCC in September 2009, while the PY 2010 GHP Program accomplishments are based on the data contained in the GHP Program tracking database supplied to Global.

Overall, the GHP Program attained about 20% of its PY 2010 goals. Existing customers were expected to represent about one-quarter of the Program's participants. In actuality, existing participants represented 43% of PY 2010 participants. We feel that this is due, in part, to the fact that new home construction was down for the third straight year in 2010, so installations in new homes were bound to end up significantly behind projections.

Table ES-1 Summary of PY 2010 GHP Program Goals and Accomplishments

	PY 2010 Goals ³⁴			PY 2010 Actuals*		
	Existing	New Construction	Total	Existing	New Construction	Total
Participants	125	375	500	41 (32.8%)	55 (14.7%)	96 (19.2%)
Rebates	\$187,500	\$562,500	\$750,000	\$69,564 (37.1%)	\$77,440 (13.8%)	\$147,004 (19.6%)
Tons Installed	500	1,500	2,000	185 (37.0%)	206 (13.7%)	391 (19.5%)
kW Impacts	-198	-593	-791	-73.2 (37.0%)	-81.5 (13.7%)	-154.7 (19.5%)
kWh Savings	-809,750	-2,429,250	-3,239,000	-299,616 (37.0%)	-333,619 (13.7%)	-633,234 (19.5%)

Note: *Percentages represent proportion of PY 2010 goals (e.g., 55 new construction participants is 14.7% of the PY 2010 goal of 375 new construction participants).

Recommendations

Based on the case studies and our review of the tracking database, we have the following recommendations for the GHP Program. The details about these recommendations are in Chapter 4.

- Require an indication of whether the hot water generator option is installed in the unit.
- Require the entry of unit cooling capacity in Btu/hour (Btuh) or kBtu/hour rather than tons, since most models are not designated by tons, but rather by kBtu in their model numbers.
- Add additional fields to the tracking database to allow the entry of model numbers and serial numbers for up to three separate GHP units.
- The rebate amount should be a calculated field based on the model number rather than a value entered by a database user.
- In addition to the type of heating system replaced for retrofits, also note the type of cooling system replaced.
- The Program should not provide incentives for the replacement of GHP systems with GHP systems, unless it can be determined that the GHP system being replaced was in need of replacement due to premature equipment or ground loop failure.
- The GHP Program currently relies heavily on word-of-mouth for marketing. Increase marketing effort to make program better known
 - Tie in the federal tax federal tax credit of 30% on GHP systems placed in service before December 31, 2016.
 - Establish or strengthen relationships with developers and new home builders, since the majority of the installations are expected to result from new construction. Remind them that the modifications required to existing home plans to accommodate GHP systems are minimal and represent an insignificant marginal cost.

³⁴ Tables GEO-2 and GEO-6, Direct Testimony of Gary Marchbanks before the Oklahoma Corporation Commission, Cause No. PUD 200900200, September 15, 2009.

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OG&E GEOTHERMAL HEATING, COOLING, AND WATER HEATING PROGRAM

Program Intent

According to the direct testimony of Gary Marchbanks before the Oklahoma Corporation Commission (OCC),³⁵ the intent of OG&E's Geothermal Heating, Cooling and Water Heating (GHP) Program is to reduce energy costs for OG&E's residential customers and improve the comfort of their homes by upgrading their home's heating and air conditioning systems. This would be accomplished by providing customers with a cash incentive to help buy down the initial investment required to install a GHP system.

Heating and cooling costs have the largest impact on most residential customers' energy bills. Their choice of heating and cooling equipment will have a huge influence these expenses for many years. According to a November 2008 study conducted for OG&E, most heating and air conditioning equipment lasts eleven years, so the choices customers make will impact their energy bills for many years.³⁶

GHP equipment offers an improved method for customers to greatly increase the efficiency of their heating and cooling equipment. GHPs are a high-efficiency heating and cooling equipment option that offers a long-term solution to managing rising energy costs.

Program Market

Analyses of equipment life suggest that roughly 20% of OG&E's residential cooling systems were installed before 1998. This suggests that there is a strong annual market for air conditioning systems. Assuming an 11 year mean life at time of replacement, then about 9% of residential cooling systems must be replaced each year.³⁷

OG&E assessed the types of cooling systems used in three different types of residential buildings: single-family detached homes, mobile homes, and multi-family buildings. Using regional data, OG&E found that the most common cooling technologies in the three types of homes were central air systems, air-source heat pumps, and window air conditioners. shows the market share of each cooling technology by housing type. Central air conditioning units are widely used in each type of home. Window air conditioners are most commonly found in mobile homes, but are still less prevalent in mobile homes than central air systems. Air-source heat pumps were found to be present in single-family and multi-family housing, and only in small numbers.

³⁵ "Direct Testimony of Gary J. Marchbanks on behalf of OG&E," September 15, 2009; part of filing In the Matter of the Application of Oklahoma Gas and Electric Company for an Order of the Commission Approving Comprehensive Demand Programs, Granting Recovery of the Costs of Such Programs and Authorizing a Recovery Rider, Cause No. PUD 200900200.

³⁶ Frontier Potential Study Phase II, dated November 2008. Frontier Associates.

³⁷ 30th Annual Portrait of the U.S. Appliance Industry, Appliance Magazine, 2006.

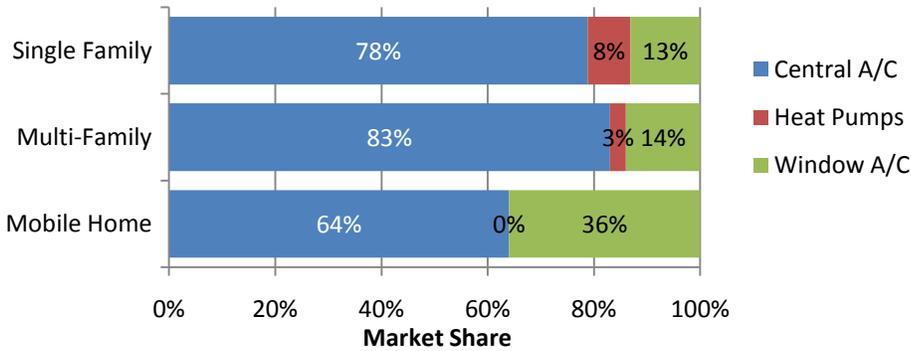


Figure 1-1 Market Share by Housing Type of Cooling Technologies

Source: 30th Annual Portrait of the U.S. Appliance Industry, Appliance Magazine, 2006.

The values in show that single- and multi-family homes are the most likely market for GHP systems, since the 86% of these homes will already have ducts in place since they currently have central air systems or air-source heat pumps. Existing homes without ducts should not be considered a potential market for GHP systems, because of the prohibitively high cost of installing ducts in existing homes. Although two-thirds of mobile homes should already have ducts, they also should not be considered a potential market for GHP systems, because mobile home parks typically lack available open space for installation of the ground loops.

Technology Goals

OG&E is offering an incentive of \$375 per ton to entice customers to purchase GHP systems with efficiency ratings of at least EER 13. OG&E’s target is 500 residential installations each year, with one-quarter of those in existing homes and the remainder in new construction as shown in . OG&E anticipates the average residential unit to be four tons, equating to a \$1,500 incentive payment per customer.

Table 1-1 Forecasted GHP Program Participation by Year

Program Year	Existing	New Construction	Total
2010	125	375	500
2011	125	375	500
2012	125	375	500

Source: Table GEO-2, Direct Testimony of Gary Marchbanks before the Oklahoma Corporation Commission, Cause No. PUD 200900200, September 15, 2009.

shows the impacts of the GHP Program per ton of installed equipment. With units being installed in 125 existing homes and 375 new homes each year and the units averaging four tons each, the total annual demand and energy reductions are expected to be 0.79 MW and 3,239 MWh, respectively.

Table 1-2 Forecasted Annual GHP Program Impacts per Ton

Type of Impact	Existing	New Construction	Total
Demand (kW/ton)	-0.47	-0.37	-0.40
Energy (kWh/ton)	-2,076	-1,467	-1,620

Source: Table GEO-6, Direct Testimony of Gary Marchbanks before the Oklahoma Corporation Commission, Cause No. PUD 200900200, September 15, 2009.



Program Barriers

The primary barrier to the installation of GHP systems in the residential market is the incremental cost of installing the ground loop. Installing the ground loop requires either trenching (horizontal loops) or drilling (vertical loops). In either case, this is an activity not required of conventional air-source heat pumps that typically results in the installed cost of a GHP system to be double that of air-source systems. The \$375 per ton incentive is designed to reduce the first-cost barrier associated with GHP systems.

OG&E's GHP Program has also been designed to overcome and eventually eliminate a number of other barriers to GHP systems in the residential market, including:

- Market structure – There may be an insufficient number of distributors that carry geothermal heat pumps. By helping to strengthen the market for GHP systems, OG&E will help increase the number of distributors of the technology.
- Product or service unavailability – There may be a deficiency of contractors who work with geothermal heat pumps. As with market structure, more contractors will see the benefit of working with GHP systems as consumers demand them.
- Lack of information – Uncertainty about equipment performance may inhibit consumers choosing high-efficiency equipment. Word-of-mouth and case studies will increase the availability of information regarding equipment performance, which will reduce consumer reluctance to seriously consider GHP systems.
- Emergency replacement – GHP installations are considerably more complex than standard HVAC equipment installations and generally must be planned in advance.
- Organizational practices and customs – GHP systems represent significant increases in initial costs and installation complexities that may not fit within budgets, timelines, and other institutional constraints or typical practices.

In an attempt to overcome these barriers, OG&E is taking the following steps as part of the program:

- Direct contractors and customers to federal tax credit opportunities, as well as federal, state, and local loans.
- Offer outreach to HVAC contractors emphasizing the benefits of geothermal heat pumps to their customers.

Evaluation Method

Our review of the PY 2010 GHP Program included conducting case studies of two program participants and a review of the program tracking database. Prior to selecting and interviewing the case study subjects, the OG&E Program Manager supplied Global with the GHP Program tracking database containing the Program's PY 2010 participants. The tracking database includes names of participants; contact and address information; project type (retrofit/new construction); GHP unit make, model, and capacity; HVAC and well contractor; kW and kWh savings; and incentive paid.

Working with the OG&E Program Manager, we randomly selected one retrofit participant and one new construction participant. The first two participants chosen could not be contacted after repeated attempts. Therefore, we asked the OG&E Program Manager to select two more participants. Both were quickly contacted and agreed to be interviewed as case study subjects.

The Spurrier Family of Mustang, OK retrofitted a gas forced-air furnace and conventional central air conditioner with a 4-ton GHP system. Terry Teitsort of Edmond, OK installed two GHP systems totaling 6 tons in his newly constructed home.

Global interviewed each participant by telephone and requested and received billing data from OG&E for the two case study participants. Analyzing the billing data has different limitations for each case study participant. The Spurrier Family (retrofit) receives only electricity from OG&E. Therefore, the gas savings he

reports are anecdotal and cannot be confirmed without requesting months of natural gas bills from him. Mr. Teitsort has lived in his new home since September 2010, so there is limited data and no previous billing data against which to compare his consumption.

The data collected allowed Global to illustrate each participant's experiences with the GHP Program during PY 2010 as well as provide background information on each participant's home, equipment installed, decision making process, and – to a limited extent – the energy impacts resulting from the new equipment.

In addition to the case studies, Global conducted a thorough review of the GHP Program's tracking database. This included, among other checks, determining whether the indicated unit capacity (in tons) matched the unit's model number and whether the rebate awarded was correct given the unit's capacity.

Report Organization

Following this introductory chapter are the two chapters containing the two case studies. Chapter 4 contains a list of lessons learned to date from the customers' experiences and Global's review of the GHP Program, along with recommendations.

CASE STUDY #1

"The warm air blowing in from the geothermal system is much better than the hot air [of the old gas forced air system]."

Bill Spurrier of Mustang, OK
OG&E Geothermal Heat Pump Program participant

The Spurrier Family of Mustang, OK benefitted from the OG&E GHP Program by retrofitting an operating Ruud central air conditioner and Ruud natural gas forced air furnace with a high-efficiency 4-ton ClimateMaster GHP unit. The GHP system provides the Spurriers with space heating and cooling, and hot water.

About the Home

Characteristics of the Home

The Spurrier Family lives in a 2,488 sq. ft., one-story single-family home that was built in 1996. The long and narrow lot on which the home sits is approximately 18,720 sq. ft. (0.43 acre). The existing heating and cooling equipment was original to the home and was about 14 years old at the time of replacement. summarizes the characteristics of the Spurrier home.

Table 2-1 Characteristics of Spurrier Home

Participant Name:	Bill Spurrier
Address:	301 East Plantation Terrace Mustang, OK 73064-4920 (Canadian County)
Year Built:	1996
Conditioned Floor Area:	2,488 sq. ft.
Lot size:	18,720 sq. ft. (0.43 acre)
Installation Type:	Retrofit

Location

Mustang is a fast growing community with an estimated population of 17,395 in 2010.³⁸ Mustang is located 15 miles southwest of downtown Oklahoma City, as shown in . It is located in the southeast portion of Canadian County, one of the fastest growing counties in the state. The soils of Canadian County are rich with a mix of humus, silt, and loam on gentle slopes. These are ideal soil types and conditions for GHP systems. The elevation of Mustang is 1,335 feet.

³⁸ 2010 US Census.

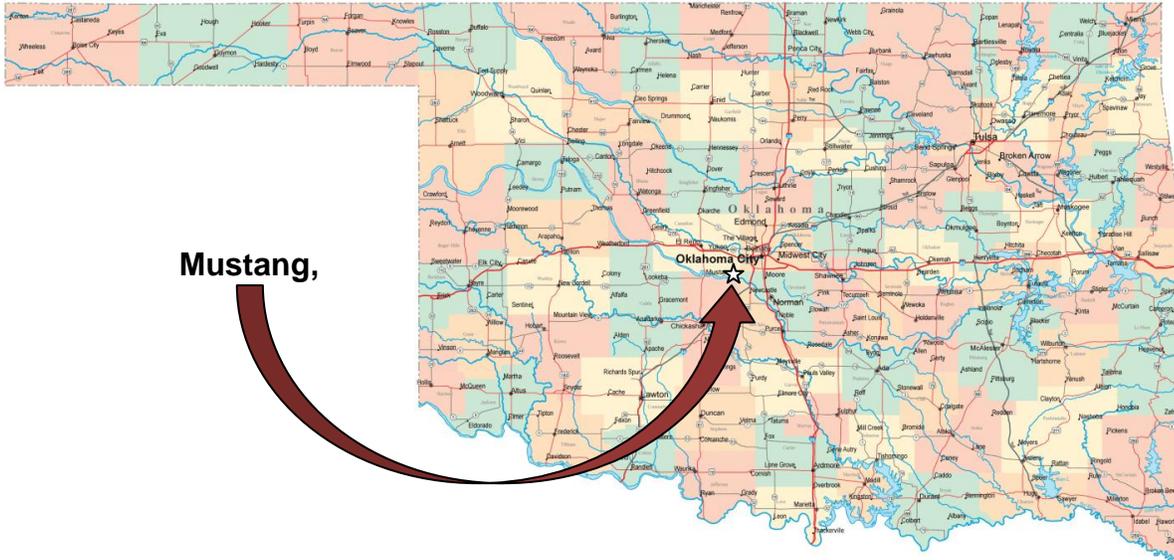


Figure 2-1 Location of Mustang, Oklahoma

shows an aerial view of the Spurrier property. The 0.43 acre property has a very large backyard, but the backyard is not easily accessed from the street for large, heavy drilling vehicles. The front yard is large enough to site geothermal wells, however, and is easily accessed from the street.



Figure 2-2 Aerial View of Spurrier Property

Project Description

The Spurrier Family's home was originally heated by a Ruud natural gas forced-air furnace and cooled by a Ruud central air conditioning unit. Because the home already had ducts installed, retrofitting to a GHP system required no additional modifications to the central air system or the home itself.

The GHP system was installed at the Spurrier home in June 2010. The details of the system are spelled out in .

Table 2-2 Characteristics of Spurrier GHP Project

Brand Installed:	ClimateMaster
Model Installed:	TTV049
Nominal Tons (Btuh):	4 (49,000 Btuh)
Loop Type:	Vertical
Number of Wells/Depth	4 / 250'
Type of System Replaced:	Ruud central AC & gas forced-air furnace
HVAC Contractor:	Comfortworks, Goldsby, OK
Name Driller Loop In:	Unknown
Month Installed:	June 2010
Total kW Saved (Deemed):	1.582
Total kWh Saved (Deemed):	6,478
Total Rebate Amount:	\$1,500 (\$375/ton)

HVAC/Well Contractors

After reviewing bids from several contractors, the Spurrier Family selected Comfortworks of Goldsby, OK for the project. Comfortworks was the HVAC contractor used by almost 57% of the GHP system installations receiving incentives from OG&E in 2010. Comfortworks is an IGSHPA (International Ground Source Heat Pump Association) accredited installer of GHP systems.

Mr. Spurrier could not recall the name of the well driller, but Comfortworks used B&H Construction of Goldsby, OK as their well drilling contractor on 94% of their OG&E-incentivized projects (the names of the well drillers in the other 6% were not recorded).

Installation of the system took four days, which included drilling the wells, plumbing and powering the system, connecting it to the existing ductwork, and balancing.

GHP system – Manufacturer & Model

Comfortworks installed a ClimateMaster TTV049 4-ton "Tranquility 27" GHP system (pictured in) in the Spurrier home.³⁹ The Tranquility 27 series is ClimateMaster's top of the line GHP system. They possess two-stage scroll compressors and variable-speed fan motors.

³⁹ The only GHP products Comfortworks installs is ClimateMaster.



Figure 2-3 ClimateMaster Tranquility 27 Geothermal Heat Pump

Photo: ClimateMaster, Inc.

The Spurrier Family opted for the hot water generator option, which provides hot water anytime the GHP system is operating. This feature does not eliminate the need for a separate water heater, but does reduce the cost of operating the water heater. provides detailed operating and efficiency characteristics of the GHP system installed by the Spurrier Family.

Table 2-3 Characteristics of ClimateMaster "Tranquility 27" GHP System in Spurrier Home

Unit	First Stage Operation*				Second Stage Operation			
	Cooling		Heating		Cooling		Heating	
	Capacity (Btuh)	EER (Btuh/W)	Capacity (Btuh)	COP	Capacity (Btuh)	EER (Btuh/W)	Capacity (Btuh)	COP
TTV049	39,600	24.9	31,200	4.6	50,600	17.9	37,500	4.0

Note: *Approximately 80% of heating and cooling needs are met using first stage operation.

The installed cost for the GHP system was \$18,000 before the OG&E rebate. After the \$1,500 (\$375/ton) rebate from OG&E, the net cost of the Spurrier’s GHP system was \$16,500. In addition, the Spurriers received a federal tax credit of \$7,500 for 2010 due to the installation of their GHP system.

Well Type & Characteristics

Because of the lack of access for the drilling rig to the home’s backyard, the four 250-foot deep vertical wells were drilled in the front lawn of the home.

It was with the well drilling that Mr. Spurrier had his only problem with the project. The drillers said they would haul off the mud. However, much of it was left on the lawn, which resulted in lumps on his front lawn that are still there. The drilling rig cracked the sidewalk in front of his house, but the driller replaced the sidewalk.

Results

After ten months operation of the GHP system, Mr. Spurrier is very pleased with both the improved comfort of his home and his reduced natural gas bills. What remains to be seen is what happens during the cooling season of 2011 in comparison to the previous year. In order to get a sense of the changes in electricity consumption experienced by Mr. Spurrier, we compare pre- and post-installation billing data. This is intended to be an ad hoc estimation rather than a rigorous investigation since it does not take into account

weather or other changes to the home, such as changes in occupancy, the installation of insulation, or other energy efficiency measures.

Customer’s Billing History vs. Deemed Savings

illustrates the monthly electric consumption at the Spurrier home for the period March 2009 through April 2011. The blue shading indicates the 10-month period beginning with the July 2010 utility bill in which the GHP system was in operation. Note that except for post-installation electricity consumption being generally higher, the month-to-month usage pattern is practically the same before and after installation of the GHP system.

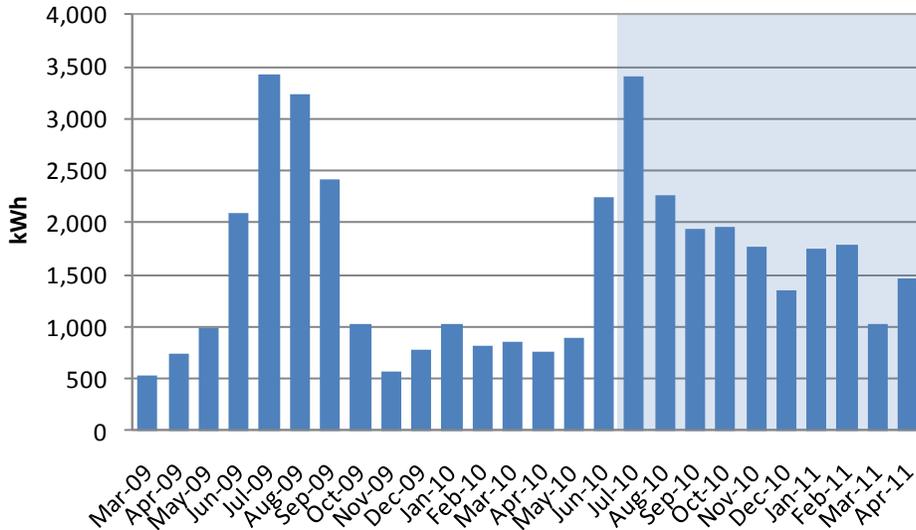


Figure 2-4 Spurrier Family Electric Billing History by Month

Comparing the two ten-month periods for which we have consumption data for both the old and new systems (July 2009–April 2010 [red shading] vs. July 2010–April 2011 [green shading]), we see at the bottom of an estimated overall 28% increase in electricity consumption since the installation of the GHP system. This is further broken down between the winter and summer rate seasons. As is expected, winter (heating) season electricity consumption almost doubled after the installation of the GHP system. This is because of the change in space heating fuel from natural gas to electricity. On the other hand, electricity use in the summer (cooling) season fell 16% after the installation of the GHP system. This is due partly to the higher operating efficiency of the GHP system compared to the AC system it replaced and in part to foam insulation the Spurriers added to their attic.

compares the electricity consumption during the two July through April periods detailed in , again with the red the pre-GHP time period and green the GHP system time period. Except for in the peak cooling month of July (see), the electricity consumption with the GHP system in place is lower during the summer months than the old conventional AC system.

Table 2-4 Comparing Pre- and Post-GHP Electricity Consumption in kWh – Spurrier Home

	Rate Season	2009	2010	2011
January	Winter		1,027	1,749
February	Winter		817	1,795
March	Winter		855	1,034
April	Winter		755	1,795
July	Summer	3,426	3,402	
August	Summer	3,233	2,272	
September	Summer	2,417	1,944	
October	Shoulder	1,019	1,954	
November	Winter	568	1,768	
December	Winter	785	1,356	
Operating Period		Pre-	Post-	Change
10-Month Period of GHP System Operation		14,902	19,069	4,167 (+28.0%)
Winter Rate Season Operation (6 months)		4,807	9,497	4,690 (+97.6%)
Summer Rate Season Operation (3 months)		9,076	7,618	-1,458 (-16.1%)

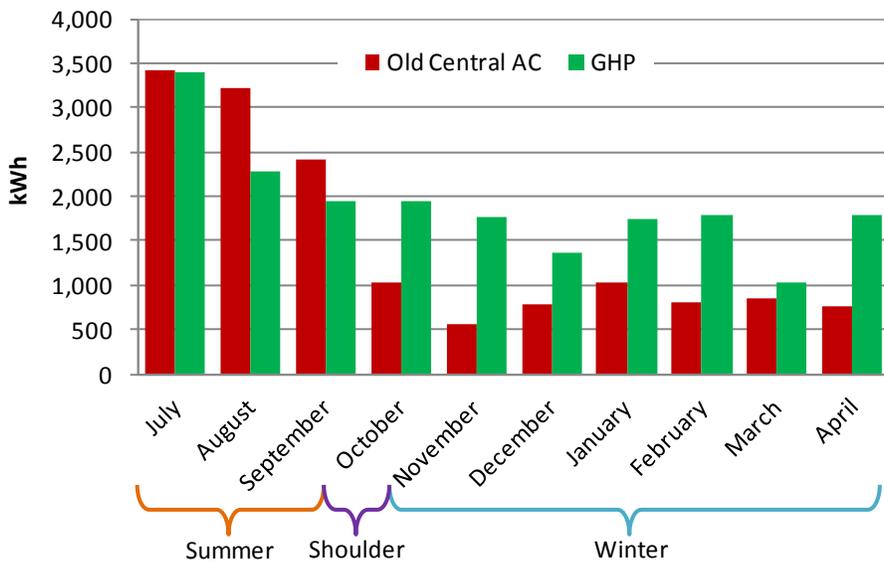


Figure 2-5 Comparing Electricity Use Before and After GHP System Installation – Spurrier Home

As a result of the increase in heating season electricity consumption due to the GHP system, the Spurrier's monthly electric bill has increased from an average of \$81.99 per month for the November 2009-April 2010 heating season up to \$122.88 per month for the November 2010- April 2011 heating season; an increase of 50% or \$40.90 per month. However, according to Mr. Spurrier, his natural gas bill during the heating months has dropped about \$270 per month! So, even with a higher electric bill, the Spurriers are spending about \$215 less per month on heating due to their GHP system, a decrease of about 55%.⁴⁰

The deemed savings for GHP systems in existing homes is 2,238 kWh per year (see). shows that through the first ten month of GHP system operation, the Spurrier's electricity consumption has increased 4,167 kWh. An overall increase would be expected, since six of the ten months have been heating months. What happens during the remaining three months of the summer cooling season will be very important to track.

It is important to note that the changes in energy consumption (both electricity and natural gas) have been impacted not only by the changeover to the GHP system, but also the installation of the spray foam insulation in the attic.

Each of the contractors that bid on the project provided the Spurriers with an estimated simple payback. The payback estimated by Comfortworks was 2 years and was based upon an assumed summer thermostat setting of 74°F in the summer and 70°F in the winter. Mr. Spurrier feels that the payback may eventually be closer to four years, since after nine months of operation, their savings have recouped about one-third of their out-of-pocket expenses. Their potentially longer payback is likely due in part to the fact that they keep the thermostat set at 72°F in the summer.

Customer's Opinions of Technology and Program

Mr. Spurrier is very enthusiastic about the performance of his GHP system, both in terms of energy savings and comfort. During the summer, his old air conditioning system would run constantly if the outside air temperature was above 100°F and yet the interior of his house would never drop below 79°F. Now he is able to keep the home consistently at a comfortable 72°F without any problem. During the winter, in particular, the Spurrier family is happier and more comfortable due to the GHP system blowing warm air from of the registers in their home than they were previously with the hot air that used to blow from their gas forced air furnace.

Mr. Spurrier is pleased with the OG&E's GHP Program, because he received a rebate check for very little effort on this part. He sees no need for any changes to the GHP Program, except to say that it might be more successful than it already is if the rebate were greater.

Decision Process

Homeowner's Attitudes Towards Energy Efficiency

Mr. Spurrier confirmed that controlling energy costs are very important to him. In addition to replacing their existing gas forced air furnace and air conditioning system with the GHP system, the Spurrier Family also had spray-on foam insulation applied in their attic, which further enhanced their energy savings.

Project Impetus and Decisions Made

Mr. Spurrier and his wife make major decisions together about replacing or purchasing new equipment, such as the one involved in deciding to install at GHP system. That they considered a GHP system in the first place was due to the fact that Mrs. Spurrier used to work for ClimateMaster. Once they began receiving bids provided by various potential contractors showed the potential energy savings that could result from a GHP system.

The Spurriers were unaware that OG&E would provide a rebate of \$375 per ton until their Comfortworks representative told them. As a result, they were pretty much set on installing a GHP system – the OG&E

⁴⁰ Global was not able to obtain a natural gas billing history because the Spurrier's natural gas is supplied by Oklahoma Natural Gas.

rebate was a bonus. In addition to the OG&E rebate, the Spurriers were eligible for a federal tax credit of 30% on GHP systems placed in service before December 31, 2016.

CASE STUDY #2

"The cooling mode [of the geothermal heat pump] controls humidity much better than a standard [air conditioning] system."

Terry Teitsort of Edmond, OK
OG&E Geothermal Heat Pump Program participant

Terry Teitsort is a retiree living in Edmond, OK. He built a new home that he moved into in September 2010. His new home features two GHP systems with a total cooling capacity of 5.5 tons that provide space heating and cooling.

About the Home

Mr. Teitsort’s home is a brand new 3,750 sq. ft. custom home built in the new Rose Creek development about six miles west of downtown Edmond. The two-story single-family home sits on a lot slightly less than one-quarter acre in size.

Characteristics of the Home

Mr. Teitsort’s home possesses many energy efficiency features as a result of his interest in building a home with long-term efficiency in mind. His home was a long time in planning and construction and he got a number of ideas for the home by noting features included in a model home at Rose Creek. The model home was conditioned by a GHP system and included an energy recovery ventilator; features that he decided he wanted in his new home. summarizes the characteristics of the Teitsort home.

Table 3-1 Characteristics of Teitsort Home

Participant Name:	Terry Teitsort
Address:	16701 Little Leaf Lane Edmond, OK 73012 (Oklahoma County)
Year Built:	2010
Conditioned Floor Area:	3,750 sq. ft.
Lot size:	10,745 sq. ft. (0.2343 acre)
Installation Type:	New Construction

Location

Edmond is part of the Oklahoma City metropolitan area in the central part of Oklahoma. In 2010, Edmond’s population was 81,405, which makes it the sixth largest city in the state.⁴¹ Edmond is located about 12 miles north of downtown Oklahoma City, as shown in , on the western edge of Oklahoma County. The city’s elevation is 1,200 feet.



Figure 3-1 Location of Edmond Oklahoma

shows an aerial view of the Teitsort property. It is a corner lot with the home set evenly in the middle. The soils in that part of Oklahoma County are clay- and humus-rich soils on very gentle slopes, which are ideal for GHP systems. The whole development is new and when the Teitsort home was constructed, there were no fences between the two adjacent homes, which made it easier for the well drilling truck to access the site.

⁴¹ 2010 US Census.

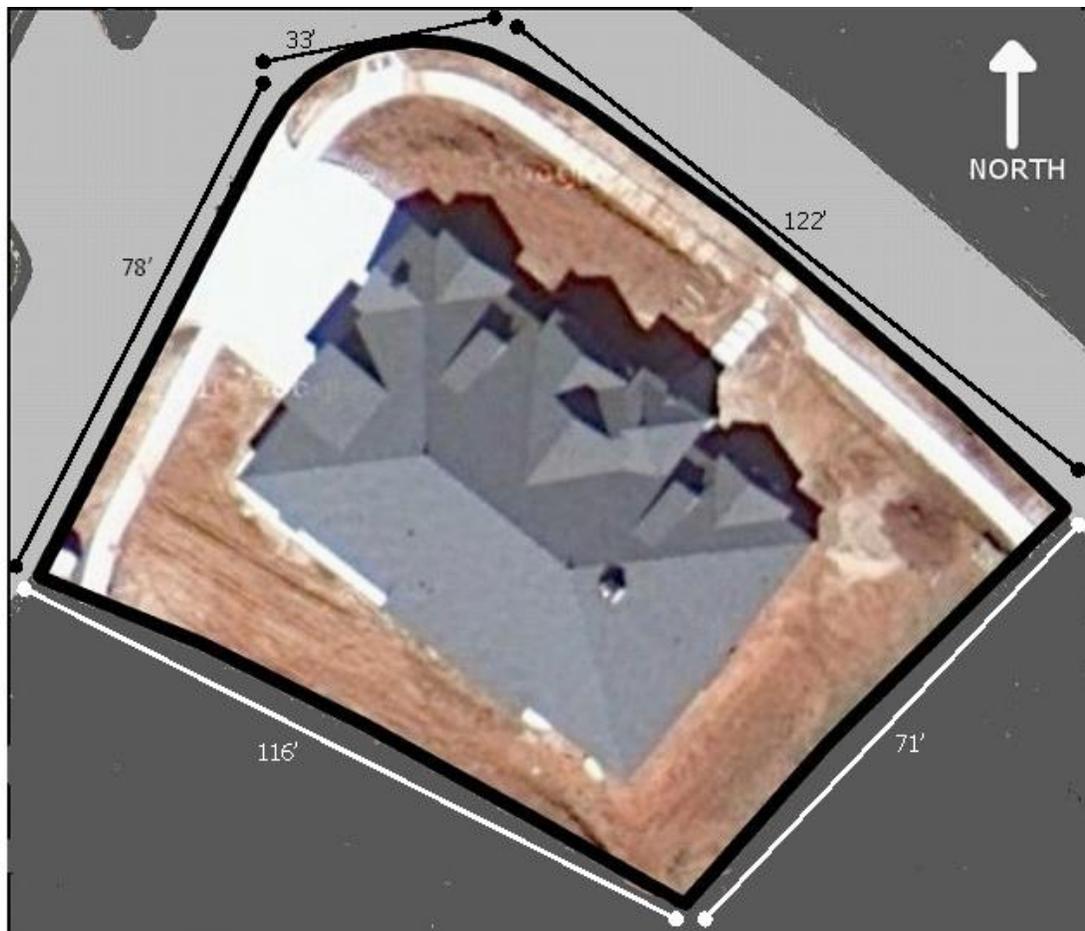


Figure 3-2 *Aerial View of Teitsort Property*

Project Description

Mr. Teitsort included many energy-efficient features in his home in addition to the GHP systems since energy efficiency is very important to him. In fact, the promise of long-term energy savings was the main reason for his equipment purchasing decisions for his new home. The details of the GHP systems in the Teitsort home are shown in .

Table 3-2 Characteristics of Teitsort GHP Project

Brand Installed:	ClimateMaster
Models Installed:	#1) TTV049 (4-tons) #2) TTV026 (2-tons)
Nominal Tons (Btuh):	6 (72,000 Btuh)
Loop Type:	Vertical
Number of Wells/Depth	5 / 220'
Type of System Replaced:	N/A (New Construction)
HVAC Contractor:	Wallace Mechanical, Edmond, OK
Name Driller Loop In:	<i>Unknown</i>
Month Installed:	Moved into home in September 2010
Total kW Saved (Deemed):	2.175
Total kWh Saved (Deemed):	8,907
Total Rebate Amount:	\$2,062.50 (\$375/ton)

In addition to installing two GHP units, Mr. Teitsort installed an energy recovery ventilator (ERV) with each GHP unit. An ERV uses the energy in air exhausted from a building to precondition incoming outdoor air. During the cooling season, the ERV will pre-cool and dehumidify outdoor air and it will pre-warm outdoor air in the heating season. This allows air-tight buildings and homes (such as the Teitsort home) to maintain a certain level of air quality while allowing for reduced heating and cooling equipment size.

HVAC/Well contractors

Mr. Teitsort selected Wallace Mechanical of Edmonds as his HVAC contractor. Wallace Mechanical is an IGSHPA accredited installer of GHP systems and installed about 7.5% of the GHP systems that received incentives from OG&E in 2010.

According to Mr. Teitsort, Wallace Mechanical used a subcontractor whose name he could not recall to drill the wells. Three times out of seven that Wallace Mechanical installs a GHP system they use Van & Co. as their well drilling contractor.

There were no issues associated with or problems encountered during the drilling of the wells at the Teitsort house.

GHP system – Manufacturer & Model

Wallace Mechanical installed two ClimateMaster "Tranquility 27" GHP systems like that pictured in in the Teitsort home.⁴² The Tranquility 27 series is ClimateMaster's top of the line GHP system. They possess two-stage scroll compressors and variable-speed fan motors. Mr. Teitsort decided against the desuperheater option for hot water from the GHP units. Instead he opted for two tankless natural gas water heaters made by Rinnai.

⁴² The only GHP products Wallace Mechanical installs is ClimateMaster.



Figure 3-3 ClimateMaster Tranquility 27 Geothermal Heat Pump

Photo: ClimateMaster, Inc.

provides detailed operating and efficiency characteristics of the GHP system installed in the Teitsort home.

Table 3-3 Characteristics of ClimateMaster "Tranquility 27" GHP Systems in Teitsort Home

Unit	First Stage Operation*				Second Stage Operation			
	Cooling		Heating		Cooling		Heating	
	Capacity (Btuh)	EER (Btuh/W)	Capacity (Btuh)	COP	Capacity (Btuh)	EER (Btuh/W)	Capacity (Btuh)	COP
TTV026	21,300	26.0	16,500	4.6	26,600	18.5	19,800	4.0
TTV049	39,600	24.9	31,200	4.6	50,600	17.9	37,500	4.0

Note: *Approximately 80% of heating and cooling needs are met using first stage operation.

Mr. Teitsort received a rebate of \$2,062.50 (\$343.75/ton), which is \$187.50 less than he should have been paid for his GHP system. This is because the information provided by the contractor to OG&E indicated the installation of a 4-ton unit and a 1.5-ton unit rather than a 4-ton and a 2-ton unit. However, it turns out that the 2-ton unit installed in the Teitsort home was the more advanced and more efficient Tranquility 27 model instead of the Tranquility 20 model ordered. In addition to his OG&E rebate, Mr. Teitsort received a federal tax credit of about \$9,000 on his 2010 federal taxes due to the installation of the GHP system.

Well Type & Characteristics

The five 220' deep vertical wells serving the GHP units are located in the back yard of Mr. Teitsort's home. As can be seen in , there are streets on two sides of the property since Mr. Teitsort's home occupies a corner lot. The other two sides of the property border on 1) the next door neighbor's driveway and 2) a golf cart path, beyond which sits another neighbor's house. At the time his home was constructed, there were no fences separating Mr. Teitsort's property from his neighbors. As a result, access to the back yard was easy for the drilling rig.

Results

After seven months operation of the GHP system, Mr. Teitsort is very pleased with the comfort of his home, in particular the upstairs area that was intended to be only a bonus/storage room but is now so comfortable even in the summer that it has become a frequently used workout area. In order to get a sense of the changes in electricity consumption experienced by Mr. Teitsort, we compared pre- and post-installation billing data. This is intended to be an ad hoc estimation rather than a rigorous investigation since it does not

take into account weather or other changes to the home, such as changes in occupancy, the installation of insulation, or other energy efficiency measures.

Customer’s Billing History (vs. Deemed Savings)

shows the monthly electricity consumption in the Teitsort home since they moved into the home in September 2010. Based on the few months of data available, it appears that the GHP system installed in the Teitsort house may have been optimized for heating, since the three coldest months are the highest consumption months.⁴³

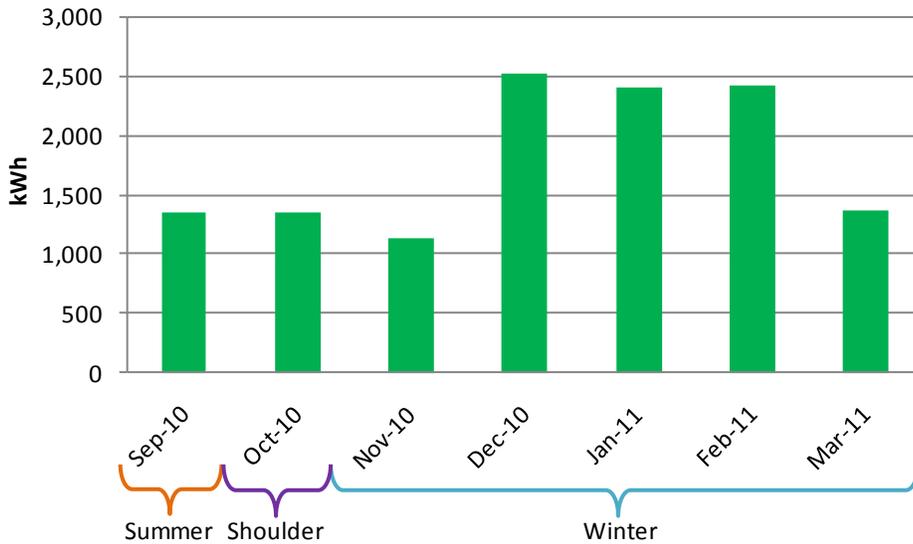


Figure 3-4 Teitsort Home Electric Billing History by Month

So far, Mr. Teitsort believes he is receiving the energy savings benefits he had expected. Several project bidders performed cost analyses. Most predicted average monthly heating/cooling costs of \$90. Since moving into the house in mid-September 2010, Mr. Teitsort’s electric bills have averaged \$144 per month. Overall, he is happy with the system and is pleased that when in cooling mode, the system controls humidity better than a standard air conditioning system.

In addition to installing the two GHP units Mr. Teitsort had spray foam insulation installed in the attic, which made the attic area of the home a comfortable and usable space. According the Mr. Teitsort, the addition of the foam insulation decreased the needed size of the GHP system by 1.5-2 tons.

Customer’s Opinions of Technology and Program

Mr. Teitsort is very impressed with his GHP system so far, especially its ability to control humidity. What he seems to be most happy with is his decision to have spray foam insulation installed in his home’s attic. He says that when it’s 105°F outside, the GHP system keeps the main part of the home at a comfortable 78°F. Yet even in the attic it’s still 86°F, which makes that space usable, a benefit he hadn’t counted on.

Mr. Teitsort is satisfied with his participation in OG&E’s GHP Program. His only suggestion to improve the program would be to make the incentive larger, since he feels that the high upfront cost of GHP systems scare many people away.

⁴³ Global was not able to obtain a natural gas billing history because Mr. Teitsort’s natural gas is supplied by Oklahoma Natural Gas.

Decision Process

Homeowner's Attitudes Towards Energy Efficiency

Controlling energy costs is very important to Mr. Teitsort, which is why he also installed an energy recovery ventilator (ERV) and two tankless gas water heaters. An ERV uses the energy in air exhausted from a building to precondition incoming outdoor air. During the cooling season, the ERV will pre-cool and dehumidify outdoor air and it will pre-warm outdoor air in the heating season. This allows air-tight buildings and homes (such as the Teitsort home) to maintain a certain level of air quality. Installing ERVs can also allow for reduced heating and cooling equipment size, although that was not the case in the Teitsort home. All the energy-efficient equipment he had installed in his new home were included for the purpose of long-term efficiency.

Impetus and Decisions Made

Mr. Teitsort first got the idea to install a GHP system from his wife's brother who has a GHP in his home. Seeing a demonstration GHP installation at a model home show "sealed the deal" as far as he was concerned. The decision to use ClimateMaster was based on the recommendation of his contractor and his desire to use a locally built product.

Because the design and construction process of his home was protracted, Mr. Teitsort made the decision to go with a GHP system in his new home before the OG&E GHP Program was implemented. However, he was aware of the federal tax credit of 30% on GHP systems placed in service before December 31, 2016.

SUMMARY OF RESULTS AND RECOMMENDATIONS

Summary of Results

We present the results of the evaluation in three sections: a review of the tracking database, program impacts, and program strengths and weaknesses.

Tracking Database Review

Our review of the tracking database revealed several interesting details:

- The tracking database contained data on 96 installations totaling 391 tons.
- The most common size unit installed was 2 tons (39.6% of units).
- The average size installed was 4.1 tons.
- New construction outnumbered retrofits 57% to 43%. (The anticipated breakdown according to Gary Marchbanks' testimony before the OCC was 75% new construction and 25% retrofit.)
- Of the retrofit installations, one-half replaced GHP systems and one-quarter replaced gas forced-air furnaces.⁴⁴
- Two-thirds of the participants live in Oklahoma City.
- Almost 91% of the GHP Program participants live in the Oklahoma City Metropolitan Statistical Area (MSA), which is comprised of Oklahoma, Canadian, Cleveland, Grady, Lincoln, Logan, and McClain Counties.
- Ninety-one percent of the installations were vertical loop arrangements. All the new construction installations were vertical loops.
- Comfortworks performed 56% of the installations.
- ClimateMaster is the brand of GHP used in 85% of the installations.

Program Impacts

details the goals and accomplishments of the GHP Program in PY 2010. The goals are based on the testimony of Gary Marchbanks before the OCC in September 2009, while the PY 2010 GHP Program accomplishments are based on the data contained in the GHP Program tracking database supplied to Global. Sections following discuss each component of the table, comparing forecasted Program goals to actual Program results.

⁴⁴ Equipment data is supplied by the HVAC contractor and may not always be accurate. For example, according to the tracking database, the Spurrier family replaced a GHP system with a GHP system. However, Mr. Spurrier reported that his GHP system replaced a gas forced-air furnace and standard AC system. However, according to OG&E's Program Manager, it is true that many of the GHP systems installed replaced GHP systems.

Table 4-1 Summary of PY 2010 GHP Program Goals and Accomplishments

	PY 2010 Goals ⁴⁵			PY 2010 Actuals*		
	Existing	New Construction	Total	Existing	New Construction	Total
Participants	125	375	500	41 (32.8%)	55 (14.7%)	96 (19.2%)
Rebates	\$187,500	\$562,500	\$750,000	\$69,564 (37.1%)	\$77,440 (13.8%)	\$147,004 (19.6%)
Tons Installed	500	1,500	2,000	185 (37.0%)	206 (13.7%)	391 (19.5%)
kW Impacts	-198	-593	-791	-73.2 (37.0%)	-81.5 (13.7%)	-154.7 (19.5%)
kWh Savings	-809,750	-2,429,250	-3,239,000	-299,616 (37.0%)	-333,619 (13.7%)	-633,234 (19.5%)

Note: *Percentages represent proportion of PY 2010 goals (e.g., 55 new construction participants is 14.7% of the PY 2010 goal of 375 new construction participants).

Participants

Overall, the 96 participants were about 19% of the 500 expected participants in the PY 2010 GHP Program. One-quarter of the installations were expected to be in existing homes and the remainder in newly constructed homes. However, with new home construction down for the third straight year in 2010, installations in new homes were bound to end up significantly behind projections.⁴⁶ Installations in new construction were less than 15% of goal, while installations in existing homes came to about one-third of goal.

Rebates

The PY 2010 GHP Program provided incentives totaling \$147,004 or just less than 20% of the goal of \$750,000.

The average size anticipated for GHP system installations was 4 tons; the actual average size was 4.1 tons. Because the anticipated and actual sizes were so close and the rebate amounts were dependent upon the unit sizes, the breakdown of rebates closely followed the participant breakdown. Rebates for new construction installations were about 14% of goal, while installations in existing homes came to 37% of goal.

Two participants were overpaid for their installations while one was underpaid. These rebate discrepancies came about because the unit capacities (in tons) reported by the HVAC contractors didn't match what was actually installed or because unit capacities are often given in fractional tons and those capacities can be interpreted differently (see 'Recommendations' section).

Tons Installed

The average size of the installations in existing homes was 4.5 tons, while the average size installed in new homes was 3.7 tons. Therefore, in addition to being closer to goal in terms of number of participants, the retrofits into existing homes were typically larger units, meaning they met 37% of their tonnage goal of 500 tons. On the other hand, new construction units were smaller and they were farther from their participant

⁴⁵ Tables GEO-2 and GEO-6, Direct Testimony of Gary Marchbanks before the Oklahoma Corporation Commission, Cause No. PUD 200900200, September 15, 2009.

⁴⁶ According to the Federal Reserve Bank of St. Louis new housing starts were unchanged 2009 through 2010, when an average of 250 permits per month for the construction of single family homes were submitted in the Oklahoma City MSA. This is down significantly from 2005, when an average of 681 permits was submitted monthly. (Source: Federal Reserve Bank of St. Louis, Economic Research Division, Privately Owned Housing Starts: 1-Unit Structures for Oklahoma City, OK (MSA) (OKLA440BP1FH), Monthly, Not Seasonally Adjusted, 1988-01-01 to 2011-02-01.)

goal, so they were about 14% of tonnage goal of 1,500 tons. Overall, the GHP Program installed 391 tons of GHP systems, almost 20% of the goal of 2,000 tons.

kW Impacts

The kW impacts are based upon the tons installed. With a deemed demand reduction of 0.396 kW per ton and a total of 391 tons installed, the total estimated kW impacts for the PY 2010 GHP Program is 155 kW, or almost 20% of the goal of 791 kW. The kW impacts by construction type follow proportionally with the tons installed, with the retrofit homes twice as close to the annual goal.

KWh Savings

The kWh savings are also based upon the tons installed. With an energy savings of 1,619.5 kWh per ton and a total of 391 tons installed, the total estimated kWh savings for the PY 2010 GHP Program is 633.2 MWh, or almost 20% of the goal of 3,239 MWh. The kWh savings by construction type follow proportionally with the tons installed, with the retrofit homes twice as close to the annual goal.

Program Strengths and Weaknesses

Our case study review identified several strengths of the GHP Program:

- The participants appear to be very pleased with the GHP Program.
- Both participants included other energy-saving equipment or features in their homes when installing their GHP systems.
- Although long-term data is not yet available, the overall heating and cooling energy savings resulting from the GHP system retrofit are already impressive.
- The program requirements are reasonable and do not hinder GHP Program participation.
- The Program Manager is helpful, responsive, and easy to work with.

The case studies and the review of the tracking database identified some weaknesses to the Program:

- The participants made their equipment purchasing decisions prior to Program participation. One participant was not aware of the OG&E incentive at the time of their decision to go with a GHP system, but was aware of the federal tax credit. They also felt that if the OG&E incentive were larger, more GHP systems would be installed.
- A stronger incentive for both participants to install GHP systems was the federal tax credits for GHP systems placed in service before December 31, 2016, since the magnitude of the tax credit was significantly greater than the incentive received from OG&E.
- The demand and energy impacts resulting from the installation of GHP systems were attributed based on the size of the unit installed in tons (cooling). This appears to contradict the information contained on page C-8 and C-9 of the Deemed Savings, Installation & Efficiency Standards document (July 29, 2009) included as Appendix C to Gary Marchbanks' testimony before the OCC. Those pages state that the demand reductions and energy savings resulting from the installation of GHP systems will be functions of:
 - Capacity of installed unit (tons)
 - Climate zone
 - Energy efficiency rating (EER) of the GHP system
 - Whether or not a desuperheater (hot water generator) is installed in the unit

The data on unit capacity is already recorded and entered into the tracking database. The climate zone can be determined by the county, which can be determined by the city, which is already recorded in the tracking database. The energy efficiency rating of the unit can be determined by the model number, which is already recorded in the database. The presence of the hot water generator can also be

determined from the model number of the unit. However, the full model number must be recorded, not just the first few alpha-numeric characters, which is typical.

- Half of the retrofits replaced GHP systems, according to the tracking database, which seems an unusually high proportion. Part of this may be due to data entry errors. For example, the retrofit case study participant is listed in the tracking database as having replaced a GHP system, when in reality a gas forced-air furnace was replaced.

Program Recommendations

Based on this review we have the following recommendations for the program.

- Require an indication of whether the hot water generator option is installed in the unit. Just four out of 96 records (4.2%) included the full model number in the tracking database. In the case of ClimateMaster, the most common brand among participants, the digit indicating the presence of the hot water generator is the eleventh digit in the model number.
- Require the entry of unit cooling capacity in Btu/hour or kBtu/hour rather than tons, since most models are not designated by tons, but rather by kBtu in their model numbers (see capacities noted with ‘†’ below, which appear to be fractional tons, but are designated otherwise) – then let the tracking database lookup tons using a table similar to below and then calculate appropriate rebate. There should be no rebate amount entered by user – it should be a calculated field.
 - Common sizes:

18,000 Btu/hour ...	1.5 tons
24,000 Btu/hour ...	2.0 tons
26,000 Btu/hour ...	2.0 tons†
28,000 Btu/hour ...	2.0 tons†
30,000 Btu/hour ...	2.5 tons
36,000 Btu/hour ...	3.0 tons
38,000 Btu/hour ...	3.0 tons†
42,000 Btu/hour ...	3.5 tons
48,000 Btu/hour ...	4.0 tons
49,000 Btu/hour ...	4.0 tons†
60,000 Btu/hour ...	5.0 tons
64,000 Btu/hour ...	5.0 tons†
72,000 Btu/hour ...	6.0 tons
- Add additional fields to the tracking database to allow the entry of model numbers and serial numbers for up to three separate GHP units. Out of the 96 participants, 19 (19.8%) had two GHP units, and eight (8.3%) had three units.
- The rebate amount should be a calculated field based on the model number rather than a value entered by a database user.
- In addition to the type of heating system replaced for retrofits, also note the type of cooling system replaced.
- The Program should not provide incentives for the replacement of GHP systems with GHP systems, unless it can be determined that the GHP system being replaced was in need of replacement due to premature equipment or ground loop failure. If the prevalence of GHP as the system replaced is due to entry errors, this should be addressed.⁴⁷
- The GHP Program currently relies heavily on word-of-mouth for marketing. Increase marketing effort to make program better known as follows:

⁴⁷ According to OG&E’s Program Manager, it is true than many of the GHP systems installed replaced GHP systems. The reason is that many existing GHP systems had failed because their “A” coils had rusted out due to faulty materials. Therefore, the existing ground loops were still usable and only the inside units were replaced.

- Tie in the federal tax federal tax credit of 30% on GHP systems placed in service before December 31, 2016.
- Establish or strengthen relationships with developers and new home builders, since the majority of the installations are expected to result from new construction. Remind them that the modifications required to existing home plans to accommodate GHP systems are minimal and represent an insignificant marginal cost.

ABOUT GLOBAL

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Global Energy Partners
An EnerNOC Company
500 Ygnacio Valley Road, Suite 450
Walnut Creek, CA 94596

P: 925.482.2000
F: 925.284.3147
E: gephq@gepllc.com

EVALUATION OF OG&E'S COMMERCIAL LIGHTING PROGRAM – PROGRAM YEAR 2010

Final Report

Prepared for Oklahoma Gas & Electric

May 27, 2011
Global Energy Partners Project Manager
Bridget Kester



Global Energy Partners
500 Ygnacio Valley Road, Suite 450
Walnut Creek, CA 94596

P: 925.482.2000
F: 925.284.3147
E: gephq@gepllc.com

OG&E

This report was prepared by

Global Energy Partners
500 Ygnacio Valley Blvd., Suite 450
Walnut Creek, CA 94596

Principal Investigator(s):

B. Kester
A. Sanchez
J. Shishido
P. Ignelzi
J. Murphy
R. Ehrhard
K. Marrin
V. Ganti

EXECUTIVE SUMMARY

This report contains description and results of the impact evaluation of the Commercial Lighting Program – Program Year 2010 conducted by Global Energy Partners. The Commercial Lighting program provides incentives to commercial and industrial customers for installation of high-efficiency lighting and lighting controls. The program targets commercial, public authority, and industrial facilities of all sizes with a focus on the small to medium-sized facility. These types of facilities are expected to have lower saturation rates and awareness levels of high efficiency lighting than larger facilities.

The program offers rebates on many types of retrofit measures, including T-8 lamps, compact fluorescent fixtures, and LED exit signs. For new construction and lighting controls, a rebate of \$160 per kW of reduced peak demand is offered.

The specific program goals are a 2.76 MW reduction in peak demand and 10,778 MWh energy savings for each program year, with 918 participants annually. This means that the Commercial Lighting program is expected to contribute 8.27 MW or almost one-quarter of the demand savings toward OG&E's entire portfolio goal of 35.8 MW over the next three years.

In PY 2010, OG&E reported that the program had 611 participants with deemed savings of 5,985 kW and 29,754 MWh, exceeding the goals for deemed savings for both demand and energy with fewer than expected participants⁶².

Table ES-1 Comparison of Program Goals to Reported Savings

	OG&E Goal	OG&E Reported savings
kW Savings	2,760	5,985
kWh Savings	10,778,000	29,754,696
Number of participants	918	611

Key Results

The analysis provided the following key results:

- As shown in Table ES-1 above, the Commercial Lighting program reported savings that exceeded its demand and energy savings goals with fewer participants than expected.
- The OG&E reported savings underestimate actual savings. Global's independently developed savings estimates using field data on actual lighting usage and which take into account the interactive effects of lighting on the heating, ventilation and air conditioning (HVAC) system loads, are higher than OG&E's reported savings. It does not appear as if the OG&E reported savings takes into consideration the interactive effects.
- There is a wide variation in the site-specific realization rates for both demand and energy savings. The range of this variation is greater for the energy savings (ranging from 0.23 to 2.25) than for the demand savings (ranging from 0.68 to 1.17 with one outlier). Since the demand estimates for individual customers tended to be more accurate, this indicates that the savings estimates based on

⁶² For more information on the program see the "Direct Testimony of Gary J. Marchbanks on behalf of OG&E," September 15, 2009; part of filing In the Matter of the Application of Oklahoma Gas and Electric Company for an Order of the Commission Approving Comprehensive Demand Programs, Granting Recovery of the Costs of Such Programs and Authorizing a Recovery Rider, Cause No. PUD 200900200.

the equipment installed were closer to what Global found. The higher variability in site-specific realization rates for energy savings indicates that the estimates of operating hours were somewhat less accurate, which is common for commercial lighting programs. Note that there is no indication that the operating hours were calculated incorrectly in any systematic way; many of the site-monitored savings estimates were high, and many were low.

- Overall, assuming that the OG&E-reported savings did not include the interactive effect, those savings overestimated the Global-estimated savings somewhat. This was counteracted by the interactive effect, which raised the final savings estimates overall.
- Global identified a couple of instances where not all of the lighting measures were installed; the customer contact acknowledged that some of the more efficient lights were kept in storage for future use. In these cases, Global adjusted the savings to reflect only the installed lights.

Purpose of the Evaluation

The purpose of this evaluation of the Commercial Lighting program for program year 2010 was to provide independent validation of the energy savings achieved by customers who participated in the program. Specific objectives of this PY 2010 impact evaluation were:

- Verify rebated measure installations
- Estimate kW and annual kWh savings most likely achieved by the program
- Recommend improvements to OG&E's savings estimation and data tracking practices

Summary of the Analysis

Our review of the program included an engineering review with on-site verification of measure installations. This evaluation approach included examining aspects of the ex-ante savings calculations to confirm or adjust the number of installations recorded and the operating hours based on the on-site verifications for a sample of customers, and then expanding that sample to estimate savings for the program.

In order to do this, we selected a random stratified sample of 30 sites on which to install lighting loggers. The sample was designed to meet the goals specified in the GJM Testimony of 10% precision and 85% confidence⁶³.

Between January and March 2011, an engineer from Global visited each of the 30 participants and installed, on average, seven HOBO on/off data loggers on a select sample of the various lighting measures installed at each site. The engineer interviewed the customer contact to verify the replaced and currently installed fixture types. The data loggers were left in place for two weeks in order to capture the operating hours needed for the analysis. Using the information gathered from the on-site verification, demand and energy savings were calculated and compared to the deemed savings. The sample was then expanded to estimate the population using a stratified ratio estimate.

Program Impact Results

Table ES-2 below shows the program-level savings for both demand and energy, including both the OG&E-reported savings and the Global-estimated savings, along with the realization rate.

Because the use of lights affects the level of cooling and heating required in the building, improvements to the efficiency of lighting has two types of impacts: savings in energy used by the lights themselves and changes in energy use for heating, cooling and ventilation (HVAC). The interactive effects on HVAC load are appropriate to include in estimating the total savings associated with lighting improvements. Using the site's heating fuel type information and type of building, we also calculated an interactive effect with the HVAC system using Global's building engineering software tool BEST (Building Energy Simulation Tool). This is an important aspect to consider when calculating the true savings from the lighting measures. In order to

⁶³ More detail on how the random stratified sample was developed is available in Appendix A: Sample Design and Reliability.

accurately calculate the interactive effects we collected information on the heating fuel and system used at the participant’s site. In general, more energy-efficient lighting generates less heat, which decreases air-conditioning use in summer and increases heating use in winter. The interactive adjustment to the demand savings was problematic. Because the demand savings are at the time of the customer peak, which can be at a different time for each customer, we could not use an hourly interactive adjustment. We had to make the simplifying assumption that the percentage impact of this interactive effect at the time of the customer’s peak was the same as the adjustment for the annual energy.

In the results tables shown below the savings estimated by Global are reported to demonstrate the two types of impact estimates as follows:

- **Lighting only impacts** = the kW and kWh savings in lighting use only, directly stemming from the improvement in efficiency of the lighting measures installed (savings without interactive effects)
- **Lighting plus HVAC impacts** = the combined kW and kWh savings associated with the lighting measures plus the effects of increased or decreased HVAC load resulting from the installation of more efficient lighting (savings with interactive effects)
- **Realization rate** = the ratio of the Global site-monitored savings with the interactive effects included to the OG&E-reported savings

The findings of Global’s analysis, counting only the direct impacts of the participants’ actions on electricity used for lighting (i.e., without interactive effects), suggest that OG&E overestimated the effects of the measures on both kW demand and annual energy use for lighting. Taking into account the interactive effects with the air conditioning, Global’s calculations show slightly more kW and kWh savings than OG&E’s reported savings for the entire program. The realization rate for demand savings is 1.07 and for energy savings is 1.03, meaning that, overall, the interactive effects increased Global’s lighting-only savings estimates, resulting in estimates of total program savings that exceed what OG&E reported.

Table ES-2 Program-Level Savings—Global-Estimated Savings Compared to OG&E-Reported Savings

Savings	OG&E-Reported Savings	Global-Estimated Savings (Lighting only impacts)	Global-Estimated (Lighting + HVAC impacts)	Program Savings Realization Rate
Demand Savings (kW)	5,985	5,851	6,375	1.07
Energy Savings (kWh)	29,754,696	27,812,688	30,564,780	1.03

To develop the program savings, we expanded the Global-estimated sample savings (both with and without the interactive effects) to the entire program population.⁶⁴

Recommendations for Improving Savings Estimates in Future Program Years

Based on this review we have the following recommendations for the program.

- In order to appropriately estimate savings and incentive payments to participants, we recommend that OG&E identify and maintain information regarding the age and functioning status (working or not) of existing or pre-program lighting conditions at the facility since the savings customers will achieve are heavily dependent on these pre-program conditions. Based on that information, baselines should be established as follows:

⁶⁴ More detail on ratio expansion is provided in Appendix B: Discussion of Impact Analysis.



- In existing facilities with fully operational equipment that still has at least half its expected useful life remaining, that is where the replacement is discretionary, the existing equipment is appropriate to use as baseline specifications.
- In existing facilities with equipment that is no longer operational or is more than halfway through its effective useful life, the appropriate baseline specifications against which the program measure should be compared to calculate savings is either the minimum efficiency alternative currently sold locally or Federal/State minimum standard equipment.
- For new construction projects, where there is no existing lighting (including building knockdowns and reconstruction), the appropriate baseline specifications against which the program measure should be compared to calculate savings is either the minimum efficiency alternative currently sold locally or Federal/State minimum standard equipment.
- Since it appears that much of the difference between the OG&E-reported savings and Global's estimates is related to operating hours, the approach used to calculate operating hours should be investigated further to see if there are ways to improve the estimates developed during the project implementation stage.
- Collect information on the type of heating fuel and system to enable reasonable estimates of the interactive effects with HVAC for the deemed savings calculations. These fields can easily be added to the Oklahoma – Retrofit Work Detail Submission Form.
- Make slight improvements to the iAvenue database including the following:
 - Enter the square footage from the data collection form into the database.
 - Enter the description of the building/room location into the database.
 - Add a field for heating fuel type to account for interactive effects in the savings estimates.
 - Correct label in database to reflect that the wattage of the lamp is expressed in watts, not kilowatts as it currently indicates.
- Conduct post-installation visits or contacts with the participants to obtain a better count of measures actually installed and operating hours for the area where the lights are installed, then either adjust individual savings values or develop and apply an estimated installation rate to the recorded savings totals. Doing this, OG&E could develop and report more accurate total savings.

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CHAPTER 1

INTRODUCTION

1.1 The Commercial Lighting Program

This report contains description and results of the impact evaluation of the Commercial Lighting Program – Program Year 2010 conducted by Global Energy Partners. The Commercial Lighting program provides incentives to commercial and industrial customers for installation of high-efficiency lighting and lighting controls. The program targets commercial, public authority, and industrial facilities of all sizes with a focus on the small to medium-sized facility. These types of facilities are expected to have lower saturation rates and awareness levels of high efficiency lighting than larger facilities.

Table 1-1 shows the specific rebate for each type of retrofit. For new construction or other lighting improvements not shown in the table, the same rebate of \$160 per kW of reduced peak demand is offered. For new construction, OG&E uses DOE’s COM/check program to calculate the kW savings of high-efficiency equipment relative to efficiency levels in the 2006 International Energy Conservation Code (IECC 2006).

Table 1-1 Rebates for Commercial Lighting Measures

Retrofit	Retrofit Rebate \$/lamp (unless noted otherwise)
T-12 to T-8 Retrofits	
1&2 Lamp	\$4
3&4 Lamp	\$8
400W HID Retrofits	
6/8 Lamp T-8	\$52
4-6 Lamp T-5	\$52
750 to 1000W HID Retrofits	
12-16 Lamp T-8	\$102
8-12 Lamp T-5	\$102
Incandescent to Hardwired Compact Fluorescent Retrofits	
26W or less	\$8
27W or greater	\$11
Exit Sign Retrofits & Replacements	
Replace incandescent with LED	\$5
Lighting Controls	
Occupancy Sensors	\$160 per kW of reduced peak demand
Photocells	\$160 per kW of reduced peak demand
Incandescent and Halogen to LED Fixtures	
LED Downlights	\$160 per kW of reduced peak demand
LED Refrigerated Display Lighting	\$160 per kW of reduced peak demand

The specific program goals are a 2.76 MW reduction in peak demand and 10,778 MWh energy savings for each program year, with 918 participants annually. This means that the Commercial Lighting program is expected to contribute 8.27 MW or almost one-quarter of the demand savings toward OG&E’s entire portfolio goal of 35.8 MW over the next three years.

In PY 2010, the program had 611 participants with deemed savings of 5,985 kW and 29,754 MWh recorded by OG&E, exceeding the goals for deemed savings for both demand and energy with fewer than expected participants.

Table 1-2 Comparison of Program Goals to Reported Savings

	Goal	Reported savings
kW Savings	2,760	5,985
kWh Savings	10,778,000	29,754,696
Number of participants	918	611

1.1.1 Qualifications to participate in program

The following types of customers may participate in the program:

- All commercial customers, regardless of size
- Industrial customers, except those that have elected not to participate in the program per the OCC Rules

1.2 Purpose of This Evaluation

The purpose of this evaluation of the Commercial Lighting program for program year 2010 was to provide independent validation of the energy savings achieved by customers who participated in the program. Specific objectives of this evaluation were:

- Verify rebated measure installations
- Estimate kW and annual kWh savings most likely achieved by the program
- Recommend improvements to OG&E’s savings estimation and data tracking practices

1.3 Organization of This Report

- Chapter 2, Methodology
- Chapter 3, Program Impact Results
- Chapter 4, Conclusions and Recommendations
- Appendix A, Sample Design and Reliability
- Appendix B, Discussion of Impact Analysis
- Appendix C, On-Site Data Collection

CHAPTER 2**METHODOLOGY****2.1 Data Collected to Support the Evaluation**

The engineering review method used for the evaluation of PY 2010 relied on key pieces of information provided by OG&E. This section outlines the data used and how they were applied to the evaluation method.

2.1.1 Program Staff Interviews

We interviewed the program manager, Steve Kardokus, for details on how the program is run, marketed, and what level of savings the program achieved. The information gained during the interview was extremely helpful in evaluating PY 2010, but also in helping create a plan for next year's evaluation.

2.1.2 Equipment Metering

Global did on-site monitoring of the lighting at a sample of sites in order to capture accurate operating hours. The following information was captured from the sample of participants:

- Description of location where lights were installed
- Heating fuel type, to be used in the calculation of the interactive effects
- Verification that the installed lights matched the ones listed in the iAvenue data export
- Installed, on average, 7 data loggers at each sample participant site in order to capture the on/off times for the lights over a two-week period. This was used to calculate the actual operating hours.

2.1.3 Utility Data Utilized

The iAvenue database is the main repository of data related to the Commercial Lighting program. Included in the database that we received are the following:

- Participant Number, a unique identifier used in the sample selection
- Start date and date completed, which were always the same
- Annual operating hours, used to calculate OG&E's reported kWh savings
- Pre- and Post-survey performed an indication of whether or not a pre- or post-inspection took place. Participants were randomly selected for the audit.
- Existing Lighting by lamp type, this is used as the baseline from which the savings are calculated
- New Lighting by lamp type, the difference in wattage from the existing lighting determines the kW savings
- Number of fixtures, indicates the number of fixtures replaced with the new lighting type
- kW saved, calculated as the wattage difference multiplied by the number of fixtures replaced
- kWh saved, calculated using the annual operating hours and the kW savings estimate
- Rebate amount by lamp type, calculated by multiplying the number of lamps by the program rebate for that lamp type

Note that while the savings are easily calculated using the data provided from iAvenue, the export from iAvenue did not include the actual formulas, but simply the values. In some cases, the decimal was lost in the export and caused rounding errors. Since the evaluation was done based on the on-site monitoring, the rounding error did not affect our analysis or resulting savings estimates.

2.2 Description of the Evaluation Approach

Our review of the program included an engineering review with on-site verification of measure installations. This evaluation approach included examining aspects of the ex-ante savings reported by OG&E to confirm or adjust the number of installations recorded and the operating hours based on the on-site verifications for a statistically representative sample of customers, and then expanding that sample to estimate savings for the program.

In order to do this, we selected a random stratified sample of 30 sites on which to install lighting loggers. The sample was designed to meet the goals specified in the GJM Testimony of 10% precision and 85% confidence⁶⁵. We designed the sample with four strata and assigned participants to each strata based on the predicted kWh savings provided by OG&E. The first three strata are random samples, while the fourth is a census of the five participants with the largest predicted savings. The first stratum of the sample design included six participants, the second stratum included seven participants, and the third stratum included twelve participants.

The program manager provided contact information for 56 participants. Using this list, we recruited on-site verification visits with 30 participants. The final distribution of participants included all five census participants, five in the first stratum, six in the second stratum, and fourteen in the third stratum. Participants were generally willing to participate and were extremely flexible in scheduling of appointments. Participants generally had a positive experience with the program and therefore wanted to help by accommodating the engineer.

Between January and March 2011, an engineer from Global visited the thirty participants and installed, on average, seven HOBO on/off data loggers on a select sample of the various lighting measures installed. The engineer interviewed the contact to verify the replaced and currently installed fixture types and their location within the facility. Based on the location, the measures were grouped into "usage groups" by type of space (e.g., offices, manufacturing, public areas such as lobbies). The data loggers were left in place for two weeks in order to capture the data needed for the analysis. After the two weeks, an engineer went to the participant's location and removed the data loggers for analysis.

Global's engineers calculated demand savings when the lighting was on as the difference in kW draw between the old lighting equipment and the equipment installed under the program. There was no indication in the documentation to indicate that the old equipment had needed replacement and it was assumed that all the installations in the program were early replacements.

Global's engineers estimated actual hours of operation and implied savings for the entire year based on the information gathered from the data loggers during the two-week period. The usage groups were assigned a weekly operating schedule based on the data from the data loggers. The demand and energy savings were calculated for an entire year, accounting for holidays, and compared to the reported savings.

Using the site's heating fuel type information and type of building, we also calculated an interactive effect with the HVAC system using Global's building engineering software tool BEST (Building Energy Simulation Tool). This is an important aspect to consider when calculating the true savings from the lighting measures. By putting in higher efficiency lighting, less heat is generated by the lights and therefore HVAC heating loads increase in the winter and cooling loads decrease in the summer. In order to accurately calculate the interactive effects we collected information on the heating fuel and system used at the participant's site. This information is used to apply the appropriate interactive effects based on heating fuel and facility type.

To develop the program savings, we expanded the Global-estimated sample savings (both with and without the interactive effects) to the entire program population using a technique call ratio expansion. Ratio estimation can take advantage of the correlation of the variable of interest y (the Global-estimated savings) with another variable x (the OG&E-reported savings) to obtain increased precision. When x and y are correlated the relative variance of the estimated ratio is less than the relative variance of the estimate of y .⁶⁶

⁶⁵ More detail on how the random stratified sample was developed is available in Appendix A: Sample Design and Reliability.

⁶⁶ More detail on ratio expansion is provided in Appendix B: Discussion of Impact Analysis

CHAPTER 3

PROGRAM IMPACT RESULTS

3.1 Summary of Program Impacts

Our analysis showed that all of the sample points were qualified to participate and met the requirements of the program. In discussing the program impacts, we use the following terminology:

- **OG&E Reported Savings**—estimates calculated or used by program staff for reporting and rebate calculations; these are estimates recorded in the iAvenue database and provided to Global. In this report, we also refer to these as the deemed or *ex-ante* savings.
- **Global's Savings – Lighting only impacts** = the kW and kWh savings in lighting use only, directly stemming from the improvement in efficiency of the lighting measures installed (savings without interactive effects)
- **Global's Savings – Lighting plus HVAC impacts** = the combined kW and kWh savings associated with the lighting measures plus the effects of increased or decreased HVAC load resulting from the installation of more efficient lighting (savings with interactive effects)
- **Realization rate** – the ratio of the Global site-monitored savings (with the interactive effects) to the OG&E-reported savings

3.2 Description and Findings of the Analysis

3.2.1 Results from Engineering Review with Onsite Verification

For each point in the sample, Global made estimates of the customer-peak kW and annual kWh savings and compared these results against OG&E's reported savings. Table and Table below show OG&E's actual savings calculated based on the OG&E Oklahoma – Retrofit Work Detail Submission Form along with the savings calculated by Global from the on-site verification both with and without the interactive effects. Table shows kW savings and Table shows the kWh savings. The ratio of the Global site-monitored savings to the OG&E-reported savings is the site-specific realization rate. A realization rate of less than one indicates that Global's calculated savings are lower than the OG&E's reported savings, finding that OG&E's calculations overestimated savings at the site; a rate over one indicates that OG&E's calculations underestimated the savings.

The site-specific realization rates show the variation in the relationship between the OG&E reported savings and Global's results. The range of this variation is greater for the kWh savings (ranging from 0.23 to 2.55) than for the kW savings (ranging from 0.68 to 1.21 with one outlier). The higher variability in customer-specific realization rates for energy savings indicates that the estimates of operating hours were more difficult for OG&E (and customers) to estimate accurately, which is common for commercial lighting programs.

Table 3-1

Participant #	Stratum #	OG&E-Reported Savings (kW)	Global-Estimated Savings (Lighting only impacts) (kW)	Global-Estimated Savings (Lighting + HVAC impacts) (kW)	Site-Specific kW Realization Rate
313	1	2.0	1.8	2.1	1.05
343	1	1.0	1.1	1.0	0.95
351	1	1.0	0.6	0.7	0.68
480	1	3.0	2.7	2.3	0.78
515	1	2.0	1.8	1.6	0.81
161	2	21.0	21.3	24.6	1.17
267	2	7.0	6.8	7.9	1.13
319	2	8.0	8.4	9.2	1.14
420	2	18.0	18.2	20.5	1.14
519	2	29.0	28.5	31.1	1.07
564	2	14.0	13.7	12.0	0.86
56	3	32.0	26.7	30.1	0.94
119	3	29.0	29.3	34.1	1.17
132	3	45.0	44.7	52.0	1.16
147	3	37.0	36.7	42.5	1.15
235	3	29.0	58.1	65.4	2.26
318	3	50.0	50.4	54.9	1.10
322	3	63.0	62.5	62.5	0.99
325	3	49.0	49.3	57.4	1.17
363	3	28.0	27.6	21.4	0.77
418	3	32.0	32.3	37.5	1.17
441	3	47.0	47.3	53.2	1.13
540	3	70.0	70.2	84.3	1.20
541	3	31.0	30.2	36.3	1.17
592	3	30.0	26.8	24.0	0.80
32	4	113.0	112.8	126.8	1.12
439	4	137.0	102.8	115.6	0.84
459	4	111.0	74.1	83.3	0.75
551	4	233.0	233.8	281.0	1.21
603	4	178.0	115.2	129.6	0.73

Table 3-2 Results of Analysis for the Sample of Commercial Lighting Participants—Annual kWh Savings

Participant #	Stratum #	OG&E-Reported Savings (kWh)	Global-Estimated Savings (Lighting only impacts) (kWh)	Global-Estimated Savings (Lighting + HVAC impacts) (kWh)	Site-Specific kWh Realization Rate
313	1	15,768	8,576	9,974	0.63
343	1	5,400	2,920.32	2,576	0.48
351	1	2,610	1,285	1,446	0.55
480	1	8,287	6,746.24	5,950	0.72
515	1	7,200	11,138	9,969	1.38
161	2	97,249	94,287.81	109,280	1.12
267	2	34,040	36,474	42,273	1.24
319	2	73,712	15,384.63	16,754	0.23
420	2	72,832	108,717	122,306	1.68
519	2	99,890	33,144.56	36,094	0.36
564	2	54,600	81,245	71,658	1.31
56	3	284,581	291,928.04	328,419	1.15
119	3	110,770	138,614	161,208	1.46
132	3	178,880	209,917.13	244,134	1.36
147	3	146,816	214,261	248,329	1.69
235	3	160,732	363,708.80	409,172	2.55
318	3	441,504	208,646	227,215	0.51
322	3	468,075	409,065.44	3	0.87
325	3	216,144	264,631	307,766	1.42
363	3	135,044	72,915.44	56,728	0.42
418	3	141,325	127,609	148,409	1.05
441	3	414,523	397,217.60	446,870	1.08
540	3	262,033	454,351	546,130	2.08
541	3	114,769	61,480.96	73,900	0.64
592	3	259,903	173,264	155,072	0.60
32	4	705,580	315,573.86	355,021	0.50
439	4	820,644	1,089,570	1,225,766	1.49
459	4	970,372	838,949.38	943,818	0.97
551	4	2,042,727	2,042,215	2,454,742	1.20
603	4	1,329,873	1,274,177.22	1,433,449	1.08

To develop the program savings, we expanded the Global-estimated sample savings to the entire program population using a technique called ratio expansion. Ratio estimation can take advantage of the correlation of the variable of interest y (the Global-estimated savings) with another variable x (the OG&E-reported savings) to obtain increased precision. When x and y are correlated the relative variance of the estimated ratio is less than the relative variance of the estimate of y.⁶⁷

⁶⁷ More detail on ratio expansion is provided in Appendix B: Discussion of Impact Analysis.

3.2.2 Program-level estimates

Table 3-3 below shows the estimates of the total program savings both with and without the interactive effects, along with the program-level realization rates. While we report our estimates of program impacts both with and without the interactive effects, the more appropriate estimate of the savings achieved is *with* these effects. Therefore, only one realization rate is included, the results with interactive effects compared with OG&E’s estimates.

The findings of Global’s analysis, counting only the direct impacts of the participants’ actions on electricity used for lighting (i.e., without interactive effects), suggest that OG&E overestimated the effects of the measures on both kW demand and annual energy use for lighting. This is shown in Table 3-3 by the higher numbers in the column labeled OG&E-Reported Savings than for the ones in the Global-Estimated Savings (Lighting only impacts) column.

The realization rate for demand savings is 1.07 and for energy savings is 1.03, meaning that, overall, the interactive effects increased Global’s lighting-only savings estimates, resulting in estimates of total program savings that exceed what OG&E reported. This is likely due to OG&E not accounting for the interactive effects of more efficient lighting (which generate less heat than less effective lights) on HVAC loads.

Table 3-3 Program-Level Savings—Global-Estimated Savings Compared to OG&E-Reported Savings

Savings	OG&E-Reported Savings	Global-Estimated Savings (Lighting only impacts)	Global-Estimated Savings (Lighting + HVAC impacts)	Program Savings Realization Rate
Demand Savings (kW)	5,985	5,851	6,375	1.07
Annual Energy Savings (kWh)	29,754,696	27,812,688	30,564,780	1.03

CHAPTER 4**CONCLUSIONS AND RECOMMENDATIONS**

The impact evaluation of the Commercial Lighting program for PY 2010 produced a number of findings described in Chapter 3. These findings provided the basis for Global's assessment of the savings calculations and information tracking practices, as well as recommendations for improving the accuracy of savings estimates for use in future program years.

4.1 Assessment of Savings Calculations and Tracking for PY 2010

Our program review identified several strengths of the program:

- Based on the feedback during recruitment and when the engineer was on-site, customers are very satisfied with the program.
- The program data in iAvenue is complete for each participant. It includes most of the necessary information, but in order to accurately reflect the interactive effects it would be better to have an indication of the HVAC fuel and system used in the building.
- The spreadsheet export from iAvenue with the savings values is clear and easy to follow.
- The program manager is extremely helpful and easy to work with. He is well respected by the participants.
- The estimated program-level realization rate for kW demand is 1.07 of OG&E's reported savings, and for annual kWh energy is 1.03, accounting for interactive effects. It does not appear that the OG&E reported savings take into account the interactive effects, although the GJM testimony mentions that deemed savings were calculated using eQuest, an engineering simulation tool that would usually account for interaction.

The engineering review with on-site verification identified some weaknesses in the program as well:

- There is a wide variation in the site-specific realization rates for both demand and energy savings. The range of this variation is greater for the energy savings (ranging from 0.23 to 2.55) than for the demand savings (ranging from 0.68 to 1.21 with one outlier). Since the demand estimates for individual customers tended to be more accurate, this indicates that the savings estimates based on the equipment installed were closer to what Global found. The higher variability in site-specific realization rates for energy savings indicates that the estimates of operating hours were somewhat less accurate, which is common for commercial lighting programs. Note that there is no indication that the operating hours were calculated incorrectly in any systematic way; many of the site-monitored savings estimates were high, and many were low.
- Overall, assuming that the OG&E-reported savings did not include the interactive effect, those savings overestimated the Global-estimated savings somewhat. This was counteracted by the interactive effect, which raised the final savings estimates overall.
- There were a couple of instances where not all of the lighting measures were installed; the customer contact acknowledged that some of the more efficient lights were kept in storage for future use. In these cases, Global adjusted the savings to reflect only the installed lights.

4.2 Recommendations for Improving the Accuracy of Savings Estimates

Based on this review we have the following recommendations for the program.

Characterization of the appropriate baseline

In order to appropriately estimate savings and incentive payments to participants, we recommend that OG&E identify and maintain information regarding the age and functioning status (working or not) of existing or pre-program lighting conditions at the facility since the savings customers will achieve are heavily dependent on these pre-program conditions. Based on that information, baselines should be established as follows:

- In existing facilities with fully operational equipment that still has at least half its expected useful life remaining, that is where the replacement is discretionary, the existing equipment is appropriate to use as baseline specifications.
- In existing facilities with equipment that is no longer operational or is more than halfway through its effective useful life, the appropriate baseline specifications against which the program measure should be compared to calculate savings is either the minimum efficiency alternative currently sold locally or Federal/State minimum standard equipment.
- For new construction projects, where there is no existing lighting (including building knockdowns and reconstruction), the appropriate baseline specifications against which the program measure should be compared to calculate savings is either the minimum efficiency alternative currently sold locally or Federal/State minimum standard equipment.

Calculating savings

- Since it appears that most of the difference between the OG&E-reported savings and Global's estimates is related to operating hours, the approach used to calculate operating hours should be investigated further to see if there are ways to improve the estimates developed during the project implementation stage.
- Collect information on the type of heating fuel and system to enable reasonable estimates of the interactive effects with HVAC for the deemed savings calculations. These fields can easily be added to the Oklahoma – Retrofit Work Detail Submission Form.
- Make slight improvements to the iAvenue database including the following:
 - Enter the square footage from the data collection form into the database
 - Enter the description of the building/room location into the database
 - Add a field for heating fuel type to account for interactive effects in the savings estimates
 - Correct the label in database to reflect that the wattage of the lamp is expressed in watts, not kilowatts as it currently indicates.
- Conduct post-installation visits or contacts with the participants to obtain a better count of measures actually installed and operating hours for the area where the lights are installed, then either adjust individual savings values or develop and apply an estimated installation rate to the recorded savings totals. Doing this, OG&E could develop and report more accurate total savings.

APPENDIX A

SAMPLE DESIGN AND RELIABILITY

We designed a stratified random sample to select measurement sites for the commercial lighting program. While a simple random sample selects sample points at random from the entire population, a stratified random sample selects sample point at random from the population mutually exclusive groups called strata. In this analysis the predicted kWh savings was used as the stratification variable. As long as the stratification variable is correlated with the variable of interest, in this case the actual savings, then using a stratified design increases the precision of the estimates holding sample size constant, and decreases sample size holding precision constant.

The first step in the sample design process is to specify the sample frame. In this case the frame consisted of the listing of 611 sites provided by OG&E that participated in the commercial lighting program in 2010. The sample was designed to conform to the precision goals stated in the GJM Testimony of 10% precision at an 85% confidence level.

The next step is to determine the number of strata, for the commercial lighting sample we chose to use four strata. Three of the strata were sampled and the fourth sample was a census. The census strata consisted of the five sites with the highest predicted savings. By using a census for the fourth strata, with very high predicted savings, we can reduce the variation in the remaining population and therefore in the remaining three strata. Next we determined the stratum boundaries using the Dalenius-Hodges procedure.

For the commercial lighting program our total sample size was pre-determined to be 30 based on the available budget, however, we did calculate the total sample size necessary to achieve the stated precision goals using equation 1.1.

$$(1.1) \quad n = \frac{(\sum W_h s_h)^2}{\left[\frac{D\bar{y}}{Z}\right]^2 + \frac{(\sum W_h s_h^2)^2}{N}}$$

where

- n = size of the sample
- W_h = weight of stratum h which is the ratio of the population size within stratum h to the total population size N
- s_h = standard deviation of stratum h
- s_h^2 = variance of stratum h
- \bar{y} = sample mean of y
- D = desired precision
- Z = relative precision of the sample mean

By using equation 1.1 we determined that the necessary sample size was 28 which is just shy of the 30 sample points we had planned for, therefore we moved ahead with the a total sample of 30 sites.

Our next step was to allocate the 30 sample customers to the four strata. Because the fourth stratum is a census the number of sample points allocated to strata four was fixed at five. We assigned sample points to the remaining three strata using a Neyman Allocation, which assigns sampling points to each stratum based on the percentage of the total population standard deviation represented by the stratum. This technique

optimizes the allocation for a fixed sample size, as we had in this case. The equation used to determine the size of each stratum using a Neyman Allocation for a stratified random sample is given in equation 1.2.

$$(1.1) \quad n_h = n \left[\frac{W_h s_h}{\sum W_h s_h} \right]$$

where

n_h = size of stratum h

After allocating the 30 sample points to each of the four strata the resulting sample design is shown in Table A-1.

Table A-1 *Final Commercial Lighting Sample Design*

Stratum number	Number of Sample Points
1	6
2	7
3	12
4	5
Total	30

Because we anticipated that not all selected site would be available, for each sample point we also selected an alternate sample point. Therefore our total sample, including back-ups, was double the design above in Table A-1 for the first three strata. No backups were available in the fourth stratum, since it was a census of the five projects with the largest savings. Subsequently, each sample point was randomly assigned to be either a primary sample point or a back-up sample point. Primary sample points were contacted first, and if needed sample strata were filled with back-up sample points.

APPENDIX B

DISCUSSION OF IMPACT ANALYSIS

RATIO EXPANSION

We used a technique called ratio expansion to calculate the Global-estimated savings for the population from the sample of participants. Ratio estimation can take advantage of the correlation of the variable of interest y (the Global-estimated savings) with another variable x (the OG&E-reported savings) to obtain increased precision. When x and y are sufficiently correlated the relative variance of the estimated ratio is less than the relative variance of the estimate of y . We first estimate the ratio in equation 2.1 by dividing the sample mean of the corrected values from the sample, \bar{y}_{st} by the sample mean of the initial savings values \bar{x}_{st}

$$(2.1) \quad r = \frac{\bar{y}_{st}}{\bar{x}_{st}}$$

where

- r = the ratio for a stratified random sample
- \bar{y}_{st} = the mean of the Global-estimated savings for a stratified random sample
- \bar{x}_{st} = the mean of the OG&E-reported savings for a stratified random sample.

Then, we can calculate the estimated Global-estimated population mean \bar{y}_{st} by multiplying the ratio from 2.1 by the actual population mean \bar{X} as shown in equation 2.2. Similarly we can estimate the Global-estimated population total $\hat{T}_{y_{rst}}$ as shown in equation 2.3.

$$(2.2) \quad \bar{y}_{st} = r_{st} \bar{X}$$

$$(2.3) \quad \hat{T}_{y_{rst}} = r X$$

where

- \bar{X} = mean of the initial savings values in the population
- X = total of the initial savings values in the population

Equations 2.4 and 2.5 show the equations to calculate the variances of the estimated mean and total respectively.

$$(2.4) \quad s_{\bar{y}_{rst}}^2 = \sum_{h=1}^L \left[\frac{W_h^2 \left(1 - \frac{n_h}{N_h}\right)}{n_h} \right] (s_{yh}^2 + r^2 s_{xh}^2 - 2r \hat{\rho}_h s_{yh} s_{xh})$$

$$(2.5) \quad s_{\hat{T}_{y(rst)}}^2 = \sum_{h=1}^L \left[\frac{N_h^2 \left(1 - \frac{n_h}{N_h}\right)}{n_h} \right] (s_{yh}^2 + r^2 s_{xh}^2 - 2r \hat{\rho}_h s_{yh} s_{xh})$$

where

- N_h = number of customers in the population in stratum h
- W_h = weight of stratum h
- n_h = number of customers in the sample in stratum h
- s_{yh}^2 = sample variance of y in stratum h

$$s_{xh}^2 = \text{sample variance of } x \text{ in stratum } h$$

$$\hat{\rho}_h = \text{sample correlation coefficient of } x \text{ and } y \text{ in stratum } h$$

Equations 2.6 and 2.7 show the equations to calculate the standard error of the sample mean and total respectively.

$$(2.6) \quad s_{\bar{y}_{rst}} = \sqrt{s_{\bar{y}_{rst}}^2}$$

$$(2.7) \quad s_{\hat{T}_{y(rst)}} = \sqrt{s_{\hat{T}_{y(rst)}}^2}$$

Finally equations 2.8 and 2.9 show the equations used to estimate the confidence intervals, or the upper and lower bounds, for the estimate of the population mean and population total.

$$(2.8) \quad CI = \bar{y}_{rst} \pm Z_{\alpha/2} s_{\bar{y}_{rst}}$$

$$(2.9) \quad CI = \hat{T}_{y(rst)} \pm Z_{\alpha/2} s_{\hat{T}_{y(rst)}}$$

APPENDIX C

ON-SITE DATA COLLECTION AND SAVINGS ESTIMATION

Savings estimates were developed using a combination of information from OG&E, information collected during on-site visits, and logger data. An engineer visited each of the 30 sites between January and March 2011 to install data loggers and verify the installation of new lights as listed in the export from iAvenue.

The iAvenue export includes information on the power demand (kW) from both the old fixtures and new fixtures, along with the number of fixtures installed. This information was verified by the field engineer while on-site. In addition, the engineer interviewed facility maintenance staff to determine appropriate locations for installing data loggers. The data loggers used in this study were Hobo on/off-type loggers manufactured by Onset. These devices contain a sensor that records when lights come on and shut off, enabling the user to accurately determine the hours of operation. The data loggers were installed for a minimum of two weeks in all cases, in order to identify variations in night and weekend operation (if any).

The OG&E savings estimates use assumed annual hours of operation for the lights which are based on the type of space. For instance, Participant No. 147 converted 90 watt halogen bulbs to 16 watt LED. The OG&E savings estimates were based on assumed operating hours of approximately 4,000 per year. However, the data from the data loggers revealed that actual operating hours were a minimum of 5,300 per year. Further, OG&E savings estimates for occupancy sensors provide a flat reduction of 30 percent of total consumption. Our estimates are based on actual reductions as recorded by the data loggers.

The method used was straightforward. First, the different lighting retrofits were divided into "usage groups", based on the specific type of space (i.e. offices, manufacturing, public areas such as lobbies, etc.). This division was based on interviews conducted during the site visits, as the OG&E database did not differentiate as to where the new fixtures were installed within any given facility. The different usage groups were assigned a weekly operating schedule based on the data from the data loggers. Thus, the operating schedule consisted of the hours of operation each day of the week.

Next, the total electricity consumption was computed using the demand and number of fixtures for both the baseline (old lighting) and the energy-efficient fixture. The old lighting was used as the baseline under the assumption that the projects did not involve new construction and the installations were early replacements. The difference was then calculated to determine savings each day of a typical week. The total per week was summed, and an annual figure was computed by multiplying this value by 52 weeks per year. In addition, savings associated with a small number of holidays were subtracted from the overall figure to compute the final estimate.

Savings from occupancy sensors were integrated into the overall estimation process. The impact of the occupancy sensors was obvious after reviewing the logger data. In those cases, the baseline operating hours were assumed to be normal business hours, and the energy efficient fixture operating schedule was based on the results from the data logger. In fact, those operating schedules varied significantly from the assumed 30 percent savings, depending on the participant. For example, Participant 161 was a retail shop with occupancy sensors in the office, storage room and restrooms. While the sensor in the office showed no savings, the storage room and restrooms operated no more than one hour per day. In another case, a manufacturer (Participant 439) operating 24/7 installed occupancy sensors throughout the facility. In that case, the lighting fixtures were on between 20 and 70 percent of the time, depending on location. Savings estimates were determined by apportioning all fixtures between six different usage groups based on observations at the facility and the logging data.

Once the savings were calculated, we calculated the interactive effect on the HVAC system. Using the location's heating fuel type and type of building, we modeled prototypical buildings in Oklahoma using Global's building engineering software tool BEST (Building Energy Simulation Tool). This is an important

aspect to consider when calculating the true savings from the lighting measures. By putting in higher efficiency lighting, less heat is generated by the lights and therefore HVAC heating loads increase in the winter and cooling loads decrease in the summer. In order to accurately calculate the interactive effects we collected information on the heating fuel and system used at the participant's site. This information is used to apply the appropriate interactive effects based on heating fuel and facility type.

A snapshot of the analysis tool used for each estimate is given in the figure below. OG&E reported estimates are given in the blue section at the left hand top of the spreadsheet, while Global estimates are given in the beige cells on the right hand side of the document near the top.

Participant No	119	Building Type	Large office	Stream chiller					
Stratum	3	Heating	Gas Heat						
Total kW Saved	29								
Total kWh Saved	110,770								
Fixture	Old W	New W	New Fixtures Saved	kWh Saved	OGE Est Hours	Calculated kWh Saved per measure	Total Annual kWh Saved	kWh Savings w Interaction	161,208
4 T12 LAMPS						127,794	138,614	29	34
DOWN TO 278									
LAMPS	172	60	250	28	106,400	3800	Total Annual kWh Saved	kWh Savings w Interaction	34
50 WATT							10,890	4,733	1,163
HALOGEN T0-4							Equivalent Annual Hours	Adjustment Factor	
WATT LED	50	4	25	1	4,370	4370			

Annual Savings Calculation		Source	Source
		from Savings	from Savings
Holidays:	# of holidays	Fix 1	Fix 2
Su	-	-	-
M	6	2,722	185
Tu	-	-	-
W	-	-	-
Th	1	454	31
F	6	2,722	185
Sa	-	-	-

Option 1 - Use with up to four different fixture types with multiple use patterns

	Baseline 1				Baseline 2				EE 1				EE 2				Savings Fixture 1		Savings Fixture 2	
	Fixture	T12s	Fixture	T12s	Fixture	50WH	Fixture	50WH	Fixture	T8s	Fixture	T8s	Fixture	Whse no	Whse w sg	baseline EE	Savings	baseline EE	Savings	
# Fixtures	175	# Fixtures	75	# Fixtures	28	# Fixtures	0	# Fixtures	175	# Fixtures	75	# Fixtures	28	# Fixtures	0	2,570		216		
kW	0.172	kW	0.172	kW	0.05	kW	0.05	kW	0.06	kW	0.06	kW	0.004	kW	0.004					
#Hours kWh	#Hours	kWh	#Hours	kWh	#Hours	kWh	#Hours	kWh	#Hours	kWh	#Hours	kWh	#Hours	kWh	#Hours	baseline EE	Savings	baseline EE	Savings	
Sunday	6.0	181	4.0	52	24.0	34	24.0	-	6.0	63	4.0	18	24.0	3	24.0	232	81	151	34	3
Monday	18.0	542	12.0	155	24.0	34	24.0	-	18.0	189	12.0	54	24.0	3	24.0	697	243	454	34	3
Tuesday	18.0	542	12.0	155	24.0	34	24.0	-	18.0	189	12.0	54	24.0	3	24.0	697	243	454	34	3
Wednesday	18.0	542	12.0	155	24.0	34	24.0	-	18.0	189	12.0	54	24.0	3	24.0	697	243	454	34	3
Thursday	18.0	542	12.0	155	24.0	34	24.0	-	18.0	189	12.0	54	24.0	3	24.0	697	243	454	34	3
Friday	18.0	542	12.0	155	24.0	34	24.0	-	18.0	189	12.0	54	24.0	3	24.0	697	243	454	34	3
Saturday	6.0	181	4.0	52	24.0	34	24.0	-	6.0	63	4.0	18	24.0	3	24.0	232	81	151	34	3

Figure C-1 Sample of Analysis Spreadsheet



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Global Energy Partners
500 Ygnacio Valley Road, Suite
450
Walnut Creek, CA 94596

P: 925.482.2000
F: 925.284.3147
E: gephq@gepllc.com

REVIEW OF OG&E'S COMMERCIAL AND INDUSTRIAL STANDARD OFFER PROGRAM – PROGRAM YEAR 2010

Final Report

Report #1334-6

May 19th, 2011

Global Energy Partners Project Manager
B. Ryan



Global Energy Partners
500 Ygnacio Valley Road, Suite 450
Walnut Creek, CA 94596

P: 925.482.2000
F: 925.284.3147
E: gephq@gepllc.com

This report was prepared by

Global Energy Partners
An EnerNOC Company
500 Ygnacio Valley Blvd., Suite 450
Walnut Creek, CA 94596

Principal Investigator(s):

B. Ryan
J. Shishido
P. Ignelzi

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EXECUTIVE SUMMARY

The Commercial/Industrial Standard Offer Program (SOP) offers financial incentives for the installation of a wide range of measures that reduce peak demand. In this program, C&I customers are eligible for incentive payments of \$250/kW for energy efficiency projects that significantly reduce customer peak demand.

Our review of the program included conducting case studies of two 2010 program projects. OG&E provided us with all the program data for the two projects. The data allowed Global to verify the savings calculations for the case study customers using an Engineering Review (IPMVP Option A) approach. In using this approach, we checked for the appropriate use of formulas and the accuracy of values used in the formulas such as efficiency level, equipment size, hours of operation and the baseline used. The goal of this review is to provide an early assessment of OG&E's project savings estimation approach to identify strengths and weaknesses in the savings calculation method.

The case study review allowed us to identify several strengths of the program as well as some weaknesses. Based on this review we recommend the following improvements to the program:

- Develop a new marketing strategy for reaching customers earlier in the decision making process.
- Use the federal minimum standard as the baseline for equipment at the end of its useful life or that is going to be replaced regardless of the program.
- Use manufacturer derived EER values to calculate both baseline and new equipment kW and make sure the EER used in the savings calculation is consistent with the equipment documentation.
- Conduct direct metering of equipment as part of the program's measurement and verification activities and as part of the PY2011 impact evaluation.

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OG&E C&I STANDARD OFFER PROGRAM

1.1 Program Intent

The Commercial/Industrial Standard Offer Program (SOP) offers financial incentives for the installation of a wide range of measures that reduce peak demand. In this program, C&I customers are eligible for incentive payments of \$250/kW for energy efficiency projects that significantly reduce customer peak demand. The flexible nature of the program encourages potential participants to customize an energy efficiency solution to meet their specific needs.

In addition to financial incentives OG&E may also take additional steps to overcome barriers large customers face in investing in energy efficiency equipment:

- Provide support to customers in designing projects and estimating savings.
- Provide customers with a list of qualified ESCOs.
- Encourage energy efficiency planning services, emphasizing consistent and long-term return on investments.

The program runs on the calendar year, January – December, it is a 3-year program targeted for 2010, 2011 and 2012. The 2010 program started late; it did not begin until June.

1.2 Program Market

The program was originally targeted at large industrial customers, but the majority of those customers opted out of the program, rather than pay the increased rate. The target market was then expanded to include all C&I facilities, schools and public authorities that qualify for the Power and Light rate or Large Power and Light rate in the Oklahoma jurisdiction.

According to OG&E as of February 2011, the target market for the Standard Offer Program consists of a total of 25,650 customers representing 2,640,185 kW of demand and 12,698,445,760 kWh of total energy use. This includes the values for the 38 customers who chose to opt-out of the program, with 211 unique accounts consisting of 3,149,275,484 kWh.

1.3 Savings Goals

The program savings goals are .99 cumulative MW reduction in peak demand and 7,380 MWh in energy savings each year for 2010, 2011 and 2012, with anticipated savings of 2.96 MW and 22,139 MWh over the period ending 2012 (Table 1-1).

Table 1-1 Standard Offer Plan Demand and Energy Savings Goals

Program Year	Annual Participants	Cumulative MW Reduction in Peak Load	Cumulative MWh Energy Savings
2010	66	.99	7,380
2011	66	1.98	14,759
2012	66	2.96	22,139

The program had a late start in the first year, launching in June of 2010. In PY 2010, OG&E reported having 17 projects in the SOP with program savings estimates of .70 MW reduction in peak load and 4,910 MWh in energy.

1.4 Program Barriers

OG&E identified the following barriers to investment in energy efficiency and demand response in the absence of the SOP:

- **High upfront costs** associated with increasing energy efficiency discourage customers from performing equipment upgrades and operations redesign.
- **Lack of Information**, customers lack the expertise in and experience with energy efficiency to confirm project savings estimates from service companies.
- **Disturbance/Opportunity Cost**, the time it takes to get informed about energy efficiency opportunities and projects and the time and cost associated with selecting contractors for projects is seen as too valuable to be offset by savings produced by increased efficiency.
- **Organizational Practices or Customs**, many customers in the target market do not have separate budgets for energy-efficiency projects. These customers typically have target payback thresholds of 18 months to 3 years for energy-efficiency projects

The main focus of the SOP in PY 2010 was to inform customers about incentives available for energy efficiency projects. The incentives help customers overcome the high upfront costs of increasing energy efficiency, reduce the payback to a more acceptable period, and encourage customers to become more knowledgeable about various energy efficiency opportunities.

1.5 Case Study Analyses

Our review of the program included conducting case studies of two 2010 program projects. Working with the OG&E program manager, we reviewed the project details of the 17 PY2010 participants and selected two that met the following criteria:

- Projects were completed and the incentive was paid.
- Documentation was available electronically and allowed for a complete and thorough review of the savings calculations.
- The participants were likely to be cooperative and willing to participate in a telephone interview and follow up calls.
- The project included measures and situations that were representative of “typical” participants in the program.

Once the case study participants were selected, OG&E provided all the available data on the project including the contact information for the customer, equipment specifications, formulas used to estimate savings, third party verification of the savings, invoices for the equipment, diagrams of the building floor plan where the equipment was installed, pictures of the equipment, and the rebate form.

The data allowed Global to verify the savings calculations for the case study customers using an Engineering Review (IPMVP Option A) approach. In using this approach, we checked for the appropriate use of formulas and the accuracy of values used in the formulas such as efficiency level, equipment size, hours of operation and the baseline used. The goal of this review is to provide an early assessment of OG&E's project savings estimation approach to identify strengths and weaknesses in the savings calculation method. It was not to make an assessment of the overall program savings.

CASE STUDY #1: CASADY SCHOOL

"Energy costs are a big part of our campus expenditures. We have a tight budget. We think about energy costs a lot."

Casady School of Oklahoma City, OK
OG&E Standard Offer Program participant

2.1 About the Business

Casady School is a pre-Kindergarten through 12th grade college-preparatory private school located in Oklahoma City. The school houses approximately 208 employees and 900 students in 26 buildings on an 80-acre campus. The buildings on campus are primarily made up of classroom facilities and faculty offices, but also include space for students such as locker rooms, common rooms, and study areas.

2.2 Project Description

The SOP provided an incentive of \$5,400.41 for the installation of a geothermal unit in their newly constructed, LEED certified math building. The old math building, built in the 1970s, was torn down and the geothermal unit replaced the existing packaged rooftop unit in the old building.

2.3 Decision Process

The school had decided to install a geothermal unit in the building prior to program participation. They decided on geothermal because they were interested in obtaining LEED certification for the building, and they thought they could use the installation as an educational tool for their students as well as a selling point for the school. The energy savings of geothermal systems along with the lower cost of being able to float the geothermal coils in the school's lake made geothermal cost effective.

2.3.1 Customer's Attitudes towards Energy Efficiency

Energy efficiency is a driving force behind the school's equipment purchasing decisions. Their product is quality education, which relies on resources in the classroom. Every dollar that goes to energy is a dollar that doesn't get spent on valuable classroom resources. They wanted good air quality, functionality, reliability, and the most efficient system available. The geothermal unit they chose meets these criteria and promises three times the energy savings of a standard rooftop unit.

2.3.2 Project Impetus and Decisions Made

The physical plant director and the school administration typically make the initial decisions about what equipment to buy. In this case, because the project was large, the project required approval from the school board.

The geothermal unit had several advantages that appealed to the school: the system met the criteria for LEED certification, it was easy to maintain, and it could make use of their existing lake; the geothermal coils were sunk in the lake and the coils were cooled by water rather than the air. The lake made the geothermal unit very cost effective, "payback was immediate." They worked with the contractors to install the unit. The contractor was not involved in the school's decision to participate in the OG&E program.

The administration at Casady contacted OG&E to find out if they had a program that would support the installation of the geothermal unit. They were aware of federal incentives, but those are mainly in the form

of tax credits and Casady School is tax exempt. They eventually were able to talk to the program manager for the SOP and signed up for the program.

2.4 Results

OG&E estimated that, compared to the rooftop units in the old math building, the new geothermal equipment will provide a 21.62 kW reduction in demand and annual energy savings of 90,728 kWh.

2.4.1 Engineering Review of Savings

OG&E provided all the available data on the Cassidy project including the contact information for the customer, equipment specifications, formulas used to estimate savings, invoices for the equipment, diagrams of the building floor plan where the equipment was installed, pictures of the equipment, and the rebate form. The data allowed Global to verify the savings calculations for the project using an Engineering Review approach. Using this approach, we checked the following:

- the formulas used by OG&E to develop savings estimates,
- the accuracy of the inputs into the formula including efficiency level, equipment size, hours of operation, and
- the appropriateness of the baseline used to calculate the projected savings.

The savings estimates for the project are calculated in spreadsheets maintained by OG&E, taking into account the capacity (in tons) and efficiency (EER) values of the old and new units as well as annual operating hours. The spreadsheets are clear and easy to follow, with the demand savings calculation simply being the difference in kW between the old and new units and the kWh savings estimated by multiplying the demand savings by the annual operation hours value. The rebate value offered by this program is \$250 per kW saved.

Baseline is the equipment and conditions against which the program-rebated equipment is compared to quantify savings the new equipment is expected to generate. The baseline used by OG&E to make savings calculations is the old equipment. This would be appropriate if the equipment is still working, has at least five years of remaining useful life, and the customer would not have replaced the equipment in the absence of the program. In the case of Casady School, the math building was a new construction project and the equipment would have been replaced even if they had not participated in the program. A more appropriate baseline, therefore, would be the least expensive option available on the market, typically the federal minimum efficiency standard. Using this more appropriate baseline decreases the savings estimate by 40.29%, primarily because efficiency standards have risen considerably since the old equipment was installed.

The tonnage and EER values of the new units at the Casady School did not match what is listed on the spec sheet in the program documentation. The administrator at the school said he obtained this information from conversations with the manufacturer, and was told that due to the low temperature of the lake he could use partial load EER values. A review of the rebate form spreadsheet found that Casady's EER values matched the spec sheet (that is, they use the partial-load values) in all cases except two—where the model number was TTH072. In these two cases, Casady used the full-load EER values (19.9) instead of the partial-load values (24.5). There was no explanation as to why the tonnage values used did not match those listed on the spec sheet. When all the correct partial-load EER values and tonnage values are used, the savings estimate decreases by 7.44% compared with OG&E's calculated savings.

Hours of operation is an important data point used to estimate energy savings, since the kWh savings the program claims is calculated as the kW reduction times the annual hours of use. For the Casady project, the program manager discussed when the building was open with the customer to determine the hours of operation. They discussed the days school was in session (including summer school and night classes), the hours the building was open, and when it was being cleaned by the janitorial staff. The building was new so much of this information was estimated. Now that the building is in use, the customer thinks it is probably

used more than they originally planned. If so, the system is likely producing greater energy savings than estimated using the lower operating hours value.

A more accurate estimate would cover the amount of hours that the equipment is running/in use, rather than when the building is open. The best method for calculating hours of equipment operation is direct metering. A second-best alternative is a more explicit discussion with the facility manager to get at the likely hours that the geothermal system operates.

2.4.2 Customer's Opinion of Technology and Program

Casady contacted OG&E after they had made the decision to purchase the geothermal unit; the program did not have the opportunity to aid the customer in the purchasing decision. They are very happy with the geothermal technology. There have been a few minor hiccups with the equipment that they are still working through. But it's a new type of system and they are still learning how to use it correctly.

According to the Casady administration, the SOP program manager ". . . was phenomenal. He never talked down to us. He helped us through every step of the program." He said the program manager was instrumental in helping them collect all the information they needed to qualify for the rebate. He would definitely recommend the program to his colleagues' and would participate in the program again if the opportunity arose.

CASE STUDY #2: NW TECHNOLOGY CENTER

"OG&E staff are wonderful people to work with. The savings from the new equipment is even better than we had hoped."

NW Technology Center of Alva, OK
OG&E Standard Offer Program participant

3.1 About the Business

The NW Technology Center provides technology education to area high schools and adults. The Center employs approximately 30 people and has two campuses; one in Alva and one in Fairview. The 75,000 square foot building where the new equipment was installed is primarily made up of classroom space, a shop area, and offices.

3.2 Project Description

The SOP provided incentives totaling \$20,446.76 for retrofitting their existing rooftop units, with 18 new high efficiency rooftop units. The existing rooftop units were 20+ years old and although they were still working, their age and increased maintenance requirements indicate that they were at the end of their useful life. The Center is also participating in OG&E's Commercial Lighting program.

3.3 Decision Process

The Center had decided to purchase new, high efficiency units prior to program participation, but had not yet chosen the specific brand of units. Energy savings was a key driver in their replacement decision along with improved comfort and lower maintenance costs.

3.3.1 Customer's Attitudes towards Energy Efficiency

Energy costs make up at least one third of the Centers operating budget. Finding ways to help control energy costs is a main focus of the maintenance department. The existing equipment they had was working but very old; improved efficiency was the main reason for replacing the equipment followed by the reduced maintenance costs.

3.3.2 Project Impetus and Decisions Made

The head of the maintenance department typically makes the initial decisions about what equipment to buy and the purchase is then approved by the assistant superintendent.

For this project, the Center purchased 18 rooftop units to replace existing rooftop units that were 20+ years old. The new units had several advantages including being more efficient and more reliable. They sent the project out for bid and hired a contractor to install the new units. They had already removed the old units themselves. The contractor was not involved in the Center's decision to participate in the OG&E program.

The customer heard about the OG&E program at a meeting he attended for the Oklahoma Plant Manager's association. He called OG&E and talked to the program manager about participating in the SOP.

3.4 Results

OG&E estimated that, compared to the 20+ year old rooftop units, the new units will provide savings of 81.787 kW reduction in demand and 340,234 kWh reduction in annual energy use.

3.4.1 Engineering Review of Savings

OG&E provided all the available data on the NW Technology Center project including the contact information for the customer, equipment specifications, formulas used to estimate savings, invoices for the equipment, diagrams of the building floor plan where the equipment was installed, pictures of the equipment, third party metering results, and the rebate form. The data allowed Global to verify the savings calculations for the project using an Engineering Review approach. Using this approach, we checked the following:

- the formulas used by OG&E to develop savings estimates,
- the accuracy of the inputs into the formula including efficiency level, equipment size, hours of operation, and
- the appropriateness of the baseline used to calculate the projected savings.

The savings estimates for project is calculated in spreadsheets maintained by OG&E, taking into account the capacity (in tons) and efficiency (EER) values of the old and new units as well as annual operating hours. The spreadsheets are clear and easy to follow, with the demand savings calculation simply being the difference in kW between the old and new units and the kWh savings estimated by multiplying the demand savings by the annual operation hours value. In the spreadsheets, each unit has its own row, listing the old unit and the unit that replaced it on one line. The NW Tech Center has the savings estimates in two separate files. The first eleven units are listed in one spreadsheet while the remaining seven are listed in another.

Baseline is the equipment and conditions against which the program-rebated equipment is compared to quantify savings the new equipment is expected to generate. The baseline used for the savings calculations is the old equipment. This would be appropriate if the equipment is still working, has at least five years of remaining useful life, and the customer would not have replaced the equipment in the absence of the program. In the case of the NW Technology Center, the equipment being replaced was at the end of its useful life. A more appropriate baseline would therefore be the least expensive option available on the market, typically the federal minimum efficiency standard. Using this more appropriate baseline dramatically decreases the savings by 81.66% compared with OG&E's calculated savings since even the minimum efficiency equipment sold today is considerably more efficient than the 20-year old units.

OG&E used an EER value of 6.5 across the board for each of the old 18 units that were replaced. The customer informed us that, as a result of not having model number information, the EER values for these old units are estimates. This is important because it directly impacts the kW values associated with the old units, thus impacting the savings estimates, but it is the best approach given the limited amount of information available. The age of these units ranged from 20 to 22 years.

Also the EER value in the calculations spreadsheet is different than the EER value provided in the equipment documentation file (RTU.pdf). For both the 2-ton and the 10-ton unit, the calculations spreadsheet lists the EER value shown in the RTU.pdf file provided to Global by OG&E. For the 5-ton units, the calculations spreadsheet lists a value of 15.0 while the EER and SEER values from the RTU.pdf file are 12.8 and 14.8, respectively. EER values are used to calculate kW for the old units and should be used to calculate kW for the new units as well. When we use the EER values from the RTUs.pdf file, the estimated savings decrease by 2.59% compared with OG&E's calculated savings.

We did additional work trying to ameliorate the efficiency values for NW Tech Center and were able to find documentation from the manufacturer, based on the model numbers, for all of the new units. We found that efficiency standards are usually measured in SEER for units less than or equal to 5 tons and in EER for larger units. As a result, the efficiency ratings from the manufacturer for all of the units, except the 10-ton unit, were in SEER. To make the correct calculation, we needed to use a SEER to EER conversion formula. We found various formulas, and ultimately selected the standard for calculating EER, based on a PG&E

document as well as on the ClimateMaster spec sheet. This EER calculation divides the capacity of the unit (in Btuh) by the power rating (in watts). Because we had both of these values for all units, and we know that this is a conversion used by others, we felt confident that our EER calculations were valid. Using these derived EER values, the estimated savings decrease by 4.9%, compared to OG&E's original calculation.

Hours of operation is an important data point used to estimate energy savings, since the kWh savings the program claims is calculated as the kW reduction times the annual hours of use. For the NW Technology Center project, we found that the hours of operation were derived from qualitative information obtained by the program manager from the customer. It is primarily based on the hours the building is open, which the customer admitted was an educated guess and was not sure how accurate it was. A more accurate estimate would cover the amount of hours that the equipment is running/in use, rather than when the building is open. The best method for calculating hours of equipment operation is direct metering. A second-best alternative is a more explicit discussion with the facility manager to get at the likely hours that the rooftop units operate.

3.4.2 Customer's Opinion of Technology and Program

The NW Technology Center contacted OG&E after they had decided to purchase high efficiency units, but had not settled on which specific brand; the program did not have the opportunity to aid the customer in the purchasing decision. They are very happy with the equipment and feel it has improved the comfort of the building. The units have also dramatically decreased the labor costs because they no longer need to spend so much time on maintenance issues.

According to the NW Technology Center maintenance manager, the SOP program manager was wonderful to work with. The customer also has experience working with OG&E's Lighting Program and is very happy with his participation in both programs. He would definitely recommend OG&E's programs to his colleagues.

SUMMARY OF RESULTS AND RECOMMENDATIONS

Our case study review identified several strengths of the program:

- Customers are very satisfied with the program.
- The program requirements are reasonable and do not in any way hinder program participation.
- The program data is mostly complete and includes the necessary information to make reasonable estimates of program savings.
- The program manager is extremely helpful and easy to work with. And he seems to take pride in providing satisfaction to the program participants.
- Members of the Oklahoma Plant Managers Association are aware of the program and promote it to other members.
- The spreadsheets with the savings calculations are clear and easy to follow.

The case study review, the engineering review task in particular, identified some weaknesses in the program as well:

- Customers have made the decision to purchase high efficiency equipment prior to program participation.
- The baseline used for the savings calculations is the old equipment. If the project is new construction or if the equipment being replaced is at the end of its useful life, a more appropriate baseline would be the least expensive option available on the market— typically the federal minimum efficiency standard.
- The correct EER value of the equipment is not used consistently in the savings calculations.
- The EER values in the equipment documentation file do not match our calculations using information from the manufacturer.
- Hours of operation is primarily based on the hours the building is open. A more accurate estimate would cover the amount of hours that the equipment is running/in use, rather than when the building is open.

Based on this review we recommend the following improvements to the program:

- Develop a new marketing strategy for reaching customers earlier in the decision making process. This could include the following:
 - Coordinating with account representatives to identify customers who are considering making changes and contact them together to inform them about the program.
 - Conduct outreach to equipment contractors such as attending their association meetings, conducting training on how the program can help improve their business and make their bids more attractive, and schedule one-on-one visits to explain the program and get their help in identifying customers who are likely to choose standard efficiency equipment and are unaware of the incentive.

- Develop additional marketing materials that show how real customers have benefited from the program, and show formulas for how the incentive brings down the initial costs and makes the payback more acceptable for various equipment upgrades.
- Use the federal minimum standard as the baseline for equipment at the end of its useful life or that is going to be replaced regardless of the program. For HVAC equipment, ASHRAE has a great resource for determining service life available online at: <http://xp20.ashrae.org/publicdatabase/>. The California Public Utilities Commission also maintains a database for energy efficient measures (DEER). Service life information can be found in this database at www.deerresources.com.
- Use manufacturer derived EER values to calculate both baseline and new equipment kW and make sure the EER used in the savings calculation is consistent with the equipment documentation.
- Conduct direct metering of equipment as part of the program's measurement and verification activities and as part of the PY2011 impact evaluation. Although the focus of this program is on demand savings, the energy savings from the SOP comprise 17% of the energy savings of OG&E's entire energy efficiency program portfolio. So, making more accurate estimates of the hours of use and resulting kWh savings is important.

ABOUT GLOBAL

Global Energy Partners is a premier provider of energy and environmental engineering and technical services to utilities, energy companies, research organizations, government/regulatory agencies and private industry.

Global's offerings range from strategic planning to turn-key program design and implementation and technology applications.

Global is a wholly-owned subsidiary of EnerNOC, Inc committed to helping its clients achieve strategic business objectives with a staff of world-class experts, state of the art tools, and proven methodologies.

Global Energy Partners
An EnerNOC Company
500 Ygnacio Valley Road, Suite 450
Walnut Creek, CA 94596

P: 925.482.2000
F: 925.284.3147
E: gephq@gepllc.com



6.2 Annual Report of Cost Effective Demand Programs – 2010

OG&E engaged Frontier Associates to report on the cost effectiveness of the demand programs. The table below summarizes their findings. The complete report is in Appendix 6.2

Program	2010 Total Resource	2011 Total Resource
	Cost (TRC)	Cost (TRC)
Low Income Weatherization	2.55	2.74
Fixed Income Weatherization	2.57	2.82
Residential HEEP	1.51	2.33
Positive Energy Home	3.33	2.83
Geothermal HVAC	1.87	1.86
Commercial Lighting	3.39	4.54
Standard Offer Program - C&I	1.78	2.22
Energy Efficiency Education		



Annual Report of Cost Effective Demand Programs - 2010



February 2011

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Introduction

Frontier Associates (FA or “Frontier”) submits this annual report on the Energy Efficiency Programs (“Programs”) for calendar year 2010 to Oklahoma Gas and Electric (OG&E) for the State of Oklahoma. OG&E’s Energy Efficiency Programs were approved by the Oklahoma Corporation Commission (“OCC” or “Commission”) on August 30, 2009 in Cause No. 2009-200. A brief description of OG&E’s approved Programs is provided below. This report covers all costs incurred in the development and implementation of OG&E’s programs of OG&E’s 2010 programs and implementation of programs from February 10, 2010 through December 31, 2010.

Geothermal Heating, Cooling, and Water Heating Measure:

The intent of OG&E’s Geothermal Heating, Cooling and Water Heating program is to reduce energy costs and improve comfort by upgrading the heating and air conditioning systems in homes. Heating and cooling costs have the largest impact for most residential customer’s energy bill. Choosing the right equipment will greatly influence these expenses for many years. According to the Frontier study most heating and air conditioning equipment last 19 years so the choices customers make will impact their energy bills for many years.

Geothermal equipment offers the best method for customers greatly improve the efficiency of their heating and cooling equipment. This high efficient option offers a better long term answer to assist customers in managing rising energy costs. The federal government agrees that geothermal technology can greatly help customers manage rising energy costs as demonstrated by the recent tax credits for the industry. These tax credits were developed to help increase the number of geothermal systems installed.

Low Income Weatherization Measure:

Low Income Weatherization is focused on customers who own their home and who have incomes at or below 200% of the Federal Poverty guidelines. This measure provides for inspecting, upgrading and improving the thermal envelope of the dwelling. Upon completion of the work the house provides more comfort to the resident than it did previously and it should help mitigate the rising impact of utility bills on participants’ finances.

Fixed Income Weatherization Measure:

Fixed Income Weatherization is focused on customers who own their home built prior to 2000, and who have family income at or below \$35,000 and are 65 years or older. This measure addresses inspecting, upgrading and improving the thermal envelope of the dwelling. Upon completion of the work the house provides more comfort to the resident than it did previously and it should help mitigate the rising impact of utility bills on participants’ finances.

Energy Efficiency Education Measure:

To help customers of all classes make knowledgeable choices in acquiring appliances, heating and cooling equipment, building materials, lights, and motors, OG&E is promoting energy efficiency through advertising, direct mail, bill inserts and the company Web site. The information is relevant, consistent, and fuel-neutral, covering efficient practices, efficient technologies, and the application of conservation measures.

Basic energy tips address improving efficiency in cooking, water heating, washing and drying clothes, lighting, heating and cooling, buying the right size air conditioner, and efficient pool and spa operation. Tips link to an on-line calculator that compiles information about a customer home's age, size, heating and cooling equipment, and major appliance mix to estimate how and where customers use electricity. OG&E also offers information on residential energy use for existing homes, for planned construction, and for outdoor living.

Positive Energy New Home Construction Program:

The purpose of the Positive Energy New Home Program is to make builders and homeowners aware of the benefits of energy efficiency and Positive Energy practices. The measure is designed to increase the overall efficiency, quality and sustainability of customer homes based on the National Association of Home Builders (NAHB) Green Home Building Guidelines, the Environmental Protection Agency's (EPA), Energy Star Homes program, the Residential Energy Services Network's (RESNET) Home Energy Rating System (HERS), and the Federal Energy Policy Act of 2005 (EPACT 2005) guidelines. Efficiency measures that are recommended by these guidelines include things such as: high efficiency cooling and heating, tighter home construction, high efficiency water heating, higher levels of wall, ceiling, floor and slab insulation, and high efficiency windows.

Residential Thermal Efficiency Measure:

The intent of OG&E's Residential Thermal Efficiency program is to reduce energy costs and improve comfort by upgrading the thermal envelope and heating and air conditioning systems in homes. Many homeowners' resources are stretched thin which can cause poor decisions. Many homeowners choose lesser efficient options because of a lower first cost. OG&E's Residential Thermal Efficiency program will allow customers to choose higher efficient options by lowering the first cost obstacle. The program also offers customers a program that addresses thermal efficiency issues that are usually ignored by homeowners.

Commercial/Industrial Standard Offer Program:

The program is intended for large customers that have in-house expertise to design their own energy program, and who may chose a third party to implement.

Commercial Lighting Measure:

The purpose of the Commercial Lighting program is to provide incentives to OG&E commercial and industrial (C&I) customers who purchase and install energy efficient indoor and outdoor lighting, lighting controls, occupancy sensors, and light emitting diode (LED) exit lights in both retrofit and new construction applications.

Report Organization

This report presents the following information, which is based on the Commission’s Energy Efficiency Rule, but also includes the results of California Standard Practice Manual cost-benefit tests:

5 OG&E 2010 Energy Efficiency Report

1. List of all programs and the date each program started;
2. The most current information available comparing projected savings to reported savings for each of the utility's programs;
3. The results of the standard cost/benefit tests for each program;
4. A statement of funds expended by the utility for program administration, including Administrative and rebate costs;

2010 Report

Program Start Dates

OG&E operated eight programs, six residential and two commercial, in 2010. Program start dates are presented in Table 1.

Table 1 - Program Start Dates

Program Name	Date Started
Geothermal Heating, Cooling, and Water Heating	February, 2010
Low Income Weatherization	February, 2010
Fixed Income Weatherization	February, 2010
Energy Efficiency Education	February, 2010
Positive Energy New Home Construction	February, 2010
Residential Thermal Efficiency	February, 2010
Standard Offer Program	February, 2010
Commercial Lighting	February, 2010

Program Projections and Results

The following tables present program specific information, including forecasted savings, reported savings, the number of participants, participant costs, the cost per kWh of saved energy, the economic benefit realized in 2010, and the economic benefits to be expected over the life of the measures. Note that economic benefits are restricted to avoided electricity generation and capacity costs and avoided natural gas costs.

Note the important distinction between the “Forecasted Net Savings” displayed in this section and the “Ex Ante” savings stated as “Projected Net Savings”. The “Forecasted Net Savings” are the net savings included in OG&E’s 2009 Comprehensive Demand Programs filing, PUD Cause 2009-200 (Gary

Marchbanks testimony, exhibits GJM-1 through GJM-8), which were based on projections of program participation. The “Ex Ante” savings reflect the savings calculated using actual participation data and the deemed savings used to develop the forecasted savings and in continuous tracking of program savings.

The modeling of the Forecasted Net Savings and Project Net Savings are based on the following assumptions:

- (a) Forecasted savings are based on the target participation levels for program year 2010 as approved in OCC Case No. 2009-200.
- (b) Program participants are those who participated in the program year 2010.
- (c) “Utility Costs: Admin” reflect program costs that were not paid directly to participants. “Utility Costs: Incentives” reflect rebates paid directly to customers. Participant costs, or incremental costs, are the marginal costs to purchase and install the measure before rebates. Net customer investment is the product of the participant costs and the net-to-gross ratio for the program.
- (d) The cost per kWh saved is calculated by dividing the total program costs by the lifetime energy saved. The cost per kW-year is calculated by dividing the total program costs by the product of the kW reduction and the approximate average effective useful life (EUL) of measures installed in the program.
- (e) The total annual benefits for each program were calculated by multiplying the annual average avoided cost of energy set forth in Exhibit B by the actual annual savings. (Since measures were installed throughout the year and not just at the beginning, these values do not reflect the savings produced in calendar year 2009.)
- (f) The net present value of the total economic benefits was calculated by taking the discounted value of the annual avoided cost times the annual savings over the useful life of each program measure.
- (g) The Projected Net Savings for residential programs assume an energy rate based on Rate OK13-R. Commercial energy rates are assumed to be \$.09/kWh for all seasons. Commercial load rates are accounted for in this assumption. The energy rates’ escalation rates are derived from the avoided costs.
- (h) Please see Exhibit B for avoided cost information.

The Forecasted Net Savings and Projected Net Savings are presented in Table 2. All programs except the Positive Energy New Home Construction program had less participants than planned; projected savings was higher than planned; and projected peak demand reduction was slightly lower than planned. The Commercial Lighting program stood out as having significantly greater energy savings and peak demand reduction than planned. This may be attributed to the actual program’s budget turning out to be twice as large as the planned program’s size (see Table 15).

Table 2 - Forecasted Net Savings vs. Projected Net Savings

Program	Forecasted Net Savings (2010)			Projected Net Savings (2010)		
	Annual Energy Savings (kWh)	Peak Demand Reduction (kW)	Participants	Annual Energy Savings (kWh)	Peak Demand Reduction (kW)	Participant
Geothermal Heating, Cooling, and Water Heating	3,239,039	791	500	763,364	186	118
Low Income Weatherization	15,073,181	3,120	16,569	7,758,540	1,799	3,210
Fixed Income Weatherization	4,185,655	866	4,601	3,900,808	968	1,433
Energy Efficiency Education	2,652,769	246	80,595	1,230,633	105	20,857
Positive Energy New Home Construction	187,602	135	158	264,765	190	217
Residential Thermal Efficiency	4,648,919	3,284	20,475	554,255	327	2,246
Standard Offer Program	7,379,657	988	66	3,978,636	586	17
Commercial Lighting	10,778,000	2,757	918	38,529,244	7,555	688
TOTAL	48,144,822	12,187	123,882	56,980,245	11,716	28,786

Oklahoma’s Demand Rules governing utility programs establish two overarching goals:

- a. Reduce the long-run cost of utility service, and
- b. Avoid or delay the need for new generation and transmission investment.

In line with these goals, the results of the Total Resource Cost Test show \$39,178,820 in present value net benefits, as illustrated in Table 3. Of these benefits, \$26,302.56 can be attributed to commercial programs and \$12,876,260 are associated with residential programs.

Table 3 - Energy Efficiency Program Total Resource Cost Test Net Benefits

Program Name	TRC Net Benefits (\$000s)
Geothermal Heating, Cooling, and Water Heating	498.77
Low Income Weatherization	7,007.20
Fixed Income Weatherization	3,164.52
Energy Efficiency Education	153.83
Positive Energy New Home Construction	720.91
Residential Thermal Efficiency	1331.03
Standard Offer Program	1,688.06
Commercial Lighting	24,614.50
ALL RESIDENTIAL	12876.26
ALL COMMERCIAL	26,302.56
TOTAL	39,178.82

All programs show a positive net benefit (Table 3). Table 4 shows the cumulative results of OG&E’s



residential energy efficiency programs cost-effectiveness portfolio. The five cost tests deliver a snapshot of the general benefit of the residential energy efficiency programs. All of these tests, with the exception of the Ratepayer Impact Measure, indicate that the residential programs produce an aggregate benefit.

Table 4 - ALL Residential Cost/Benefit Tests

	Participant Test	Utility Cost Test	Ratepayer Impact Measure	Total Resource Cost Test	Societal Test
Benefit/Cost Ratio	4.00	1.34	0.52	2.57	2.59
Net Benefits (\$000s)	22,057.87	2,667.07	-9,596.58	12,859.81	13,090.38
Total Benefits (\$000s)	29,413.94	10,571.53	10,571.53	21,073.37	21,303.93
Total Costs (\$000s)	7,356.07	7,904.46	20,168.11	8,213.55	8,213.55

Tables 5 through 10 individually show the results of OG&E’s residential energy efficiency programs costeffective portfolio. All programs pass the Total Resource Cost Test.

Preparing cost benefit ratios for these tests requires estimating many values affecting expected costs (e.g. incremental costs, free-ridership, etc) and benefits (e.g. avoided costs, escalation rates, etc.), about which there are varying degrees of uncertainty. When updated information was unavailable, the estimates from OG&E’s August, 2009 filing were applied.

Table 5 – Positive Energy New Home Construction Cost/Benefit Tests

	Participant Test	Utility Cost Test	Ratepayer Impact Measure	Total Resource Cost Test	Societal Test
Benefit/Cost Ratio	2.97	1.95	0.81	2.83	2.85
Net Benefits (\$000s)	649.98	233.73	-113.52	720.91	727.24
Total Benefits (\$000s)	979.38	479.18	479.18	1,114.59	1,120.92
Total Costs (\$000s)	329.41	245.45	592.70	393.68	393.68

Table 6 - Energy Efficiency Education Cost/Benefit Tests

	Participant Test	Utility Cost Test	Ratepayer Impact Measure	Total Resource Cost Test	Societal Test
Benefit/Cost Ratio	6.17	0.63	0.34	1.33	1.36
Net Benefits (\$000s)	2,639.43	-298.98	-989.71	153.83	170.08
Total Benefits (\$000s)	3,149.68	502.08	502.08	625.78	642.02
Total Costs (\$000s)	510.26	801.06	1,491.79	471.95	471.95

Table 7 - Fixed Income Weatherization Cost/Benefit Tests

	Participant Test	Utility Cost Test	Ratepayer Impact Measure	Total Resource Cost Test	Societal Test
Benefit/Cost Ratio	3.72	1.50	0.57	2.82	2.85
Net Benefits (\$000s)	4,417.16	869.81	-1,981.71	3,164.52	3,219.62
Total Benefits (\$000s)	6,044.05	2,605.56	2,605.56	4,900.27	4,955.37
Total Costs (\$000s)	1,626.89	1,735.75	4,587.27	1,735.75	1,735.75

Table 8 - Low Income Weatherization Cost/Benefit Tests

	Participant Test	Utility Cost Test	Ratepayer Impact Measure	Total Resource Cost Test	Societal Test
Benefit/Cost Ratio	3.86	1.41	0.52	2.74	2.77
Net Benefits (\$000s)	10,611.21	1,672.69	-5,305.34	7,007.20	7,135.38
Total Benefits (\$000s)	14,318.81	5,703.76	5,703.76	11,038.27	11,166.45
Total Costs (\$000s)	3,707.59	4,031.07	11,009.10	4,031.07	4,031.07

Table 9 - Geothermal Heating, Cooling, and Water Heating Cost/Benefit Tests

	Participant Test	Utility Cost Test	Ratepayer Impact Measure	Total Resource Cost Test	Societal Test
Benefit/Cost Ratio	2.29	2.59	0.61	1.86	1.89
Net Benefits (\$000s)	757.18	435.43	-456.40	498.77	515.04
Total Benefits (\$000s)	1,343.99	709.60	709.60	1,079.54	1,095.82
Total Costs (\$000s)	586.81	274.17	1,166.01	580.78	580.78

Table 10 - Residential Thermal Efficiency Cost/Benefit Tests

	Participant Test	Utility Cost Test	Ratepayer Impact Measure	Total Resource Cost Test	Societal Test
Benefit/Cost Ratio	6.05	0.70	0.43	2.33	2.34
Net Benefits (\$000s)	2,994.19	-245.61	-749.90	1,331.03	1,339.67
Total Benefits (\$000s)	3,587.24	571.35	571.35	2,329.29	2,337.93
Total Costs (\$000s)	593.05	816.96	1,321.25	998.26	998.26

Table 11 shows the cumulative results of OG&E’s commercial energy efficiency programs costeffectiveness portfolio. The five cost tests deliver a snapshot of the general benefit of the commercial energy efficiency programs. All of these tests, with the exception of the Ratepayer Impact Measure, indicate that the commercial programs are having an aggregate benefit.

Table 11 - ALL Commercial Cost/Benefit Tests

	Participant Test	Utility Cost Test	Ratepayer Impact Measure	Total Resource Cost Test	Societal Test
Benefit/Cost Ratio	5.28	15.49	0.64	4.16	4.24
Net Benefits (\$000s)	36,915.11	24,662.29	14,591.37	26,302.56	26,969.98
Total Benefits (\$000s)	45,541.97	26,364.76	26,364.76	34,632.11	35,299.53
Total Costs (\$000s)	8,626.85	1,702.47	40,956.13	8,329.56	8,329.56

Tables 12 and 13 individually show the results of OG&E's commercial energy efficiency programs cost-effective portfolio. Both programs pass the Total Resource Cost Test. The Commercial Lighting Program (Table 12) shows very high net benefits. These benefits can be attributed to the forecasted energy and demands savings being greater than planned.

Table 12 - Commercial Lighting Cost/Benefit Tests

	Participant Test	Utility Cost Test	Ratepayer Impact Measure	Total Resource Cost Test	Societal Test
Benefit/Cost Ratio	5.76	16.79	0.65	4.54	4.63
Net Benefits (\$000s)	32,899.73	22,641.42	-12,733.16	24,614.50	25,216.42
Total Benefits (\$000s)	39,805.61	24,075.00	24,075.00	31,564.26	32,166.19
Total Costs (\$000s)	6,905.88	1,433.58	36,808.16	6,949.76	6,949.76

Table 13 - Standard Offer Program Cost/Benefit Tests

	Participant Test	Utility Cost Test	Ratepayer Impact Measure	Total Resource Cost Test	Societal Test
Benefit/Cost Ratio	3.33	8.52	0.55	2.22	2.27
Net Benefits (\$000s)	4,015.38	2,020.86	-1,858.21	1,688.06	1,753.56
Total Benefits (\$000s)	5,736.36	2,289.76	2,289.76	3,067.85	3,133.35
Total Costs (\$000s)	1,720.97	268.89	4,147.97	1,379.79	1,379.79

Program-Related Expenditures

All program-related expenditures are presented in Table 14 and are separated by administrative costs and inducements.

Table 14 - Program Costs - 2010

Program Name	Administrative Costs	Inducements	Total Program Cost
Geothermal Heating, Cooling, and Water Heating	81,986.27	145,275.00	227,261.27
Low Income Weatherization	323,475.52	5,882,227.69	6,205,703.21
Fixed Income Weatherization	108,857.46	2,361,246.31	2,470,103.77
Energy Efficiency Education	290,808.10	833,476.65	1,124,284.75
Positive Energy New Home Construction	80,745.22	113,850.00	194,595.22
Residential Thermal Efficiency	451,123.21	1,126,741.34	1,577,864.55
Standard Offer Program	92,803.20	162,829.67	255,632.87
Commercial Lighting	181,999.35	1,036,927.21	1,218,926.56
TOTAL	1,611,798.33	11,662,573.87	13,274,372.20

Planned and actual program costs are compared in Table 15. Actual program costs significantly exceeded planned program costs for the Geothermal, Fixed Income Weatherization, and Commercial Lighting programs. The Residential Thermal Efficiency program had a significantly smaller budget than planned, which can be attributed to its smaller market in its roll-out year.

Table 15- Planned and Actual Program Costs - 2010

Program Name	Actual Program Cost	Planned Program Cost
Geothermal Heating, Cooling, and Water Heating	227,261	833,333
Low Income Weatherization	6,205,703	6,568,080
Fixed Income Weatherization	2,470,104	1,824,103
Energy Efficiency Education	1,124,285	1,141,299
Positive Energy New Home Construction	194,595	133,247
Residential Thermal Efficiency	1,577,865	3,422,222
Standard Offer Program	255,633	322,818
Commercial Lighting	1,218,927	656,436
TOTAL	13,274,372	14,901,538

Exhibit A: August 2009 OG&E Filing

Exhibit B: Avoided Cost

OG&E Avoided Costs					
Year	Winter	Summer	Shoulder	Demand	Gas (\$/therm)
2010	\$0.0288	\$0.0311	\$0.0295	\$133.33	0.4846521
2011	\$0.0310	\$0.0332	\$0.0309	\$136.66	0.5821139
2012	\$0.0388	\$0.0431	\$0.0377	\$140.08	0.6170367
2013	\$0.0422	\$0.0469	\$0.0415	\$143.58	0.5940333
2014	\$0.0465	\$0.0517	\$0.0454	\$147.17	0.590053
2015	\$0.0510	\$0.0569	\$0.0499	\$150.85	0.6077777
2016	\$0.0545	\$0.0608	\$0.0534	\$154.62	0.6162697
2017	\$0.0592	\$0.0661	\$0.0580	\$158.49	0.6172436
2018	\$0.0630	\$0.0703	\$0.0617	\$162.45	0.6219149
2019	\$0.0662	\$0.0738	\$0.0648	\$166.51	0.6285028
2020	\$0.0694	\$0.0774	\$0.0680	\$170.68	0.6419466
2021	\$0.0721	\$0.0805	\$0.0706	\$174.94	0.6515566
2022	\$0.0746	\$0.0832	\$0.0731	\$179.32	0.66949
2023	\$0.0774	\$0.0864	\$0.0758	\$183.80	0.6742034
2024	\$0.0774	\$0.0863	\$0.0758	\$188.39	0.6698615
2025	\$0.0816	\$0.0910	\$0.0799	\$193.10	0.6753357
2026	\$0.0855	\$0.0954	\$0.0838	\$197.93	0.6910366
2027	\$0.0880	\$0.0982	\$0.0862	\$202.88	0.7048299
2028	\$0.0910	\$0.1016	\$0.0892	\$207.95	0.7274443
2029	\$0.0970	\$0.1083	\$0.0950	\$213.15	0.7509984
2030	\$0.1029	\$0.1148	\$0.1008	\$218.48	0.7726853
2031	\$0.1079	\$0.1204	\$0.1057	\$223.94	0.8024628
2032	\$0.1130	\$0.1261	\$0.1107	\$229.54	0.8136362
2033	\$0.1191	\$0.1329	\$0.1167	\$235.28	0.8168184
2034	\$0.1283	\$0.1431	\$0.1256	\$241.16	0.8352587
2035	\$0.1361	\$0.1519	\$0.1333	\$247.19	0.8462498
2036	\$0.1445	\$0.1612	\$0.1415	\$253.37	0.871637294
2037	\$0.1534	\$0.1711	\$0.1502	\$259.70	0.897786413
2038	\$0.1628	\$0.1816	\$0.1594	\$266.19	0.924720005
2039	\$0.1728	\$0.1928	\$0.1692	\$272.85	0.952461605
2040	\$0.1834	\$0.2046	\$0.1796	\$279.67	0.981035454
2041	\$0.1946	\$0.2172	\$0.1906	\$286.66	1.010466517
2042	\$0.2066	\$0.2305	\$0.2024	\$293.83	1.040780513
2043	\$0.2193	\$0.2447	\$0.2148	\$301.18	1.072003928
2044	\$0.2327	\$0.2597	\$0.2280	\$308.70	1.104164046

Energy and load avoided costs provided by OG&E. Gas avoided costs derived from DOE-EIA.

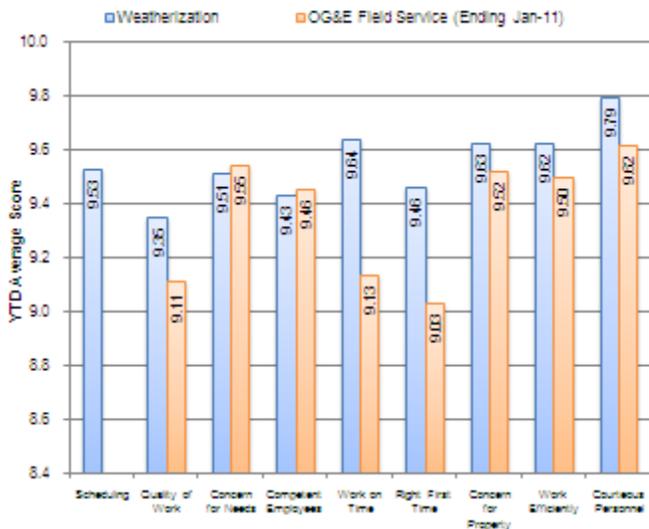
6.3 SURVEY RESULTS



Weatherization

WITH ALL YOUR POWER  WHAT WOULD YOU DO?

Weatherization and Field Comparison



- Overall the contractors for weatherization are exceeding the OG&E field responses in every category except for 'Concern for Needs' and 'Competent Employees' but both are by a very slight margin.
- As with the OG&E Field survey, our highest marks are for 'Courteous Personnel'.
- Lowest mark for the Weatherization contractors 'Quality of Work'. Still, overall scores are VERY good with even the lowest not dropping below 9 for a mean.

WITH ALL YOUR POWER  WHAT WOULD YOU DO?



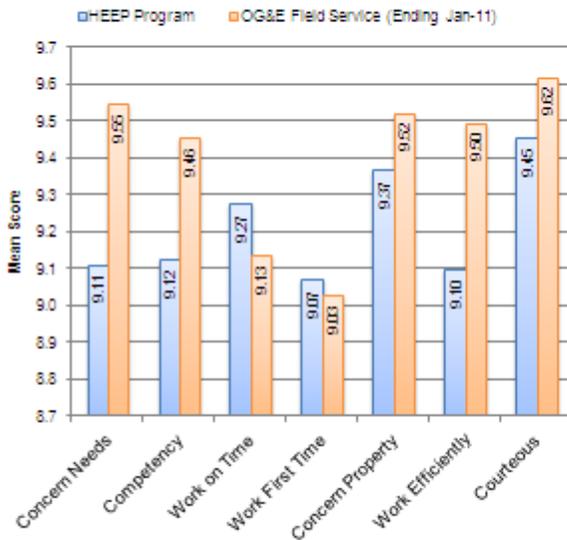
POSITIVE
ENERGY
TOGETHER

HEEP

WITH ALL YOUR POWER  WHAT WOULD YOU DO?

Mean Score by Question

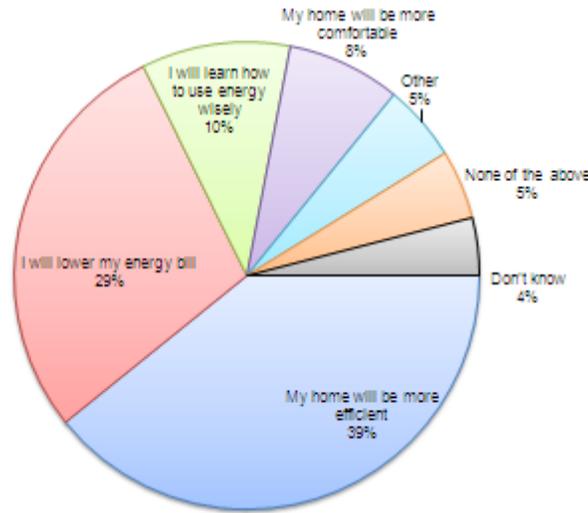
POSITIVE
ENERGY
TOGETHER



- Contractor scores were very high and they have been trending up (on a short trend)
- However, scores were exceeded by OG&E field services in all questions except 'work on time' and 'work right first time'
- Pattern is similar to Weatherization and the overall OG&E... 'Work done right first time' was the low with a mean score of 9.07 and 'Courteous personnel' was the high with 9.45.

WITH ALL YOUR POWER  WHAT WOULD YOU DO?

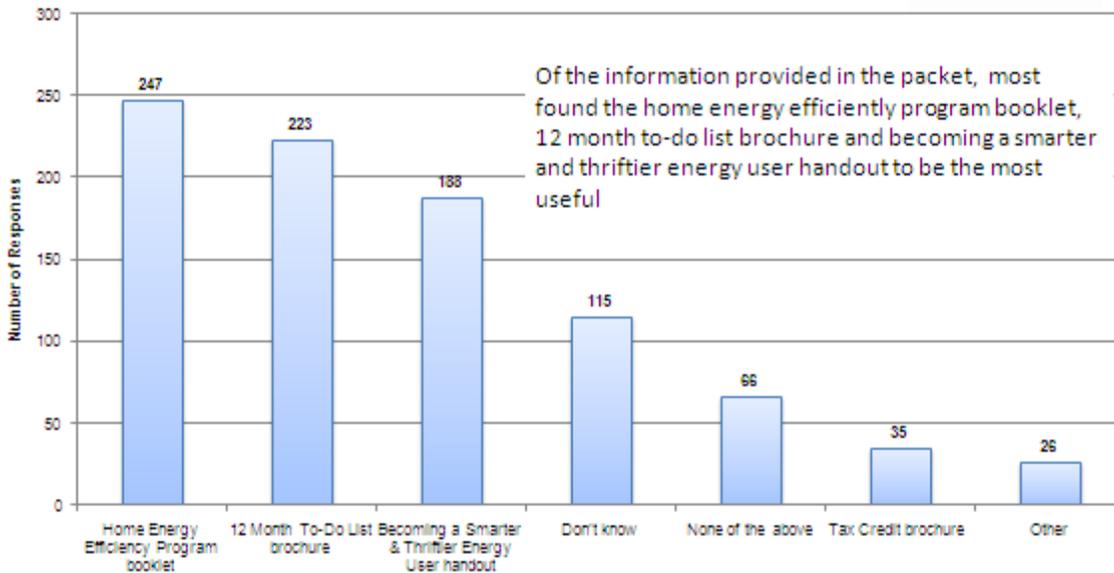
Expected Benefits



The majority of customers are expecting their home to be more efficient (39%) and to lower their energy bill (29%)

WITH ALL YOUR POWER  WHAT WOULD YOU DO?

Most Helpful Information



WITH ALL YOUR POWER  WHAT WOULD YOU DO?



7.0 Demand Response Program Load Reduction

Load Reduction Rider Program

Program Description

The Load Reduction Rider is an offering approved by the Oklahoma Corporation Commission. This rider became effective on January 1, 2010 and applied to the contract period beginning April 1, 2010. The rider shall remain in effect until canceled or modified by order. This rider is available, upon application by the customer and acceptance by the Company, to all customers served under a standard rate schedule with an annual on-peak period maximum demand of 200 kW or above. This rider is available to eligible customers in conjunction with the Day-Ahead Pricing Tariff (DAP) subject to special conditions, as defined within the DAP tariff.

The Company, at its sole discretion, may call for curtailment for any operating or economic purpose. The use is not limited to emergency conditions. This rider shall not apply if a service interruption resulting from system-emergency operating conditions should occur.

The Customer designates its Subscribed Curtailment Load during the enrollment period. The Subscribed Curtailment Load (specified in kW) is the amount of load the customer expects to reduce during curtailment events. Customer must specify a load ranging from 0 kW to the customer's maximum annual demand occurring during the on-peak period. Only customers that have actual historical measured on-peak period demands are eligible to specify a subscribed load greater than 0 kW. Customers that do not have actual historical metering data must specify a Subscribed Curtailment Load of 0 kW. Customers selecting a Subscribed Curtailment Load of 0 kW will receive only the Performance Credit portion of the curtailment billing credits.

The customer chooses the required notification time period of either 4-hour notification or 30-minute notification. Although the Company endeavors to always give as much notice as possible prior to the curtailment period, the Company will provide the notification to a customer with at least the selected notification time.

The customer also chooses a curtailment limit of 120 hours or 240 hours. This will be the maximum number of hours that the Company will call for a curtailment from the customer. Once the customer has been curtailed for the selected number of hours, the customer is no longer obligated to meet the curtailment commitment and will not be assessed the buy-through provision charges.

Customers enrolled in this tariff receive billing credits based on their Subscribed Curtailment Load (Subscription Credits) and load reduction (Performance Credits) during Company called curtailment events. The Subscribed Curtailment Load (specified in kW) is the amount of load the customer expects to reduce during curtailment events. Subscription Credits are applied to the customer's bill during the summer season months of June through September. The credit is

based on the customer Subscribed Curtailment Load and the monthly Subscription Prices posted by the company prior to the enrollment period. Performance Credits are applied to the customer's bill during the billing period in which a curtailment is called by the Company. The credit is calculated based on the difference of the baseline energy and actual measured energy during each hour of the curtailment event multiplied by the Curtailment Price communicated to the customer in conjunction with the curtailment notification. Minimum Curtailment Prices are posted prior to the enrollment period.

In the event that a customer, with a subscribed curtailment load greater than 0 kW, fails to provide a reduction of Subscribed Curtailment Load during any interval of a curtailment event, the customer is assessed a Buy-Through Charge based on the portion of the Subscribed Curtailment Load not reduced during each hour (or portion of an hour) of the curtailment period. Customers that have elected a Subscribed Curtailment Load of 0 KW are not subject to the Buy-Through Charge. Customers that have met their curtailment obligation (selected curtailment hours) are not subject to the Buy-Through Charge for any hours in which a curtailment event is called beyond the elected curtailment hours.

Program Highlights

- Rider became effective 1/1/2010
- 112 Commercial/Industrial Customer Accounts enrolled in 2010
- 39.545 MW Subscribed Curtailment Load (SCL)
 - 57 customer accounts with SCL > 0
 - 55 customer accounts with SCL = 0
- 21 Load Reduction Events initiated for 112 hours of Load Reduction in 2010
- Load Reduction Rider customers reduced an average of 277kW
- Performance credits averaged \$5,800 per customer
- Buy-through averaged \$7,803 per customer
- Net performance credit -\$2,003 per customer (cost)
- Net Subscription averaged \$7,344 per customer
- Net Credit \$5,341 per customer
- Program cost \$19/kW-year reduced
- Program value \$64/kW-year reduced (NPV of Avoided Capacity)

Program Events

There were twenty one Load Reduction events in 2010. Fifteen of the events were called requesting all participants to curtail load during the time frames given. There were six events that only the 30 minute notification customers were called to curtail load. The Table 1 shows the date and duration of the curtailment events that occurred in 2010 along with the notification groups that were requested to curtail.

Table 1 2010 Load Reduction Events

Event	Date	Time	Hours	Requested to Curtail			
				30m-120h	30m-240h	4h-120h	4h-240h
1	5/6/2010	1:00pm-9:00pm	8.0	x	x	x	x
2	5/26/2010	1:00pm-7:00pm	6.0	x	x	x	x
3	5/27/2010	12:00pm-8:00pm	8.0	x	x	x	x
4	6/2/2010	1:00pm-8:00pm	7.0	x	x	x	x
5	6/7/2010	1:00pm-9:00pm	8.0	x	x	x	x
6	6/8/2010	3:00pm-7:00pm	4.0	x	x	x	x
7	6/11/2010	3:00pm-7:00pm	4.0	x	x	x	x
8	6/14/2010	2:30pm-7:00pm	4.5	x	x	x	x
9	6/18/2010	3:00pm-7:00pm	4.0	x	x	x	x
10	6/22/2010	4:00pm-8:00pm	4.0	x	x		
11	6/23/2010	1:30pm-8:00pm	6.5	x	x	x	x
12	6/24/2010	2:00pm-6:00pm	4.0	x	x	x	x
13	7/16/2010	3:30pm-7:30pm	4.0	x	x		
14	8/2/2010	3:00pm-7:00pm	4.0	x	x		
15	8/3/2010	3:30pm-7:30pm	4.0	x	x	x	x
16	8/9/2010	2:00pm-8:00pm	6.0	x	x	x	x
17a	8/23/2010	12:00pm-8:00pm	8.0	x	x		
17b	8/23/2010	2:00pm-8:00pm	6.0			x	x
18	8/31/2010	4:00pm-8:00pm	4.0	x	x		
19	9/10/2010	2:30pm-6:30pm	4.0	x	x		
20	9/16/2010	2:00pm-7:00pm	5.0	x	x	x	x
21	12/1/2010	6:30am-11:30am	5.0	x	x		

Program Analysis

Table 2 shows the performance of the load reduction rider on a per customer basis.

Table 2 Customer Population

	Total	Max	Average	Min
Subscription Level	27,360 kW	5,000 kW	288 kW	0 kW
Performance Level	26,416 kW	3,477 kW	278 kW	~2 kW
Excess Performance*	13,610 kW	3,477 kW	135 kW	<1 kW
Subscription Credit	\$697,684	\$110,518	\$7,344	\$0
Performance Credit	\$546,146	\$56,925	\$5,749	\$43
Buy-Through Charge	(\$741,335)	(\$225,258)	(\$7,804)	\$0
Net Credits	\$502,495	\$91,952	\$5,289	(\$108,879)

*Excess is load reduced beyond contracted level.

The summary of the Load Reduction Rider performance for all participating customers is shown in Table 3.

Table 3 Summary of Customer Analysis

	SCL	Performance	Excess	\$/kW Reduced
All Customers	27,360 kW	26,416 kW	13,610 kW	\$19.02
SCL > 0 kW	27,360 kW	15788 kW	2,982 kW	\$19.36
SCL = 0 kW	N/A	10628 kW	10,628 kW	\$18.52
Performers	7,950 kW	9082 kW	2,038 kW	\$44.19
Non-Performers	19,410 kW	6706 kW	944 kW	-\$14.29



Outlook for Continuation, Expansion, Reduction or Termination

The Load Reduction Rider continues for the year 2011. To date 104 customers are participating in the program with 11,885 kW committed for load reduction. Of those 104 customers, 12 customers have a Subscribed Curtailment Level (SCL) greater than zero. The remaining 92 customers have an SCL of zero. Customer had the opportunity to change their SCL during the annual enrollment period of January 1, 2011 through March 31, 2011.

Changes to Program

The base price for the SCL payment was change from \$4.30 per kW to \$4.00 per kW for 2011. The minimum Performance price for 2011 was changed from \$0.16 per kWh to \$0.25 per kWh. These changes were filed and approved by the Oklahoma Corporation Commission On December 15, 2010 and can be found in the OG&E Standard Pricing Schedule: LR, Load Reduction Rider.