Entergy New Orleans, Inc.
1600 Perdido Street, Bldg #505
New Orleans, LA 70112
Tel 504 670 3655
Fax 504 670 3615

Lana Lovick
Manager, Regulatory Affairs
llovick@entergy.com

June 1, 2012

Via Hand Delivery

Honorable Peggy C. Lewis
Clerk of Council
Council of the City of New Orleans
City Hall, Room 1E09
1300 Perdido Street
New Orleans, Louisiana 70112

Re: Energy Smart Plan Annual Report filing by Entergy New Orleans, Inc.
(Docket No. UD-08-02)

Dear Ms. Lewis:

Pursuant to paragraph 46(a) of the 2009 Agreement in Principle adopted by Council of the City of New Orleans ("Council") Resolution R-09-136, Entergy New Orleans, Inc. ("ENO") submits this Annual Report for the Energy Smart Plan for the period April 2011 to March 2012. We respectfully request that you file the original and two copies into the record, and return to us a date-stamped copy. Should you have any questions regarding this filing, please contact my office at (504) 670-3655.

Further, ENO also requests that the Council establish a comment period of 30 days for parties to respond to this annual report, and to take any other related actions that may be appropriate.

Thanking you for your usual professional courtesies and attention to this matter.

Sincerely,

:lpn
Enclosure

cc: All Councilmembers of the City of New Orleans
Official Service List UD-08-02

RECEIVED
JUN 01 2012
By

EnergySmart
A New Orleans Program

Year 1 Annual Report
April 1, 2011 to March 31, 2012

CLEAResult

Entergy
THE POWER OF PEOPLE

Table of Contents

I. Executive Summary

Energy Smart is a comprehensive energy efficiency program available to all residents and businesses located on the east bank of Orleans Parish. The Plan was developed by the New Orleans City Council, administered by Entergy New Orleans and implemented by CLEAResult. Entergy New Orleans is regulated by the New Orleans City Council and the program costs are recovered from customers through their electric rates.

In March 2011, Energy Smart completed its first year of a 3 year, $11 million plan. In its first program year, Energy Smart provided incentives to more than 8,500 customers. Incentives were provided for energy efficient measures such as energy audits, direct install CFL bulbs, low flow fixtures, weatherization, HVAC, A/C Tune-ups and lighting, among others. It their first year, the programs saved 15,812,954 kWh of electricity, which is 111% of their 14,238,801 kWh energy savings goal. Several programs exceeded their energy saving targets, including, the Residential Solutions, CFL Direct Install, Low Income, Small Commercial and Large Commercial Programs. The map below is a graphical representation of the participants from the first year of the program.

The Gross Savings for all programs reported in this document were calculated using the New Orleans Deemed Savings approved by the City Council in March of 2009 or followed an International Performance Measurement & Verification Protocol approved method for custom type projects. Optimal Energy, Inc. ("Optimal") performed an energy savings impact evaluation on the first year energy saving results for the programs. The objective of the evaluation was to provide verification of the gross savings and a thorough engineering review of the project files for the year. The full Energy Smart New Orleans Impact Evaluation Report is attached as Appendix C for reference.

The Energy Smart Program also performed customer satisfaction surveys for all the programs. Energy Smart utilized GCR, Inc. to conduct the customer satisfaction survey of participants. The survey verified the customers experience with the program which included the quality of work performed and professionalism of the contractor. In summary, both residential and commercial customers rated the program at 98% good or excellent. A more detailed summary of survey results are included as Appendix A.

Energy Smart utilized 60 trade ally contractors to market the program to customers. Energy Smart provided trade allies the training and information needed to effectively promote the programs. Energy Smart also marketed directly to customers through mass media such as radio and internet, as well as through more focused tactics such as bill inserts and community events. Energy Smart also utilized the "One Stop Shop" to promote the programs as well as educate New Orleans residents on the benefits of energy efficiency.

The chart below gives a high-level look at program performance and incentive budget.

	Yr 1 Goal	Yr 1 Actual	% of Goal
Electric Goal (kWh)	14,238,801	15,812,954	111.1%
Incentive	$1,627,000	$1,509,473	92.8%

The following report details the program results and experiences encountered in its first program year, including an in-depth look at all aspects of program performance, outreach and marketing, data tracking and management, budget, and a look ahead at 2012.

II. Introduction & Program Background

The first year of the Energy Smart Plan officially started on April 1, 2011 and ended on March 31, 2012. The Energy Smart Plan consists of 7 Residential Programs and 2 Non-Residential Programs that were implemented by CLEAResult.

- **Residential** –Customers with an residential electric meter
  - **Residential Solutions Program**
  - **ENERGY STAR Air Conditioning Program**
  - **A/C Tune-up Program**
  - **Energy Efficient New Homes Program**
  - **CFL Direct Install Program**
  - **Weatherization Ready (Low Income) Program**
  - **Solar Water Heater (pilot) Program**

- **Small Commercial Program –** Commercial electric customers with peak demand of 100 kW or less

- **Large Commercial and Industrial Program –** Customers with peak demand of more than 100

There were also 2 Pilot Programs administered by Entergy New Orleans, Inc. The two programs are:

- **In-home Display (IHD) Pilot**
- **Solar Monitoring Pilot**

III. Program Performance

In the first year of the Energy Smart plan, the programs surpassed their overall kWh savings goals while remaining within budget. Year 1 program performance is shown in the sections below and is divided by customer class.

Residential Programs

Goal Achievement

Residential Program Summary			
	Year 1 Goal	Year 1 Actual	% of Goal
Electric Savings (kWh)	7,449,910	8,003,144	107.4%
Incentive	$888,000	$772,779	86.9%

The results for individual Year 1 Energy Smart Residential Programs are listed below.

Residential Solutions

The Residential Solutions program provides incentives for Energy Assessments (audits), air sealing, insulation, duct sealing, Heat Pump water heaters, direct install measures, efficient pool pumps and solar screens. The Program provides energy assessments at low cost to customers through a network of participating energy consultants. The first year of the Residential Solutions program was very successful and exceeded its kWh savings goal. Incentive dollars were moved from other underperforming programs to this program. The transfer of funds is detailed in Section VIII of the report. Residential Solutions savings totals are below:

	Year 1 Goal	Year 1 Actual	% Goal
Electric Savings (kWh)	651,656	3,080,830	472.8%
Incentives	$198,000	$356,580	180.1%

An Energy Assessment must be performed by an Energy Smart energy consultant prior to any weatherization work (insulation, air and duct sealing) being performed. Energy

Consultants are paid an incentive based on the home size and the type of testing that was performed. The Assessment incentive schedule is outlined in the table below:

Energy Assessment Incentive Schedule

Assessment Type		Energy Consultant Incentive		Discounted Price to Customer
		One (1) A/C System	Two (2) A/C System or greater	
Informational Audit		$65.00	$100.00	$35.00*
Recommended Add-ons	Option 1 ONE Blower Door Test	$35	$75.00	$115*
	Option 2 ONE Duct Leakage Test	$40.00	$75.00	$160*
Energy Smart HERS**		$140.00	$175.00	$460.00*

Maximum Incentive per home is $175
*Actual price the customer pays may vary based on size of home and other factors.

Measure Incentive Schedule

Measure	Rebate Amount	Measure	Rebate Amount
Attic Insulation	Up to $0.35 per sq. ft.	Air Infiltration Sealing	$0.20 per CFM Reduced
Wall Insulation	$0.25 per sq. ft.	Duct Sealing	$0.24 per sq. ft.
Floor Insulation (Electric Heat)	$0.20 per sq. ft.	Solar Screens or Window Film	$1 per sq. ft.
Heat Pump water heater	$400	Variable Speed Pool Pumps	$400

In Year 1, there were 646 Energy assessments performed resulting in 480 submitted rebates for installed weatherization measures. The month by month breakdown of Energy Assessments and rebates paid is below:

Energy Assessments by Month

Month	Energy Consultants	Assessments			
		Informational	Add-on BD or DB	Add-On BD&DB or HERS	Incentives paid
April	6	0	0	0	0
May	7	37	5	0	$3,615
June	1	67	37	8	$7,502
July	1	39	23	6	$4,913
August	2	67	34	5	$7,010
September	2	57	33	2	$5,733
October	0	69	37	8	$7,127
November	3	69	46	13	$8,153
December	0	89	37	21	$9,613
January	1	56	18	15	$6,038
February	0	70	51	6	$13,631
March	0	26	32	24	$7,004
YTD Totals	22	**646**	**352**	**108**	$80,339

Measures by Month

Month	Contractors	Insulation			Air Sealing	Duct Sealing	Direct Install measures	Incentives paid	Savings kWh
		Ceiling	Wall	Floor					
April	6	0	0	0	0	0		0	0
May	5	2	0	2	2	0		$3,250	18,804
June	3	21	7	11	5	0		$17,660	157,636
July	1	14	5	12	9	8		$19,736	134,000
August	2	28	9	9	4	1		$21,801	195,928
September	0	19	8	4	2	0		$12,023	86,706
October	2	32	8	13	9	2		$25,030	225,691
November	3	14	12	18	14	6	23	$30,248	184,365
December	0	13	5	21	21	6	6	$27,661	198,760
January	1	8	5	7	8	1	10	$15,348	90,727
February	1	6	9	7	3	0	0	$812	60,144
March	0	14	18	13	5	1	1723	$102,672	1,728,069
YTD	**24**	**171**	**86**	**117**	**82**	**25**	**1762**	$276,241	**3,080,830**

ENERGY STAR Air Conditioning Program

The Energy Star Air Conditioning program provides incentives for the purchase of Energy Star rated window air conditioners and central air conditioning systems. Incentives are paid to customers who purchase a new Energy Star rated central air conditioning system from a participating contractor. An Energy Star rated window air conditioner may be purchased from any retailer and the customer need only submit a mail in rebate to the program to participate.

	Year 1 Target	Year 1Actual	% Goal
Electric Savings (kWh)	651,656	134,655	20.7%
Incentives	$119,000	$26,215	22.0%

Measures by Month

Month	Contractors	Window AC	Central AC	Incentives paid	Savings kWh
April	12	0	0	0	0
May	8	19	2	$1,530	10,465
June	0	27	6	$3,170	17,766
July	0	37	2	$2,390	15,590
August	1	75	2	$3,515	24,394
September	0	24	3	$1,315	8,818
October	2	20	6	$4,085	21,104
November	0	2	0	$70	442
December	1	7	9	4,290	17,449
January	1	0	1	$575	2,136
February	3	4	5	$2,350	10,419
March	0	5	6	$1,935	6,072
YTD	**28**	**220**	**42**	**$26,215**	**134,655**

Air Conditioning Tune-up Program

The air conditioning tune-up program provides incentives for customers who have their central air conditioning systems tuned-up by a participating contractor. All Tune-ups that are performed through our network of participating contractors must follow the

program's procedures for a high performance tune-up. As a result, an HVAC system that receives a tune-up through this program will not only save the customer money on their utility bill but will also reduce their maintenance costs. Energy Smart provides a one-time $75 instant cash incentive per system off the contractor's invoice for customers participating in the program. The first year results of the program are below:

	Yr 1 Target	Yr 1 Actual	% Goal
Electric Savings (kWh)	882,739	429,291	48.6%
Incentives	$119,000	$73,070	61.4%

Measures by Month

Month	Participating Contractors	Tune-Ups performed	Savings kWh	Incentives paid
April	14	43	26,025	$3,225
May	2	90	51,402	$6,450
June	0	140	81,443	$10,500
July	0	77	50,203	$5,775
August	0	32	17,337	$2,400
September	0	79	35,333	$5,925
October	0	36	18,702	$2,700
November	0	202	74,943	$18,930
December	0	73	26,419	$7,750
January	0	14	7,576	$1,540
February	0	0	0	0
March	4	123	39,908	$7,650
YTD	**20**	**909**	**429,291**	**$73,070**

Energy Efficient New Homes Program

The New Homes program seeks to achieve energy savings by promoting the advantages of building energy efficient housing. The program has partnered with the following local builders to provide incentives for new houses. Any builder, or homeowner acting as their own general contractor, may participate.

Participating Builders/Developers

- Jericho Road
- Build Now. LLC
- Green Coast Enterprises
- Make It Right -N.O., L.L.C.

- Pontchartrain Park CDC
- J.W. Drennan
- Hope Enterprise Corporation

The Year 1 results of the Program year:

	Yr 1 Target	Yr 1 Actual	% Goal
Electric Savings (kWh)	1,266,391	207,067	16.4%
Incentives	$132,000	$37,288	28.2%

Measures by Month

Month	Rebates			Savings kWh	Incentives paid
	HERS 70 or less	HERS 71-85	Prescriptive		
April	-	-		-	-
May	-	-	-	-	-
June	-	-	-	-	-
July	-	-	-	-	-
August	-	-	-	-	-
September	6	0	0	12,522	$2,250
October	20	0	0	41,740	$7,500
November	0	8	0	8,352	$1,600
December	29	0	0	60,523	$10,875
January	0	3	0	3,132	$600
February	0	20	4	54,745	$9,935
March	4	3	4	26,052	$4,527
YTD	**59**	**34**	**8**	**207,067**	**$37,288**

CFL Direct Install Program

The CFL Direct Install Program partnered with Green Light New Orleans and provided incentives for the installation of energy efficient CFL's in customer's homes at no cost. In addition to incentives, the program provided marketing support to Green Light New Orleans guaranteeing a steady stream of participants. The first program year was extremely successful. The program results are below:

	Yr 1 Target	Yr 1 Actual	% Goal
Electric Savings (kWh)	3,424,013	3,726,006	108.8%
Incentive	$90,000	$169,010	187.8%

Measures by Month

Month	Participants	14W CFL	18W CFL	23W CFL	Total	kWh savings	Incentives paid
April	483	5901	870	504	7275	304,311	$14,550
May	142	1685	258	222	2165	93,372	$4,330
June	438	6272	984	409	7665	317,297	$15,330
July	364	4297	662	363	5322	222,951	$10,644
August	220	3896	132	81	4109	156,039	$8,218
September	394	5302	610	624	6536	276,385	$13,072
October	377	6042	992	537	7571	319,071	$15,142
November	371	5026	830	414	6270	263,219	$12,540
December	329	5567	928	481	6976	293,757	$13,952
January	563	9722	1055	678	11,455	467,752	$22,910
February	599	9752	1383	644	11,799	485,392	$25,089
March	651	11471	1032	628	13,131	526,460	$13,233
Total	**4,931**	**74,933**	**9,736**	**5,585**	**90,254**	**3,726,006**	**$169,010**

Weatherization Ready Program (Low Income)

The Weatherization Ready program provided funding for income qualified customers to receive energy efficient improvements at no cost. The Program partnered with 2 local Non-profits, UNITY and Council on Aging, to help identify and qualify customers. The Program provided customers with no-cost improvements including Energy Star Rated Window Air Conditioner replacements, direct install measures (CFL bulbs, low flow showerheads, faucet aerators), and weatherization improvements. Weatherization improvements were limited to $2,500 per home. In the first program year, the program installed Room Air conditioners for 90 participants, direct install measures for 330 participants and weatherization improvements to 25 homes. The first program year was extremely successful and the results are shown below:

	Yr 1 Target	Yr 1 Actual	% Goal
Electric Savings (kWh)	81,699	419,857	513.9%
Incentives	$140,000	$108,902	77.8%

Measures by Month

Month	RAC Installed	Weatherization Projects	Direct Install	kWh savings	Incentives paid
April	-	-	-	-	-
May	-	-	-	-	-
June	-	-	-	-	-
July	16	-	-	4,129	$7,996
August	13	-	-	4,122	$7,604
September	30	-	-	5,121	$12,184
October	25	20	-	5,142	$11,394
November	2	5	-	14,987	$8,581
December	4	-	-	32,474	$14,064
January	-	-	-	34,094	$20,055
February	-	-	-	69,888	$7,188
March	-	-	330	249,900	$19,836
Total	**90**	**25**	**330**	**419,857**	**$108,902**

Solar Water Heater Pilot Program

The Solar Hot Water Heater Program was intended to be a one year pilot program that provided cash incentives to customers who have a qualifying solar domestic hot water ("DHW") system installed by an Energy Smart participating contractor. The customer must have an existing electric hot water heater to qualify. First year program results are below.

	Yr 1 Goal	Yr 1 Actual	% of Goal
kWh Savings	259,785	5,438	2.1%
Systems Installed	90	2	2.2%
Incentives	$90,000	$1,848	2.1%

Small Commercial Solutions Program

The Small Commercial Solutions Program provides assistance and incentives for the installation of certain energy efficiency measures that reduce consumption in small commercial facilities. Incentives are paid based on the annual kWh savings. The program pays a one-time incentive of $0.14 per kWh saved on an annualized basis. To participate, customers contact the program for a free assessment of their facility. Energy Smart calculates and approves the energy efficiency work and incentive. Once the project is complete, the Program staff post-inspects the work and the customer receives the incentive. The first year program results are below.

	Yr 1 Goal	Yr 1 Actual	% of Goal
kWh Savings	2,230,328	2,231,265	100.0%
Incentives	$278,000	$278,176	100.1%

Measures by Month

Month	Assessments	Lighting Projects	Non-Lighting	kWh savings	Incentives paid
April	10	-	-	-	-
May	7	-	-	-	-
June	5	2	-	137,460	$16,744
July	56	6	4	216,510	$26,801
August	8	2	-	198,690	$27,817
September	9	19	-	397,628	$54,978
October	0	13	-	277,109	$37,603
November	0	13	-	351,957	$49,005
December	0	1	-	27,571	$3,852
January	0	4	-	211,280	$29,579
February	0	2	-	69,725	$9,250
March-Closeout	0	12	-	33,924	$22,547
Total	**95**	**72**	4	**2,231,265**	**$278,176**

Large Commercial and Industrial Solutions

The Large Commercial and Industrial Solutions Program provides engineering assistance and incentives for the installation of certain energy efficiency measures that reduce consumption in large commercial facilities. Incentives are paid based on the annual kWh savings. The program pays a one-time incentive of $0.12 per kWh saved for non-lighting projects and $0.10 per kWh for lighting projects on an annualized basis. Incentives are capped at $50,000 per project. To participate, customers contact the program for a free assessment of their facility. Energy Smart calculates and approves the energy efficiency work and incentive. Once the project is complete, the Program staff post inspects the work and the customer receives the incentive. Year 1 Program results are below.

	Yr 1 Goal	Yr 1 Actual	% of Goal
kWh Savings	4,130,464	5,578,546	135.1%
Incentives	$461,000	$458,518	99.2%

Measures by Month

Month	Assessments	Lighting Projects	Non-Lighting	kWh savings	Incentives paid
April	18	-	-	-	-
May	13	-	-	-	-
June	5	1	1	531,844	$51,269
July	6	4		330,972	$33,097
August	5	9	1	588,200	$59,246
September	2	3	2	1,990,813	$108,843
October	0	2		205,735	$20,574
November	2	2		233,832	$23,383
December	0	5		450,545	$45,480
January	2	2		232,812	$23,281
February	3	1		12,746	$1,275
March-closeout	0	8	1	1,001,047	$92,070
Total	**53**	**37**	5	**5,578,546**	**$458,518**

Pilot Programs

Entergy New Orleans is administering 2 one year pilot programs for Energy Smart. These programs include the Solar Monitoring pilot and In Home Display ("IHD") pilot. There are no customer cash incentives related to either of these pilot programs. The Solar Monitoring program is an information pilot which will provide data on the value of solar power in New Orleans. The In Home Display pilot is a behavioral pilot to determine if real time access to your energy usage and an estimate of your monthly bill will affect a customer's usage. There is a kWh savings goal associated with the IHD pilot but not with the Solar Monitoring pilot. Because these programs did not commence until late in the plan's first year, and results will not be known until late in the program's second year, any savings associated with the IHD pilot will be contributed to the Year 2 Program savings.

Pilot Program Summary			
	Year 1 Goal	Year 1 Actual	% of Goal
Electric Savings (kWh)	428,100	0	0.0%
Incentive	0	0	0.0%

Solar Monitoring Pilot Program

The purpose of the New Orleans Energy Smart Solar PhotoVoltaic (PV) Monitoring pilot is to conduct a third-party study of PV performance and costs data in the New Orleans area. The one-year study will include data monitoring and collections from both residential and commercial installations. There are thirty (30) residential installations, fifteen (15) of which will be comprised from "Make-It-Right" housing stock, and fifteen (15) from "typical" housing stock throughout the City of New Orleans. Three (3) commercial installations will also be included in the pilot.

The one-year pilot program period to study the residential installations officially began on April 1, 2012 and will run through April 1, 2013. The official start period to study the commercial installations is targeted to begin in June. Efforts are underway to resolve an issue with one of the commercial locations that is experiencing equipment and data reliability issues and another that entails negotiating an access agreement with the data monitoring and collection system owners.

The approved funding allocated to the program is $100,000. The current project costs expended to-date are $62,053, with the majority of expenditures associated with procurement and installation of the data monitoring and collection systems as well as consultant services from NREL to provided technical assistance and guidance in developing the framework of the study and project plans.

A collaborative approach was used to outline the focus and framework of the study. Stakeholders participating in the discussions included representatives from Entergy New Orleans, Department of Energy ("DOE") -National Renewable Energy Laboratory (NREL), Make-It-Right (MIR) Solar and Gulf States Renewable Energy Industries Association (GSREIA).

NREL has been commissioned to oversee data collection and develop a report which will be filed with the Council and made publicly available. An agreement is in-place with MIR-GSREIA to install PV data monitoring and collection equipment and one is in-place with NREL to serve as the third-party to provide technical assistance, compile and analyze the data and produce the report. A cooperative endeavor agreement is also in-place between ENO and GSREIA to highlight the importance of industry input and the

broader team's commitment to facilitate accurate, helpful and customer-friendly information.

Once the final report is assembled, customer and stakeholder outreach is planned to communication and distribute the final report and key findings

In Home Display Pilot

The purpose of the New Orleans Energy Smart In-Home Display (IHD) Pilot is to determine if near real-time access to energy usage and estimated monthly electric costs will encourage electric customers to make behavioral changes to lower their electric usage. Through use of the new smart meter technology and an IHD monitoring device, customers will have a tool to view their energy usage and secure estimated monthly electric cost on a near real-time basis. Approximately 300 customers are being targeted to participate in the pilot.

The one-year pilot program period officially began on March 1, 2012 and will run through March 1, 2013.

To date, system performance of the new smart meter technology is excellent and customer issues in using the IHD device are minimal. A significant factor in the current success of the program was the lessons-learned during the design, integration and deployment of the AMI Smartview Program.

The program currently has 296 participants. Four (4) customers have voluntarily left the program. The reasons for departure include installations of net metering due to solar installations and limited interest in the program. The current "pairing report", or meter-to-IHD device connectivity report, shows that of the 296 participants, 266 or 90% have IHDs that are connected and fully-operational; 30 participants, or 10%, have devices that are not connected.

For devices that are not connected, the IHD Support Center conducts Customer outreach in an attempt to troubleshoot and remedy the connectivity problem. The significant findings in this effort are 1) in all cases, the new meter technology is performing as required, 2) in some cases, a hardware issue exist and the IHD device requires replacement, 3) customer actions require that the Support Center perform a reconnect of the IHD to the meter, and 4) consistency in reaching customers has proved to be a challenge.

The approved funding allocated to the program is $275,000. The current project cost to-date is $226,735, with the majority of expenditures associated with procurement and installation of the new AMI meters and IHD devices; design, integration and testing of the systems to support the new smart meter technology; and operations of the IHD Support Center.

Additionally, customers were allowed to participate in the program without regard to income limits or restrictions as was required for participation in the Smartview AMI Pilot.

All enrollments were made through an online application process and began in late Nov. 2011. The initial customer outreach focused on use of social media, primarily Twitter. The success rate for Twitter enrollments was less than 10 applicants over a 2-3 week period and the outreach plan was adjusted. The adjusted plan broaden the outreach to civic and community organizations and to applicants that were not eligible to participate in the Smartview AMI Pilot. Within a 3-4 week period, the enrollment success rate improved significantly and the goal of reaching 300 eligible participants was attained in late Jan. 2012. Eligible customers were e-mailed a "welcome letter" package to congratulate them on becoming eligible for the program and ineligible were notified as well.

Field deployment and change-out to the new AMI meters and delivery of the IHD monitoring devices began late Jan. 2012 and were completed by mid Feb. 2012. For those customers that were not at home to take delivery of the IHD, the device was mailed via UPS. During both delivery methods, additional "welcome package" information was provided to the customers to overview the program, activation of the IHD and methods to secure support via the delivered hard-copy material, the Energy Smart IHD Support Center toll-free phone line or the Energy Smart IHD website.

No major customer issues were identified during the customer enrollment period. Two issues were identified during deployment of the meters and delivery of the IHDs and each was satisfactorily addressed with minimum impact to the customer.

During deployment of the IHDs, 28 devices that were not fully upgraded and compatible to the new smart meter technology were inadvertently delivered to customers. Customers were contacted of the error and plans were implemented to minimize any inconvenience. Deliveries were made on Saturdays, and in those instances were necessary, arrangements were made directly with the customers to schedule delivery timeframes that were convenient for the customer.

Going forward, the major focus of the pilot remains satisfactorily performance of the new smart meter technology, prompt resolution of customer issues and maintaining customer interest in program. To help promote increased customer interest, program participants are being sent periodic emails regarding energy usage and efficiency tips, programs and events.

Also, participants will be sent 2-3 surveys during the course of the pilot to solicit feedback, comments and behavioral information regarding customer participation in the program.

Examples of customer outreach and correspondence are included in Appendix B.

There were 428,100 kWh of savings associated with the IHD pilot included the Year 1 goals. Because the program did not launch until the end of Year 1 performance, savings will be included in the Year 2 results.

IV. Marketing and Outreach

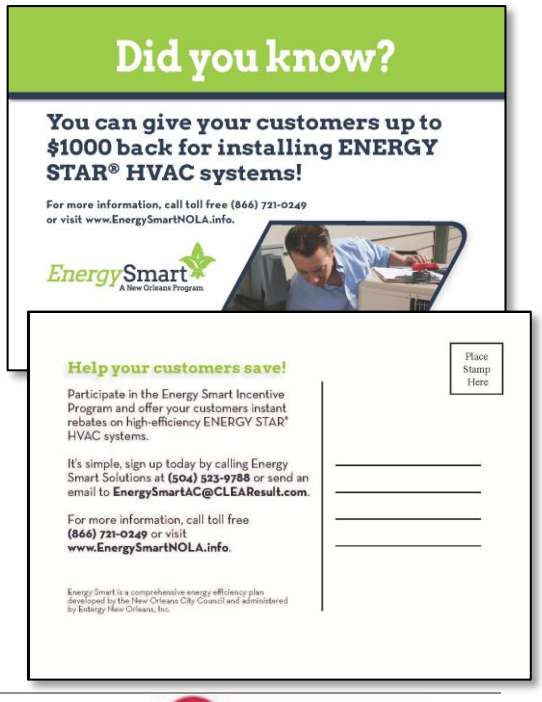
Energy Smart's marketing and outreach efforts created program awareness, increased program participation and promoted Energy Smart as a means to help customers become more energy efficient. As outlined below, Energy Smart focused its efforts on local contractor, community and customer outreach, in addition to using strategic marketing initiatives to reach target audiences and specific geographical areas.

Participating Contractors

A primary marketing channel for the Energy Smart Program was the network of auditors and contractors who performed audits, weatherization, and HVAC work. In Year 1 of the program, more than 60 trade allies supported the program, performing energy audits, air sealing, installing insulation, A/C Tune-ups, and HVAC replacements.

Energy Smart created marketing materials to recruit and train trade allies to effectively promote the program. This regular outreach included face-to-face meetings, email newsletters, post cards, and group training sessions. Local contactor outreach included these groups:

- City of New Orleans DBE list
- Hispanic Chamber of Commerce
- HBA of Greater New Orleans
- Cold Calling – in person and by phone
- New Orleans Home and Garden Show
- Internet
- Mayor's Economic Summit list
- Southeast Coalition of A/C Contractors
- Louisiana Heat Pump Association
- City of New Orleans permitting database



Program goals included increasing the number of participating contractors, the number of minority owned contractors as well as the number of rebates submitted per contractor. Interested local contractors were encouraged to participate in the program. There is no cost for the contractors to participate. Contractors must sign a Participating Contractors agreement, submit copies of applicable licenses, liability insurance, references and meet with the program manager to participate.

Significant outreach led to participation by over 60 licensed, insured, and experienced contractors of which approximately 33% are minority owned. The contractors are listed below by program:

Participating Contractor List

Residential Solutions - Energy Consultants	
Home Performance Diagnostics	Riverview Construction
Construction Specialists Group	Rebirth Energy Systems
In-tech Insulation and Consulting	Digital Living
Project Homecoming	E & I
Global Green, USA	Avak Consulting Services
Star Energy Solutions	Diversified Energy
Core USA	OWL Technologies, LLC
Greenwood Home Energy	Greenwood Home Energy
Brotherhood Way General Contractors LLC	HLN Energy Services
Green Apple Foam Insulation	Wilserv, Inc
Smart Energy Solutions	Retro-Fitz
Residential Solutions – Contractors	
Calmar Corporation	Riverview Construction
Construction Specialists Group	GreenBean Insulation
Bywater Sheet Metal Works and Roofing, Inc.	Louisiana Home Specialists, LLC
HLN Energy Services	In-tech Insulation
Green Apple Foam Insulation	Retro-Fitz
Ozone Green Spray Foam	Star Spray Foam Systems
Fontenot Insulation LLC	Wilserv
Simmons and Simmons	Envirogreen
Brotherhood Way General Contractors, LLC	Advanced Mechanical
Air Conditioning Ambulance	OWL Technologies, LLC
Project Homecoming	Taylor and Tyler, Inc.
Green Energy Solution	The Weatherization Company, Inc
Solar Water Heater	
Comfort Engineered Systems	Riverview Construction
Solar Alternatives	Brotherhood Way General Contractors, LLC
Sunergy Solar Solutions	

A/C Tune Up Contractors	
Riverview Construction	Help Heating and Air Conditioning
Robert Refrigeration, Inc	Berner Air Conditioning and Heating
Burkhardt Air Conditioning	Dyer's A/C and Heating
Cold Air Now!, LLC	Southern Services A/C & Heating
Home Air Solutions	Air One Heating & Cooling
The Weatherization Company, Inc.	Comfort Engineered Systems
A & H Service Co., Inc.	Metro A/C and Heating
Authentic Air LLC	ATI Anderson Technicians, Inc.
GBOB Enterprises, LLC	Bryan's United
Pullen Air Conditioning, Inc.	General Heating and Air
Energy Star Air Conditioning Contractors	
Help Heating and Air Conditioning	ATI Anderson Technicians, Inc.
Berner Air Conditioning and Heating	Robert Refrigeration, Inc
Dyer's A/C and Heating	Taylor and Tyler, Inc.
Southern Services A/C & Heating	Hinton A/C
Air One Heating & Cooling	Total Maintenance, Inc.
Flettrich Services, Inc.	Burkhardt Air Conditioning
Advanced Mechanical, Inc	Cool Air, Inc.
Surgi's Heating and Air Conditioning	Brotherhood Way General Contractors LLC
Comfort Engineered Systems	Cold Air Now!
Cool Master, Inc.	Home Air Solutions
Bryan's United	The Weatherization Company, Inc.
General Heating and Air	A & H Service Co., Inc.
Riverview Construction	Authentic Air LLC
Metro A/C and Heating	GBOB Enterprises,
	Pullen Air Conditioning, Inc.

Another goal of the program was to increase the number of rebates submitted by contractor. The number of rebates submitted per contractor is often an indicator of the perceived value of the program. The program strives to educate Contractors about the benefits of selling energy efficiency and participating in the Program.

The Contractors who provided customers with the highest level of incentive payments are shown by program in the chart below.

Highest Performing Contractors

*Program	Contractor	# of Rebates Submitted
ESTAR Air Conditioning	*Help A/C*	24
ESTAR Air Conditioning	*Hinton A/C services*	5
ESTAR Air Conditioning	*Taylor and Tyler*	3
A/C Tune-Up	*General Heating and Air*	434
A/C Tune-Up	*Help A/C*	100
A/C Tune-Up	*Comfort Engineered Systems*	67
Residential Solutions-Auditor	*Diversified Energy*	216
Residential Solutions-Auditor	*Rebirth Energy Solutions*	148
Residential Solutions-Auditor	*E & I Consulting*	98
Residential Solutions-Contractor	*RetroFITZ*	87
Residential Solutions-Contractor	*In-Tech*	78
Residential Solutions-Contractor	*Envirogreen*	73

*Only programs with participating contractors are included.

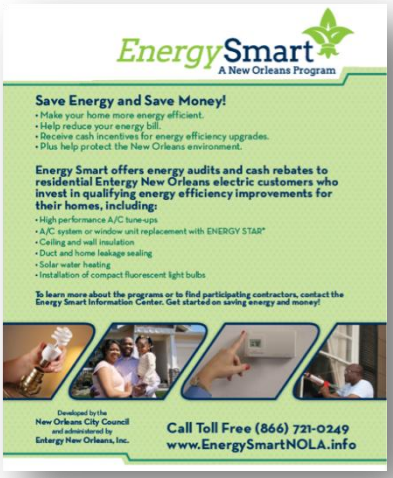
Customer Outreach

Community awareness is a major driver of participation and customer satisfaction. Energy Smart utilized multiple marketing channels to promote the programs.

Marketing and outreach included:

- Neighborhood Association Summit
- Energy Smart presentations at all existing New Orleans public libraries.
- Bill inserts to all Entergy New Orleans residential customers.
- Predictive dialing to all ENO residential customers.
- Bus advertising

- Radio advertising
- Press releases, and twitters on various events, programs and milestones.
- Email-blasts
- Door hangers
- flyers
- Multiple presentations to neighborhood associations
- Multiple marketing pieces distributed through contractors and at civic events



- Development of a variety of marketing materials, shown at the end of this section.

Energy Smart Information Center (One-Stop Shop)

The **Energy Smart Information Center** (ESIC) is the combination of phone, website and in-person staff available for customers to reach Energy Smart to participate, have their questions answered, and receive information on other energy efficiency programs.

Month	Phone calls received	Website hits
April	175	
May	125	1,132
June	362	1,345
July	271	1,338
August	2,168	1,248
September	1,071	778
October	178	994
November	157	820
December	180	1248
January	217	2665
February	305	2555
March	251	1,211
Total	5,460	15,334

In addition to the call center and website, Energy Smart staffed a physical location appropriately named the Energy Smart Information Center. This location allowed participants to meet directly with a staff person and ask questions. The ESIC was located in thee Entergy New Orleans, Inc. East Bank Customer Care Center for the first half of the year, and is now partnering with the New Orleans public libraries to host

presentations, present information, and provide an ESIC staff person to answer questions. The expected schedule of locations is below:

- ENO Customer Care Center (June 2011 to February 2012)
- Partnership with New Orleans Public Library
  - Main library: February 2012 to May 2012
  - Norman Mayer (Gentilly): May - June 2012
  - Robert E Smith (Lakeview): July – August 2012
  - East N.O. Regional: September – October 2012
  - Rosa F. Keller (Broadmoor): November – December 2012

V. Customer Satisfaction

As part of Energy Smart's commitment to program quality, surveys were sent to all program participants. The surveys were administered by GCR and Associates. An overview of the survey results received through May 21st is shown below. A more detailed review of survey results is included as Appendix A.

Any customer who responded that their experience was less than "good" or "excellent" was contacted by Energy Smart to follow up on their issue or concerns.

Program	Total # respondents	% of Responses good or excellent
Residential Solutions	47	99%
A/C Tune-up	10	100%
Direct Install CFL	55	99%
ESTAR Air Conditioning	42	98%
Weatherization Ready	10	93%
New Homes	2	100%
Small Commercial	22	98%
Large Commercial	6	99%
Total	162	**98.5%**

VI. Program Findings

In its first year, the Energy Smart several program enhancements in an effort to increase participation and energy savings. Some of the issues faced during the first year of the programs were due to regulatory or market changes since the programs were designed in 2009. The first year findings/discoveries are detailed below as well as any program enhancements that were made.

Residential Solutions

Floor Insulation

Shortly after program launch CLEAResult staff noticed that the floor insulation requirement in the deemed savings was R-19. The DOE recommended insulation levels for this climate zone are R-13. Installing R-19 in an elevated floor would have been extremely cost prohibitive and participation would have been negligible. The program modified the floor insulation requirements to R-13 and the CLEAResult Engineering group revised and reduced the kWh savings for the measure to ensure its cost effectiveness. The result of this change was substantial participation. 117 rebates were submitted for this measure.

Energy Assessments

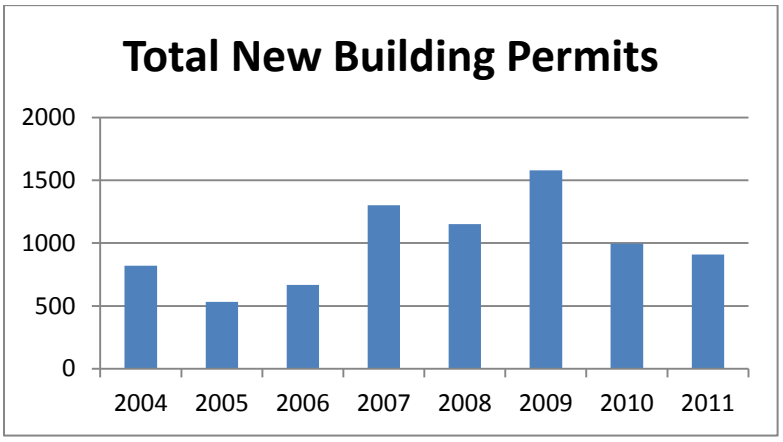
Energy Smart requires an energy assessment before a participant is eligible for weatherization, air and duct sealing rebates. The program would provide an incentive once an energy assessment was performed. During the course of the year the program noticed an increase in the number of assessments being submitted to the program yet the number of rebates submitted remained unchanged. Also, incentives paid for energy assessments are from the same budget as rebates for work performed. The more incentives paid for assessments results in fewer funds being available to pay for weatherization rebates and energy savings. In order to best utilize funding to increase energy savings while moving to transform the market for energy efficiency, the program will change its audit incentive structure so that Energy Consultants receive a portion of their incentive up front and the remaining once work has been performed. This change will prevent companies from only providing audits and not properly educating the customer on energy efficient upgrades. The change is to take effect on July 5, 2012.

Energy Efficient New Homes Program

Number of permits

When the Energy Smart programs were approved in 2009, New Orleans was at a peak in new home building, due to both the post-Katrina development, and the overall national housing boom. Since then, new home building has declined when measured by building

permit activity provided by the City of New Orleans permitting database. According to this data, building has declined about 42% from the 2009 level of 1580 permits. In 2011, the number of permits issued for new construction including doubles, singles and ½ of party-wall doubles was 910. See permit comparison below.



Total New Building Permits (single, double and ½ party wall double) applied for by year. Source: City of New Orleans permitting database.

Analysis shows that the New Homes Program participation goal is now higher than the total number of new home permits applied for in the city. The Year 2 Energy Smart New Homes Program participation goal is 1,632 homes.

Government incentives

In 2011, the program also faced a challenge when the state of Louisiana's Department of Natural Resources New Home Energy Rating Option ("HERO") program ended. The state rebate provided up to $2,000 in rebates for building new homes to high efficiency standards that had a Home Energy Rating ("HERS") performed. Without the state incentive, the Energy Smart $375 HERS incentive was too low to motivate builders to include energy efficient designs in their homes.

The combination of the high kWh program goal and the low number of new homes being built as described above, forced the program to change its requirements in an effort to increase participation.

Energy Smart developed a prescriptive option (measures) in addition to performance only (HERS rating). The new option allowed builders the choice of submitting a HERS rebate or receive incentives for installing individual or prescriptive energy efficiency measures in new homes. The measures and incentive amounts are in the table below.

Prescriptive Option

Measure	Measure Type	Incentive
HERS 70	Performance	$375
HERS 71-85	Performance	$200
Central A/C	Prescriptive	$175 per unit
Heat Pump	Prescriptive	$225 per unit
Heat Pump DHW	Prescriptive	$250 per unit
ESTAR Windows	Prescriptive	$0.36 per sf of window
ENERGY STAR Advanced lighting Package	Prescriptive	$100 per home

Energy Smart also contacted over 400 builders to inform them of the program, and reached out to major government funded new home building projects about the program.

ENERGY STAR A/C Program

The Energy Star A/C program was designed to benefit from the federal tax credit of $1,500 for installing energy efficient central HVAC systems. The Energy Smart Program was designed to provide an average incentive of $400 for installing a 3 ton 16 SEER central air conditioning system. Together, the federal and Energy Smart incentive covered a majority of the incremental cost to upgrade to a high efficiency system.

The federal tax credit, available in 2009-2010, was reduced to a maximum of $300 in 2011, and eliminated for 2012. The standalone Energy Smart incentive for central HVAC systems did not cover a significant portion of the incremental cost to upgrade and thus motivate buyers or HVAC contractors to install energy efficient units.

In response to this, Energy Smart doubled the rebate amounts per system in August, 2011 in an effort to increase participation and energy savings. Original and revised rebate amounts are shown in the tables below:

Original central HVAC rebates

	SEER		
ENERGY STAR Rated	14.5 - 14.99	15-15.99	16 & above
A/C only	$175	$250	$350
A/C & Heat Pump	$225	$300	$400

Revised central HVAC rebates

Central Systems	SEER Range				
Size (in tons)	14.5 - 14.99	15 - 15.99	16 – 16.99	17 – 17.99	18 & above
1.5	$150	$175	$200	$250	$300
2	$175	$225	$250	$350	$375
2.5	$200	$275	$325	$450	$475
3	$250	$325	$400	$525	$575
3.5	$300	$400	$450	$625	$675
4	$350	$450	$500	$700	$750
5	$425	$550	$650	$900	$950

Solar Water Heater Pilot Program

The Solar Water Heater Pilot program faced challenges related to permitting issues that greatly impacted participation. The State of Louisiana Department of Health and Hospitals had proposed language in the plumbing code that would have required new Solar water heater systems to install a backflow preventer. Backflow preventers require a yearly inspection that adds significant cost to owning an operating a solar hot water system. The Program kept abreast of the permitting issues by communicating with Gulf States Renewable Energy Industry Association ("GSREIA") throughout the year. Code restrictions have been adjusted and solar installations are expected to be more prevalent. However, due to the long period of uncertainty, very few installations were completed and the market for solar water heating has declined significantly. While this program was originally planned for the first program year only, Energy Smart will continue to offer the program and monitor its results during the second program year.

Weatherization Ready

This program also was designed to supplement federal funds, specifically funds through the federal LIHEAP Weatherization Assistance Program ("WAP") designated to weatherizing homes of low income residents, administered through Total Community Action (TCA). Approximately 10% of all homes which apply for WAP funding do not qualify due to structural and air infiltration issues. Energy Smart funds were to be utilized to make the homes "weatherization ready" to qualify for WAP funds. Due to cuts in federal WAP funding, Energy Smart changed the focus of this program to provide direct weatherization through other income qualifying Non-profit organizations in the city. As a result, Energy Smart weatherized 25 income qualified homes, replaced and recycled 90 Window A/Cs, and installed 330 direct install measures at no charge to participants.

A/C Tune Up Program

Through communication with the participating contractors, Energy Smart discovered that there was a shortage of qualified technicians that are able perform to A/C tune-ups during peak summer season. The HVAC companies have their staff busy installing more profitable new systems instead of performing A/C tune-ups. Energy Smart is working to establish a training program that would produce technicians who are capable of performing A/C tune-ups to the program's standards. The newly trained technicians will help fill the void and enable the HVAC companies to provide A/C tune-ups throughout the peak replacement season.

Direct Install CFL Program

The CFL program realized changes in both the cost of CFL bulbs and the average wattage of replaced bulbs. Higher costs were realized while implementing the program. Due to a shortage of phosphorous worldwide, the cost of CFL's increased significantly since the program was designed in 2009. Also, the average kWh savings per bulb replaced was lower than projected due to the fact the majority of the bulbs being replaced in the field were 60 Watt instead of the projected 75 Watt. As result, funding was moved from other underperforming programs so this program could continue its momentum. Incentive transfers are listed later in this report.

CFL Installation - Projected vs. Installed

	Yr 1 Projected	Yr 1 Installed	% Change
Number of CFL	45,000*	83,000*	+184%
kWh savings per bulb	75.8	41.3	-28.2%

*Number of bulbs need to achieve goal of 3,424,013 kWh.

Small and Large Commercial Programs

The commercial programs were extremely successful and surpassed their first year savings goals. Lighting projects remained the dominant project type. Lighting projects are the most popular projects type because of the short payback time or the time needed to recoup the project investment. Businesses look for projects with a return on investment of approximately 2 years or less. Specifically, small business owners often indicate their future at the location is uncertain due to lease term or profitability. Small business owners will not invest in a building if they will not be there to recoup their investment thru savings.

VII. Budget Information

Overall program spending was within the Year 1 budget. A breakdown of the Year 1 budget versus actual spending is below.

Program Funding and Allocation- Year 1

	$ Thousands		
	Yr 1 Budget	Yr 1 Actuals	Variance
TPA Administered Residential Program Funding	1,776	1,661	(115)
TPA Administered Small Commercial Program Funding	665	665	0
TPA Administered Large Commercial Program Funding	1,000	998	(2)
ENO Administered In-Home Display Pilot	280	227	(53)
ENO Administered Solar Monitoring Pilot	100	62	(38)
Independent Monitor/ RFP Expenses	99	128	29
Total	**3,920**	**3,740**	(180)

VIII. Movement of Incentive Funds

Due to the opportunities and challenges discussed above, several programs several programs performed better than expected while others fell short of their goals. Energy Smart transferred incentive funds from underperforming programs to the performing programs. The movements of funds ensured that funding was always available for the successful programs and their momentum continued. Funding was not transferred between rate classes. The Year 1 Incentive fund summary is below.

Incentive Transfers

Program	Incentive Budget	Transfers						Deposits 2011-12 (including transfers)	Expended to Date	Balance
		A	B	C	D	E	F			
Residential Solutions	198,000	70,000	28,000		43,000	23,000	(4,900)	357,100	356,580	519
Energy Star A/C	119,000			(50,000)	(43,000)		300	26,300	26,080	220
A/C Tune Up	119,000		(28,000)			(17,000)		74,000	73,070	930
CFL Direct Install	90,000		30,000	50,000			(900)	169,100	169,010	89
Energy Efficiency New Homes	132,000	(70,000)	(30,000)				5,500	37,500	37,287	212
Low Income	140,000							140,000	108,902	31,097
Solar WH Rebate	90,000					(6,000)		14,000	1,848	82,152
Small Commercial Solutions	278,000							278,000	278,176	(176)
Large Commercial Solutions	461,000							461,000	458,517	2,482
Total Year 1 Activity	**1,627,000**							**1,557,000**	**$1,509,472**	**$117,527**

Transfer Details

Transfer A

Residential Solutions program was very successful and was out of incentives. New Homes Program not projected to utilize all funding. $70,000 was moved from New Homes Program to Residential Solutions.

Transfer B

Residential Solutions program continued to gain momentum. A/C Tune-up program not projected to utilize all funding. $28,000 moved from A/C Tune-up to Residential Solutions. CFL program experienced higher material costs. New Homes Program not projected to utilize all funding. $30,000 moved from New Home program to CFL Program.

Transfer C

CFL Program realized lower savings per install and more bulbs were needed to achieve goal. Energy Star A/C not projected to utilize all funding. $50,000 transferred from Energy Star A/C program to CFL Program.

Transfer D

Residential Solutions success continued. ENERGY STAR A/C not projected to utilize all funding. $43,000 moved from ENERGY STAR A/C to Residential Solutions.

Transfer E

Residential success continued. A/C Tune-up program and Solar water heater not projected to utilize all funding. $6,000 moved from the Solar water heater program and $17,000 moved the A/C Tune-up program to Residential Solutions Program.

Transfer F

The New Homes program received projects for payment sooner than expected. Residential Solutions submissions slowed and $4,900 was moved from Residential Solutions back to the New Homes program. With the exception of the Low Income and Solar Water Heater Programs, the goal was to utilize any remaining residential incentive funding. This goal is the reason small transfers took place.

IX. Deemed Savings

As part of the Energy Smart Program EM&V Plan, an Independent Evaluator, Optimal Energy, was tasked to review the current approved Energy Smart (March 2009) Deemed Savings baseline efficiency levels. This was done to assure that the appropriate baselines are being used to calculate the per measure energy savings. Furthermore, Optimal reviewed the methodologies used for each measure and confirmed that input assumptions were in accordance with industry standards and best practices. Based on their review, the following deemed savings modifications were identified. Optimal recommended that deemed savings be developed for new measures and adjustments to below, with CLEAResult's recommended approach to meet this requirement. Optimal's deemed savings review is included as Appendix D.

Analysis Comment - 1

- ✓ Document sources for all assumptions in deemed savings document. If based on modeling, include a description of all modeling inputs in an appendix.

CLEAResult Action

- ✓ This comment primarily applies to specific measures in the Residential Solutions Program (see Affected Measures column). These measures were originally developed by Frontier Associates using EnergyGauge or ESPRE, both residential energy modeling tools. To generate the New Orleans deemed savings, Frontier took deemed savings values from the Houston climate zone and weather-adjusted them to New Orleans using heating and cooling degree days. Based on Optimal Energy's review they observed that these deemed savings values were appropriate and "in-line" with deemed savings from other jurisdictions. The intent of this recommendation was to provide additional documentation to "increase transparency and ease of future update".

CLEAResult believes the existing documentation to be sufficient, given the savings values are "in-line" with industry accepted values.

If further information is needed, these measures methodologies were based on deemed savings programs in Texas and the savings documentation is publically available through the Public Utility Commission of Texas (PUCT) filings. These documents provide a more thorough explanation, such that the assumptions used and modeling inputs can be derived from the publically available documentation..

Affected Measures

- ✓ Ceiling Insulation, Wall Insulation, Floor Insulation, ENERGY STAR Windows, Air Infiltration, Solar Screens, Duct Efficiency Improvement

Analysis Comment – 2

- ✓ Include O&M and gas savings in deemed savings document

CLEAResult Action

While both O&M and gas savings are counted in Total Resource Cost (TRC) tests in other jurisdictions, Entergy New Orleans' programs focus on electric benefits. As a result, measure costs used in TRC analysis should "net out" both O&M and gas savings to the extent that both resources play a part in participant decisions. CLEAResult has not adjusted the deemed savings document to calculate O&M and gas savings impacts.

Affected Measures

- ✓ All Measures

Analysis Comment – 3

- ✓ Add a systematic approach for dealing with early retirement retrofits

CLEAResult Action

For all air conditioning equipment retrofit measures, CLEAResult created a systematic approach to handle early retirement retrofits. This approach accounts for the equipment's expected useful life and estimates the remaining useful life based on the average survival rate of the equipment being replaced. Upon request a detailed explanation of this approach is available.

Early retirement (ER) involves the replacement of an existing system that has a remaining useful life (RUL). For an early retirement retrofit the baseline will be based on the system's manufactured year and the corresponding ASHRAE 90.1 standard effective during the existing equipment's manufactured year, which in most part follows the latest federal manufacturing standard.

For early retirement (ER) projects the measure's energy savings will be calculated by considering the project to have two separate components:

1) An ER project that provides savings over the RUL of the replaced system defined by the incremental efficiency between the replaced system baseline efficiency and that of the installed system, and

2) An replace on burnout (ROB) project that would have a standard EUL (e.g. 15 years for unitary equipment), with savings defined by the incremental efficiency between that of the installed systems and the ROB project baseline efficiency.

Since these two components have different measure lives, a weighted average savings is estimated by weighting the RUL of the ER component with the incremental energy savings from the efficiency improvement from the replaced system to the installed system and weighting the EUL of the ROB component with the energy savings from the incremental efficiency between the baseline efficiency and that of the installed system. This weighting helps account for the average annual savings for the standard EUL of the system. The equation below helps summarize this method.

Weighted ER Measure Savings (kWh) = (kWhER×RUL + kWhROB×(EUL-RUL)) / EUL

Where:
kWhER = Early Retirement (ER) Energy Savings
kWhROB = Replace on Burnout (ROB) Energy Savings
Remaining Useful Life (RUL)
Estimated Useful Life (EUL)

Affected Measures

- ✓ Room AC, Unitary AC & HP, Chillers

Analysis Comment – 4

- ✓ Add information necessary to calculate TRC

CLEAResult Action

When conducting a cost-effectiveness review, CLEAResult researches and assigns measure costs based upon publicly-available and vetted industry sources. CLEAResult will document its assumptions and can add measure cost information where appropriate to the deemed savings document as cost-effectiveness results are determined.

Affected Measures

- ✓ All Measures

Analysis Comment – 5

- ✓ Solar Screen: Update baseline SHGC assumption

CLEAResult Action

The existing deemed savings assumes a base SHGC of 0.75. CLEAResult has program eligibility requirements in place to ensure only windows with existing SHGC greater than or equal to 0.75 (e.g. single-pane glass) are incentivized. This ensures the validity of the savings estimates.

Affected Measures

- ✓ Solar Screens

Analysis Comment – 6

- ✓ Variable Speed Pool Pumps: Find source documenting assumption of 365 day of pool operation, or use more conservative estimate

CLEAResult Action

CLEAResult maintains that the 365 day assumption is the best available industry data. It is primarily based on a 2002 PG&E Pool Pump metering study performed by ADM Associates of over 300 pool pump residential installation. In addition, based on research of several pool pump manufacturer's literature the best practice is to operate the filtration system daily. Therefore the 365 day assumption appears to be appropriate since the pool's filtration system is typically operational throughout the year.

Affected Measures

- ✓ Variable Speed Pool Pumps

Analysis Comment – 7

- ✓ Commercial HVAC measures: update efficiencies to match current CEE specification.

CLEAResult Action

Updated table to match the current CEE specifications.

Affected Measures

- ✓ Commercial and Residential Unitary AC and HP

Analysis Comment – 8

- ✓ Commercial HVAC measures: find documentation for coincidence factor of 1.0, or use 0.8.

CLEAResult Action

CLEAResult will use a 0.8 coincidence factor for all HVAC measure when calculating demand savings.

Affected Measures

- ✓ All Commercial and Residential HVAC measures

Analysis Comment – 9

- ✓ HVAC measures: ensure a consistent methodology in deriving full load hours for residential and commercial HVAC, and describe in deemed savings document

CLEAResult Action

For residential HVAC measures, the EFLH are based on ENERGY STAR's AC & Heat Pump energy savings calculator.

For commercial HVAC measures, the EFLH are based on a regression model derived from multiple publically-available sources (AR TRM, Texas LoanStar program, and ENERGY STAR). The regression model accounted for various building types and weather data (using Heating and Cooling Degree Days), allowing one to calculate the applicable EFLH for a particular city. Upon request a detailed explanation of this approach is available.

Affected Measures

- ✓ All Commercial and Residential HVAC measures

Analysis Comment – 10

- ✓ Commercial HVAC: use less stringent 2008 federal standards, rather than ASHRAE 90.1-2007, as baseline for retrofits

CLEAResult Action

For new construction and replace on burnout, the baseline will be ASHRAE 90.1-2007. For an early retirement retrofit the baseline will be based on the system's manufactured year and the corresponding ASHRAE 90.1 standard effective during the existing equipment's manufactured year, which in most part follows the latest federal manufacturing standard. This is an integral part of CLEAResult's systematic approach to handle early retirement retrofits.

Affected Measures

- ✓ All Commercial and Residential HVAC measures

Analysis Comment – 11

- ✓ Chillers: Develop algorithm for water cooled chillers from kW/ton

CLEAResult Action

For new construction and replace on burnout, the baseline will be ASHRAE 90.1-2007. For an early retirement retrofit the baseline will be based on the system's manufactured year and the corresponding ASHRAE 90.1 standard effective during the existing equipment's manufactured year, which in most part follows the latest federal manufacturing standard. This is an integral part of CLEAResult's systematic approach to handle early retirement retrofits.

Affected Measures

- ✓ Chiller Measures

Analysis Comment – 12

- ✓ Lighting Measures: Develop strategy to account for baseline shift due to new federal standards

CLEAResult Action
CLEAResult developed a modified estimated useful life (EUL) to account for the diminishing remaining useful life of T12 Baseline systems currently operational in the field. The same approach was utilized in a recent filing approved by the Public Utility Commission on Texas (docket #39146). Under this approach, High Performance and Reduced-wattage T8 Systems (per the Consortium for Energy Efficiency - CEE specifications) will be required on projects involving T12 magnetically ballasted baseline equipment. These changes will take effect on August 1, 2012, which corresponds to new T12 lamp requirements that are scheduled to take effect in mid-July 2012.

Affected Measures

- ✓ All Commercial Lighting Measures

Analysis Comment – 13

- ✓ Duct sealing: Require that ducts run through an unconditioned space to be eligible for the measure

CLEAResult Action

The deemed savings documentation defines the condition and unconditioned space criteria. To ensure this duct sealing measure is properly applied there is pre-qualification language in the deemed savings documentation to address this comment. Language will also be included in the program documentation. Inspection procedures are in place to validate eligibility.

Affected Measures

- ✓ Duct Sealing

Analysis Comment – 14

- ✓ Unitary AC: update typo in table - IEER should be 9.4, not 94

CLEAResult Action

Table has been updated.

Affected Measures

- ✓ Unitary AC

Analysis Comment – 15

- ✓ Heat pump replacement: revise column headers to be more explicit about the range of covered efficiencies - e.g., ">= 8.0 and <8.2"

CLEAResult Action

Deemed savings table has been updated.

Affected Measures

- ✓ Heat Pump Replacement

Evaluation Measurement & Verification

The delivery of the Evaluation Measurement and Verification (EM&V) function of the Energy Smart Program is a requirement of the Third Party Administrator i.e. CLEAResult. In order to maintain transparency and an arms-length review of Energy Smart results and savings, CLEAResult issued a request for proposal for an experienced third party EM&V contractor. Optimal Energy was chosen to conduct an independent evaluation of the energy savings achieved through the Energy Smart Programs implemented by CLEAResult. A summary of the results of the evaluation are included

in this document. The goal of evaluation was to review participant documentation to assure that program savings were calculated appropriately, determine that appropriate "deemed savings" were applied, and provide a Final Energy Smart – Energy Savings Impact Report for Program Year 1.

Optimal Energy's review process included the review of program database, project documentation and quality assurance inspection results to confirm appropriate calculation of program savings. Optimal Energy further evaluated the process utilized by CLEAResult to calculate savings for custom projects which require the utilization of the International Protocol for Measurement and Verification Procedures. The program by program verified savings calculated by Optimal are listed below along with key recommendations based on Optimal Energy's findings.

Verified Savings

Program	Reported kWh Savings	Verified kWh Savings	kWh Realization rate	Reported kW Savings	Verified kW Savings	kW Realization Rate
CFL Direct Install	3,726,006	3,776,511	1.01	604	612	1.01
AC Tune-Up	429,291	406,374	0.95	223	221	0.99
Residential Solutions	3,080,830	2,984,079	0.97	623	749	1.20
Energy Star Air Conditioner	134,655	152,201	1.13	49	56	1.14
New Homes	207,067	207,067	1.00	65	65	1.00
Low Income	419,858	419,208	1.00	67	95	1.42
Solar Hot Water	5,438	5,438	1.00	1	1	1.00
Commercial and Industrial	7,809,811	7,891,461	1.01	1,326	1,338	1.01
Total	**15,812,956**	**15,842,339**	**1.0**	**2,958**	**3,137**	**1.06**

Key Recommendations

The evaluation also identified several key recommendations to ensure that the high quality of the data continues, and that program savings estimates are accurate. These include:

Optimal Energy Key Recommendations	CLEAResult Actions
✦ Ensure that the project savings information is updated based on post-inspection verification information.	All 2012 projects are being captured in a new project database. CRM captures this information accurately.
✦ Ensure that the instructions for which wattage CFLs should replace any given incandescent bulb are consistent between the Residential Solutions program, the CFL DI program, and the deemed savings documentation. These instructions should be based on the requirement of maintaining the same lumens pre- and post-installation. Any reduction in light output after the direct install will make it more likely for the customer to switch back to incandescent, thus negating the energy savings.	The 2012 Programs are calculating CFL savings based on the 2002 DOE lighting study. All installation locations and wattages are being recorded.
✦ Ensure that envelope measures for detached homes with multiple dwelling units are only counted once. This was especially an issue for the low-income program, which had many projects in 2-3 family homes.	All dwelling units will be accurately named and will be recorded in CRM. All 2012 projects are now being captured in CRM.
✦ Include the lighting calculator with the commercial lighting project files. This will make it far easier to verify savings, and update savings after any post-installation verification.	All 2012 project lighting calculators that are directly associated with the project are being uploaded into CRM.
✦ Ensure that all contractors are using the most up-to date version of the lighting calculator.	The updated lighting calculator has been distributed for use in the field.
✦ Consider adding a factor representing HVAC interactive effects for savings calculations.	The current lighting calculator dies account for interactive HVAC

Residential Solutions

The 2012 program will see a few changes including; the addition of radiant barrier to the approved measure list, incentive structure for energy audits, and the program transitioning to Home Performance with Energy Star. In addition, there will be an increased focus on the multi-family customer segment based on the successes in Year 1 of the program.

Radiant Barrier

Radiant barriers are designed to block radiant heat transfer between a building roof and the attic space insulation. They are typically comprised of a metallic foil material (usually aluminum), and generally installed on the roof decking or beneath roof sheathing. Radiant barriers are most effective at reducing cooling consumption by reflecting heat away from conditioned space.

Efficiency Requirement

The efficiency requirements for radiant barriers must meet the standards set by the Reflective Insulation Manufacturers Association International (RIMA) and must meet proper attic ventilation requirements.

All radiant barriers should be installed according to the RIMA Handbook Section 7.4. However, horizontal installations are not eligible due to the likely hood of dust build up and wear and tear damaging the radiant barrier.

- Radiant Barrier emittence must be 0.10 or less to qualify
- The radiant barrier must not be installed on top of the attic floor insulation
- If the radiant barrier has foil on only one face, install the foil-face down to minimize dust accumulation on reflective surface
- Install radiant barrier under the roof by stapling to the underside of the rafters
    - A radiant barrier cannot be in contact with any other materials on its underside or else it becomes defective.
- Fully cover 100% of underside of roof

Interior radiation control coatings (IRCCs) are not applicable.
IRCCs emittance ratings are substantially higher than radiant barriers, and therefore do not reduce heat gain at the same rate as a radiant barrier. A study performed by RIMA found that none of the coating type products currently on the market had an emittance of 0.10 or lower as required by the standards set by the American Society for Testing and Materials (ASTM) for a product to be considered a radiant barrier. Therefore, all coating materials and spray application materials are ineligible.

Incentive Amount

An energy assessment will be required before a radiant barrier rebate can be issued. Incentive is based on the square footage of the roof area that it is being installed to. Incentives will be based on $0.07 per sf of barrier installed.

Measure Savings

Savings for this measure were developed by CLEAResult and the table below lists the savings by heating type.

Existing Home: Radiant Barrier - Climate Zone New Orleans, LA			
Electric A/C And Heating Type	Site Built Home		
	kWh Savings per sq. ft. Roof Deck Treated	Therm Savings per sq. ft. Roof Deck Treated	Summer Peak kW Savings per sq. ft. Roof Deck Treated
Ducts Located in Attic Space			
Gas Heat	0.2740	0.0030	0.00024
Electric Heat	0.3263	n/a	0.00023
Heat Pump	0.2969	n/a	0.00023
Ducts Located in Conditioned Space			
Gas Heat	0.2131	0.0025	0.00013
Electric Heat	0.2690	n/a	0.00013
Heat Pump	0.2410	n/a	0.00013

Energy Assessment Incentive Structure

As a result of lessons learned from Year 1, the program will modify the Energy Assessment incentive structure in an effort to motivate the auditors to better educate the homeowner on the benefits of energy efficiency upgrades and discourage door to door audits. The incentives will no longer be based on the size of the home but will instead be based whether measures were installed. In order to best utilize funding to increase energy savings while moving to transform the market for energy efficiency, Energy Consultants will receive a portion of their incentive up front and the remaining once work has been performed.

Energy Assessment Incentives

Assessment Type	Level 1	Level 2
Initial "Pre" Assessment	$75	$100
"Post" Assessment (After work performed)	$50	$150
"Post" Assessment w/CAZ	$75	$175
Total Incentive	$125-150	$250-$275

Market Transformation - Home Performance with Energy Star

The Residential Solutions program has applied to become a Home Performance with Energy Star ("HPwES") program. The change will not affect any rebates or incentive amounts but will change the information collected and testing associated with the energy assessment. The HPwES change will bring more recognition to the program by allowing the program to utilize the well-known ENERGY STAR label and align itself with the Home Performance with Energy Star whole house approach. Participants will also benefit from the change by receiving a more complete home assessment as well as an estimate of energy savings by measure. The estimated savings will enable customers to base their decisions on the amount of energy saved rather than the cost of the upgrade.

Weatherization Ready

The Year 2 Program will continue to replace Room Air Conditioners and weatherize homes. The program has also seen a need from participants that have central A/C systems. These participants cannot afford to have their central A/C systems serviced and or repaired. They must also be educated on the proper maintenance of their central a/c systems. The program will work with participating contractors to provide up to $300 to repair and/or service central HVAC systems for income qualified customers. Adding this service to our program will not only increase comfort for the participants but will also save them energy as well.

Increase opportunities for Multi- Family

As with the Residential Solutions Program, Weatherization Ready saw great success and a market for additional multi- family direct install applications. Energy Smart also plans to incorporate additional multi-family opportunities in Year 2 of program.

CFL program changes – room by room savings and bulb costs

The Direct Install CFL Program will make a few changes in 2012. The program will begin logging the installation locations of bulbs installed through the program and also be soliciting donations to help cover additional program costs.

Installation Locations - kWh Savings

The program has begun logging the installation location of CFL bulbs in addition to wattage in an effort to calculate more accurate energy savings. Savings for the installations in 2012 will be based on the 2002 DOE U.S Lighting Market Characterization Study which details the hours of use by room type. The tables below highlight the differences in usage and savings by room. Additional information about the CFL savings calculations is available upon request. For more information on the DOE study go to: http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/lmc_vol1_final.pdf.

Table D-4. Annual hours of operation by room-type by home for the Residential Sector

	Mobile Home	Single Family Detached	Single Family Attached	Multifamily 2-4 Units	Multifamily >4 Units
Bathroom	603	669	617	647	577
Bedroom	403	406	408	442	423
Closet	314	513	382	264	183
Dining Room	888	829	885	1,088	1,080
Family Room	626	772	676	441	453
Garage	667	720	665	0	0
Hall	519	616	542	462	414
Kitchen	994	1,210	1,089	921	888
Living Room	948	864	921	1,040	1,015
Office	385	708	676	435	401
Other	267	435	299	0	0
Outdoor	981	1,027	989	0	0
Utility Room	487	888	673	448	370

Wattage Replacement

CFL Wattage Range	Average CFL	Comparable Incandescent
9 to 12	12	40
13 to 17	15	60

18 to 25	23	75
26 to 32	27	72

Note: In 2012 the baselines for 100 Watt incandescent will drop due to market changes.

Single Family - kWh savings by installation location

Room Type	Hours of Operation	9-12 W	13-17W	18-25 W	26-32 W
Porch	1027	28.8	46.2	53.4	46.2
Kitchen	1210	33.9	54.5	62.9	54.5
Living Room	864	24.2	38.9	44.9	38.9
Family Room	772	21.6	34.7	40.1	34.7
Dining Room	829	23.2	37.3	43.1	37.3
Bathroom 1	669	18.7	30.1	34.8	30.1
Bathroom 2	669	18.7	30.1	34.8	30.1
Bathroom 3	669	18.7	30.1	34.8	30.1
Bedroom 1	406	11.4	18.3	21.1	18.3
Bedroom 2	406	11.4	18.3	21.1	18.3
Bedroom 3	406	11.4	18.3	21.1	18.3
Bedroom 4	406	11.4	18.3	21.1	18.3
Bedroom 5	406	11.4	18.3	21.1	18.3
Office	708	19.8	31.9	36.8	31.9
Den	435	12.2	19.6	22.6	19.6
Entryway	435	12.2	19.6	22.6	19.6

Single Family - kW savings by installation location

Room Type	Hours of Operation	9-12 W	13-17W	18-25 W	26-32 W
Porch	1027	0.000	0.000	0.000	0.000
Kitchen	1210	0.002	0.004	0.004	0.004
Living Room	864	0.002	0.004	0.004	0.004
Family Room	772	0.002	0.004	0.004	0.004
Dining Room	829	0.002	0.004	0.004	0.004
Bathroom 1	669	0.002	0.004	0.004	0.004
Bathroom 2	669	0.002	0.004	0.004	0.004
Bathroom 3	669	0.002	0.004	0.004	0.004
Bedroom 1	406	0.002	0.004	0.004	0.004
Bedroom 2	406	0.002	0.004	0.004	0.004

Bedroom 3	406	0.002	0.004	0.004	0.004
Bedroom 4	406	0.002	0.004	0.004	0.004
Bedroom 5	406	0.002	0.004	0.004	0.004
Office	708	0.002	0.004	0.004	0.004
Den	435	0.002	0.004	0.004	0.004
Entryway	435	0.002	0.004	0.004	0.004

Multi-Family - kWh savings by installation location

Room Type	Hours of Operation	9-12 W	13-17W	18-25 W	26-32 W
Porch	0	0.0	0.0	0.0	0.0
Kitchen	888	24.9	40.0	46.2	40.0
Living Room	1015	28.4	45.7	52.8	45.7
Family Room	453	12.7	20.4	23.6	20.4
Dining Room	1080	30.2	48.6	56.2	48.6
Bathroom 1	577	16.2	26.0	30.0	26.0
Bathroom 2	577	16.2	26.0	30.0	26.0
Bathroom 3	577	16.2	26.0	30.0	26.0
Bedroom 1	423	11.8	19.0	22.0	19.0
Bedroom 2	423	11.8	19.0	22.0	19.0
Bedroom 3	423	11.8	19.0	22.0	19.0
Bedroom 4	423	11.8	19.0	22.0	19.0
Bedroom 5	423	11.8	19.0	22.0	19.0
Office	401	11.2	18.0	20.9	18.0
Den	0	0.0	0.0	0.0	0.0
Entryway	0	0.0	0.0	0.0	0.0

Multi-Family - kW savings by installation location

Room Type	Hours of Operation	9-12 W	13-17W	18-25 W	26-32 W
Porch	0	0.000	0.000	0.000	0.000
Kitchen	888	0.002	0.004	0.004	0.004
Living Room	1015	0.002	0.004	0.004	0.004
Family Room	453	0.002	0.004	0.004	0.004
Dining Room	1080	0.002	0.004	0.004	0.004
Bathroom 1	577	0.002	0.004	0.004	0.004
Bathroom 2	577	0.002	0.004	0.004	0.004
Bathroom 3	577	0.002	0.004	0.004	0.004

Bedroom 1	423	0.002	0.004	0.004	0.004
Bedroom 2	423	0.002	0.004	0.004	0.004
Bedroom 3	423	0.002	0.004	0.004	0.004
Bedroom 4	423	0.002	0.004	0.004	0.004
Bedroom 5	423	0.002	0.004	0.004	0.004
Office	401	0.002	0.004	0.004	0.004
Den	0	0.002	0.004	0.004	0.004
Entryway	0	0.002	0.004	0.004	0.004

Additional Support Needed

The increase in the number of bulbs needed to achieve the Year 2 program goal as well as the increased cost of CFL bulbs have created a shortage of funding for the program. The program is actively soliciting donations in the form of CFL bulbs and cash incentives to help cover the additional costs associated with the program. The Energy Smart Program estimates that between 110,000 and 120,000 bulbs will be needed in order to reach the kWh savings goal.

Appendix

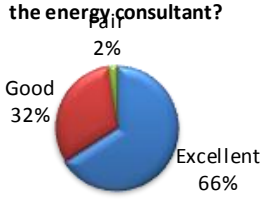
A Customer Satisfaction Survey Results
B In Home Display Pilot customer communication
C Optimal Energy EM&V Report
D CLEAResult Deemed Savings Review

A - Customer Satisfaction Survey Results

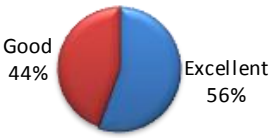
Residential Energy Solutions Program - Customer Satisfaction Surveys

Total of 47 surveys received through May 21, 2012

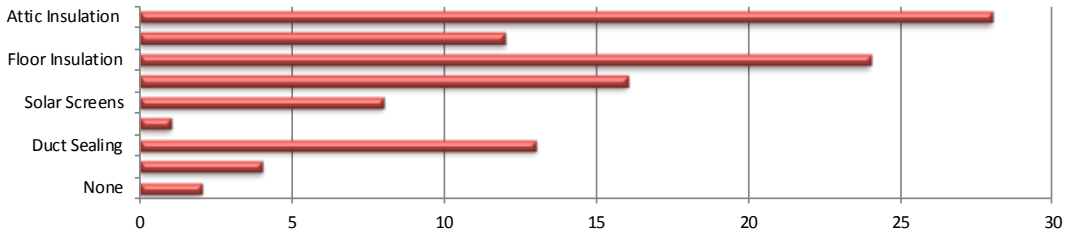
Q1b: How do you rate your experience with the energy consultant?



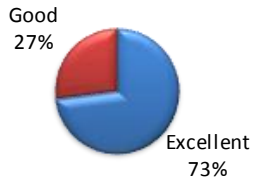
Q1c: How do you rate the value of the Energy Smart assessment?



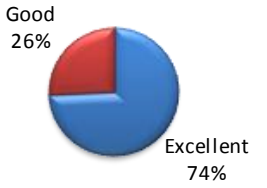
Q1d: What measure(s) did you or do you plan to implement within 60 days for the assessment?



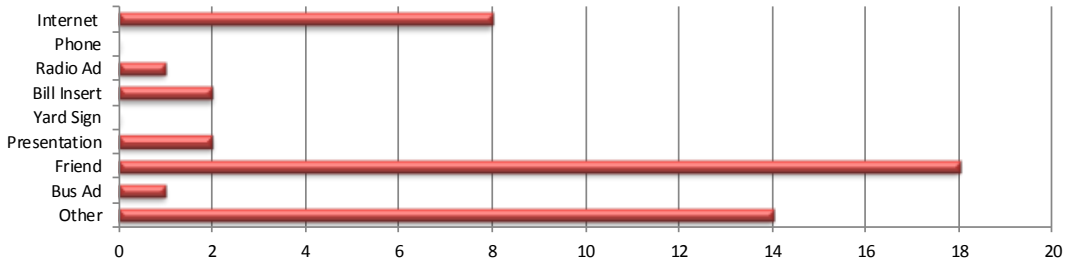
Q2b: What was the contractor's overall level of professionalism?



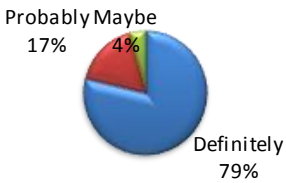
Q2c: How would you rate the ease of contacting the contractor and scheduling an appointment?



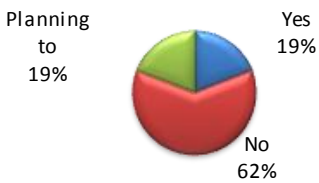
Q4: How did you hear about the Energy Smart program?



Q3: Would you recommend the Energy Smart program to others?



Q5: Have you taken advantage of other Energy Smart programs?

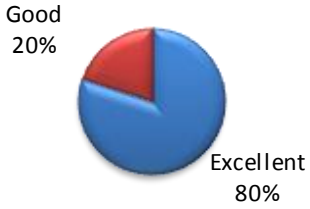


High Performance AC Tune-Up - Customer Satisfaction Surveys

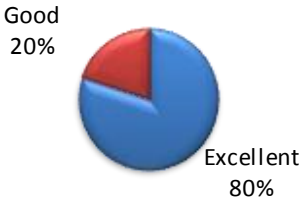
Total of 10 surveys received through May 10, 2012

Q1b: What was the contractor's overall level of professionalism?

Q1c: How would you rate the ease of contacting the contractor and scheduling an appointment?

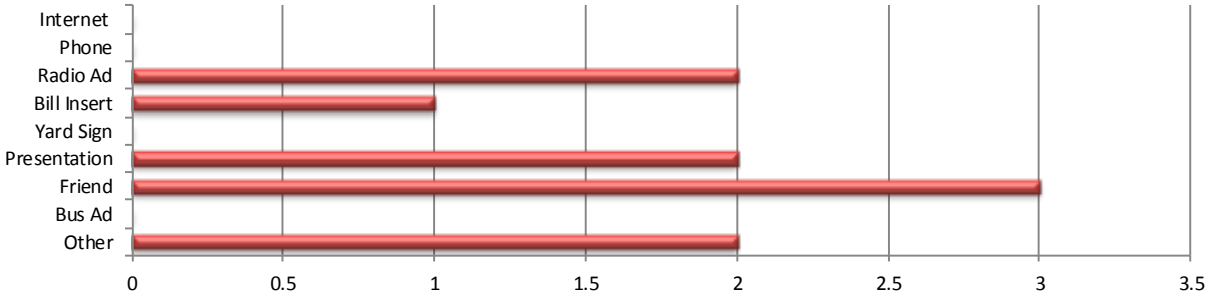


Q2: How do you rate the value of the Energy Smart tune-up?

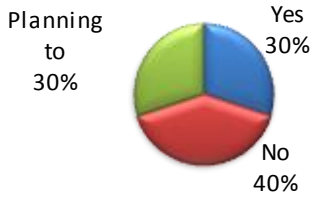


Q3: Would you recommend the Energy Smart program to others?

Q4: How did you hear about the Energy Smart program?



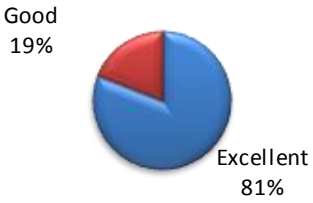
Q5: Have you taken advantage of other Energy Smart programs?



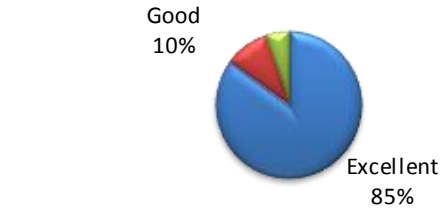
Small Commercial Solutions Program - Customer Satisfaction Surveys

Total of 22 surveys received through Apr 17, 2012

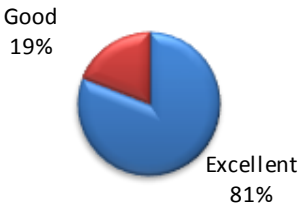
Q1a: What was the representative's overall level of professionalism?



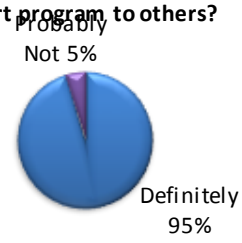
Q1b: How would you rate the ease of contacting the representative and scheduling an appointment?



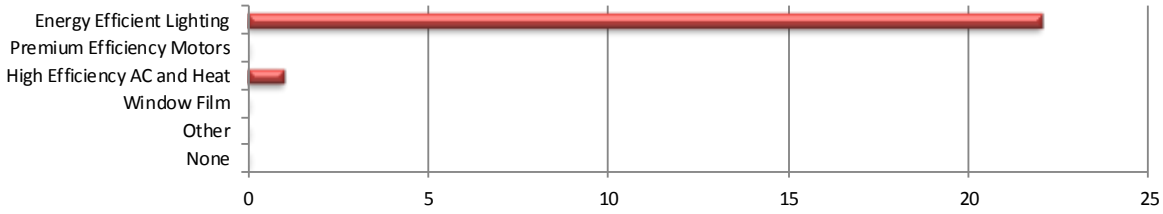
Q1c: How would you rate the overall value of your assessment?



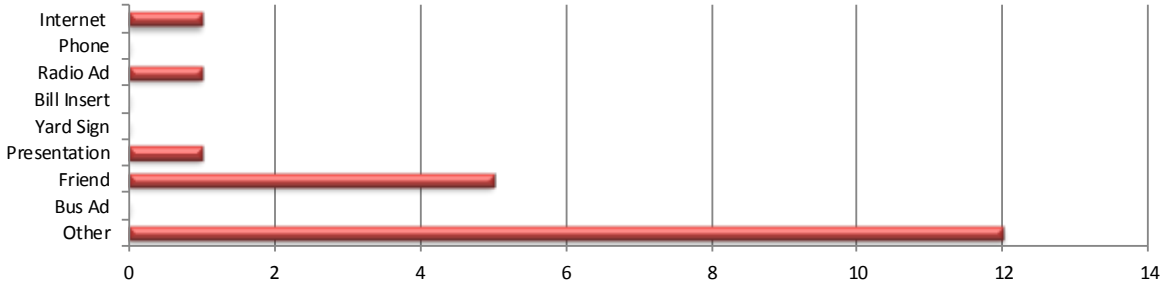
Q2: Would you recommend the Energy Smart program to others?



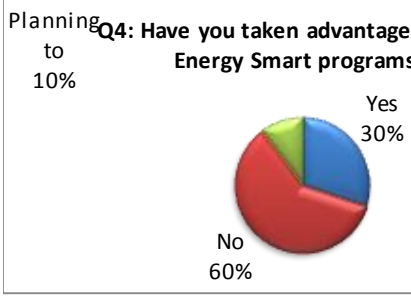
Q1d: What upgrade(s) do you plan to implement within 60 days of the assessment?



Q3: How did you hear about the Energy Smart program?



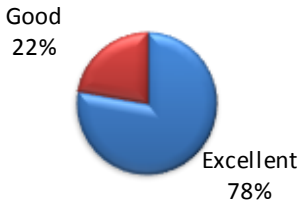
Q4: Have you taken advantage of other Energy Smart programs?



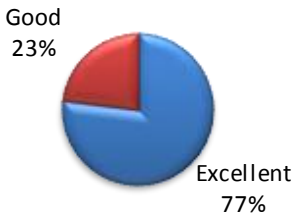
Residential CFL Program - Customer Satisfaction Surveys

Total of 55 surveys received through May 16, 2012

Q1a: What was the volunteer's overall level of professionalism?



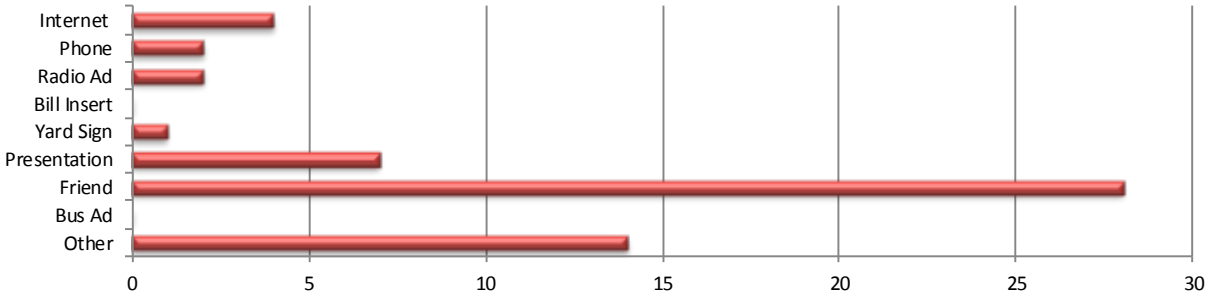
Q1b. How would you rate the ease of contacting Green Light New Orleans and scheduling an appointment?



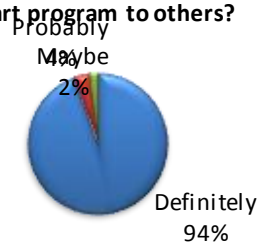
Q2a. How would you rate the overall value of your CFL installation?

Q2b. How would you rate your level of satisfaction with the CFL bulbs that were installed?

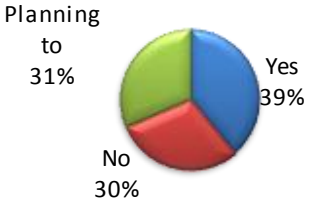
Q4: How did you hear about the Energy Smart program?



Q3: Would you recommend the Energy Smart program to others?



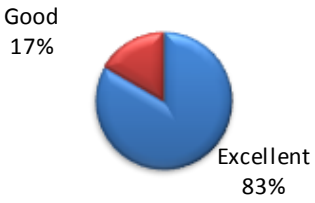
Q5: Have you taken advantage of other Energy Smart programs?



Large Commercial Solutions Program - Customer Satisfaction Surveys

Total of 6 surveys received through Apr 11, 2012

Q1a: What was the representative's overall level of professionalism?

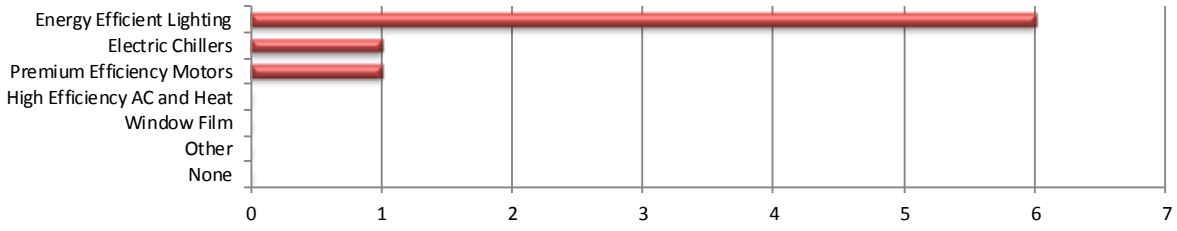


Q1b: How would you rate the ease of contacting the representative and scheduling an appointment?

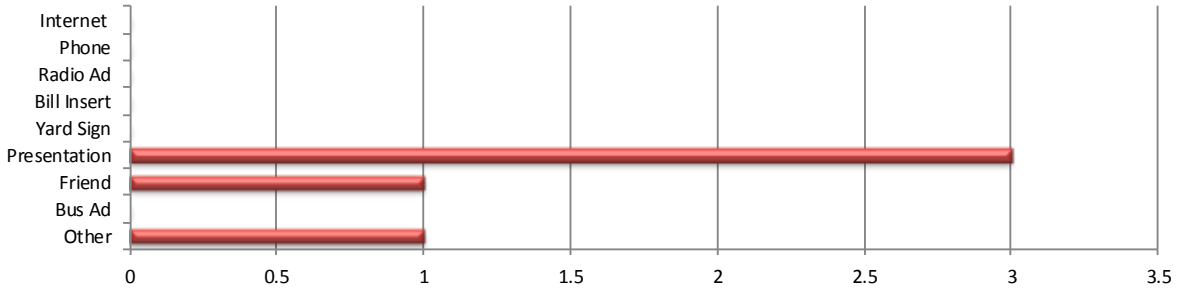
Q1c: How would you rate the overall value of your assessment?

Q2: Would you recommend the Energy Smart program to others?

Q1d: What upgrade(s) do you plan to implement within 60 days of the assessment?



Q3: How did you hear about the Energy Smart program?



Q4: Have you taken advantage of other Energy Smart programs?

Energy Star Central A/C Program - Customer Satisfaction Surveys

Total of 1 surveys received through Apr 11, 2012

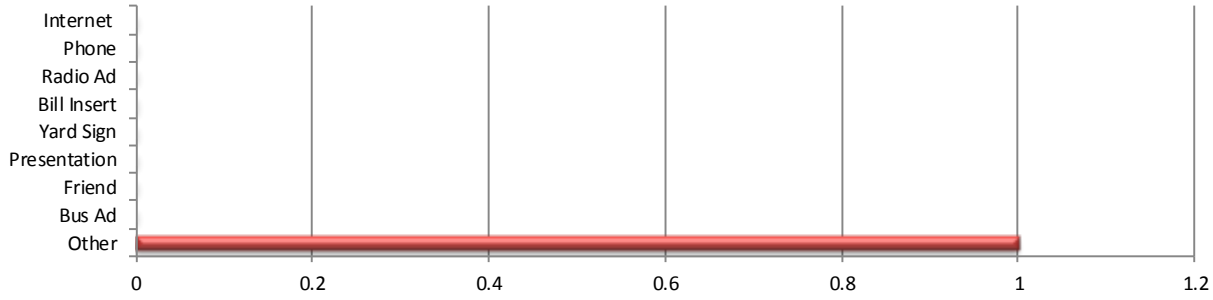
Q1b: What was the contractor's overall level of professionalism?

Q1c: How would you rate the ease of contacting the contractor and scheduling an appointment?

Q2: How do you rate the value of the Energy Smart Energy Star A/C program?

Q3: Would you recommend the Energy Smart program to others?

Q4: How did you hear about the Energy Smart program?

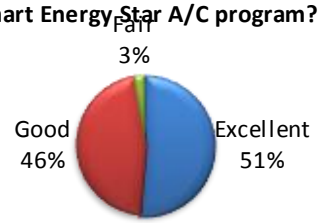


Q5: Have you taken advantage of other Energy Smart programs?

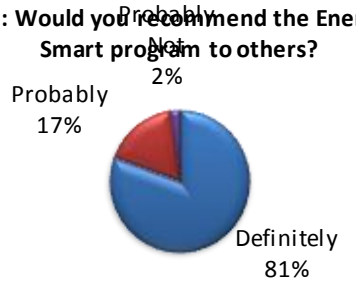
Energy Star Window Unit A/C Program - Customer Satisfaction Surveys

Total of 41 surveys received through Apr 11, 2012

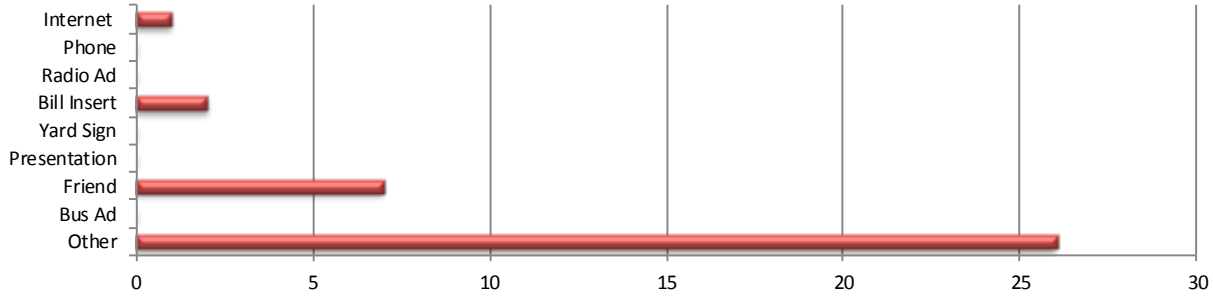
Q1: How do you rate the value of the Energy Smart Energy Star A/C program?



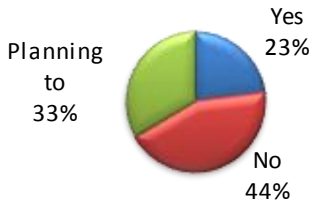
Q2: Would you recommend the Energy Smart program to others?



Q3: How did you hear about the Energy Smart program?



Q4: Have you taken advantage of other Energy Smart programs?

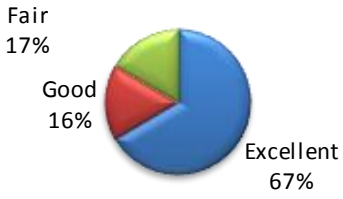


Low Income Room A/C Replacement Program - Customer Satisfaction Surveys

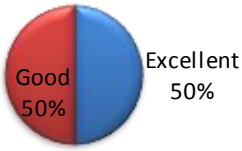
Total of 6 surveys received through Apr 11, 2012

Q1b: What wa the staff member's overall level of professionalism?

Q1c: How would you rate the ease of contacting the staff member and scheduling an appointment?



Q2a: What was the installer's overall level of professionalism?

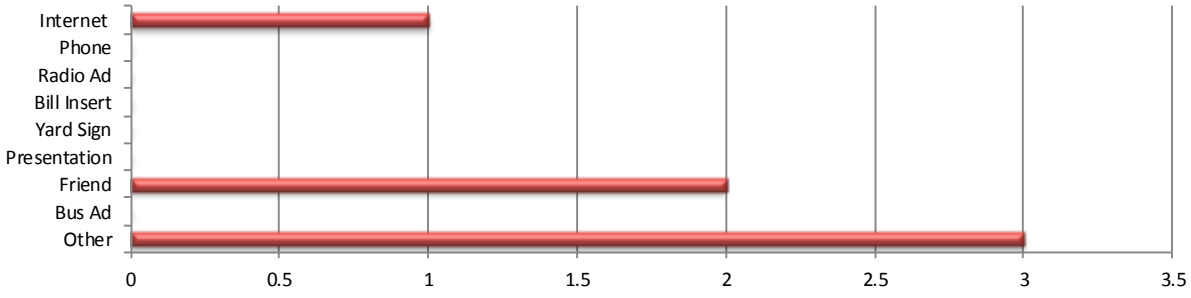


Q2b: How would you rate the ease of contacting the installer and scheduling an appointment?

Q3: How do you rate the value of the Energy Smart room air conditioning unit replacement?

Q4: Would you recommend the Energy Smart program to others?

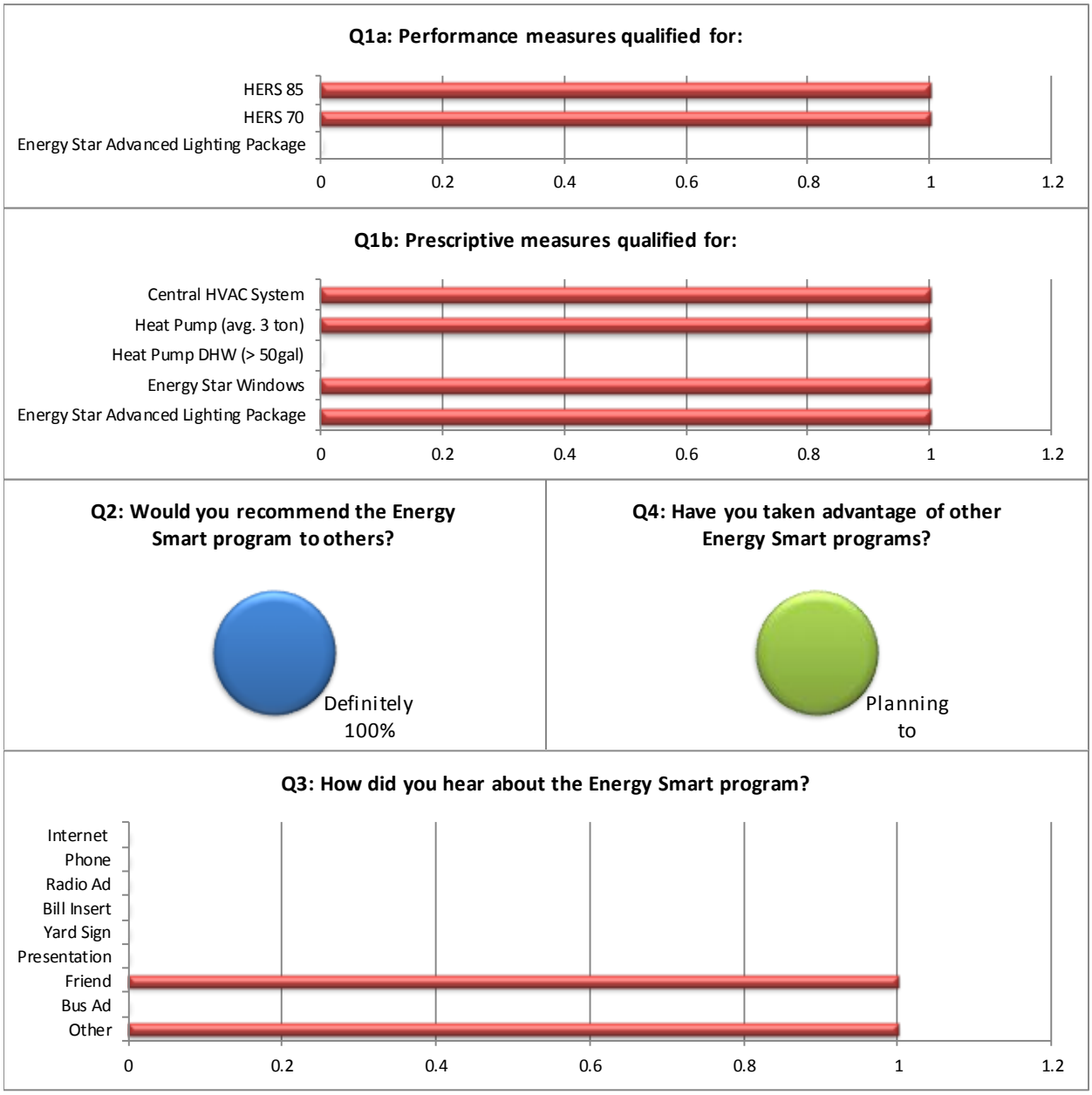
Q5: How did you hear about the Energy Smart program?



Q6: Have you taken advantage of other Energy Smart programs?

Energy Efficient New Homes Program - Customer Satisfaction Surveys

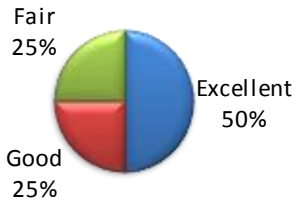
Total of 2 surveys received through Apr 11, 2012



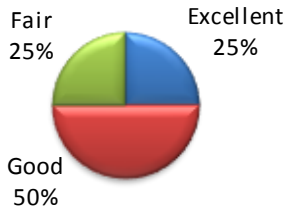
Low Income Weatherization Ready Program - Customer Satisfaction Surveys

Total of 4 surveys received through Apr 11, 2012

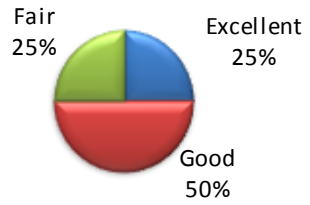
Q1b: What was the contractor's overall level of professionalism?



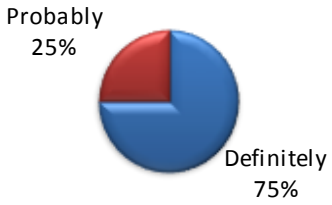
Q1c: How would you rate the ease of contacting the contractor and scheduling an appointment?



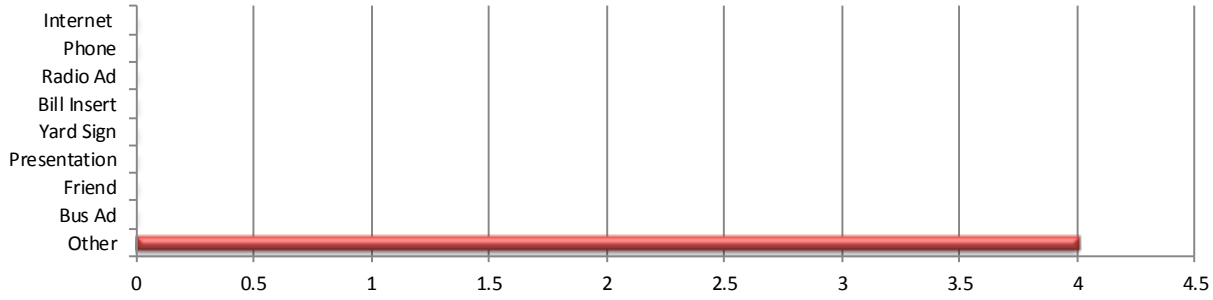
Q2: How do you rate the value of the Energy Smart Weatherization Ready program?



Q3: Would you recommend the Energy Smart program to others?



Q4: How did you hear about the Energy Smart program?



Q5: Have you taken advantage of other Energy Smart programs?

B – In Home Display Marketing and Outreach Materials

Entergy New Orleans, Inc.
1600 Perrido Street, Bldg #505
New Orleans, LA 70112
Tel 504 670 3680
Fax 504 670 3615

DATE

Entergy Account #

Dear

Congratulations and welcome to the New Orleans Energy Smart In-Home Display pilot program. You have been successfully enrolled in the program.

The Energy Smart IHD pilot was developed to make customers more aware of their energy usage and to provide information to help customers save energy and money. We will periodically send you surveys to determine if the program is helpful to you.

The anticipated timeline for implementing the 12-month pilot is:

- Install new smart meter – January 17th through February 17th
- Deliver In-Home Display monitoring device January 17th through Feb. 17th
- Pilot program officially begins March 1st (You can begin monitoring your usage and estimated bill once the IHD device is installed and activated).

We will deliver your In-Home Display monitoring device and instructions to your home when your new smart meter is installed. If you are not home at this time, we will mail your IHD device via UPS within a week of meter installation. Instructions for operating the IHD device are also available on-line at http://www.energysmartnola.info/ihd-pilot/.

The Energy Smart In-Home Display program was developed by the New Orleans City Council and is being administered by Entergy New Orleans, Inc.

Thank you for being a valued customer of Entergy New Orleans, and thank you for your participation in this pilot program. If you have any questions, please call us toll-free at 1-855-33SMART (1-855-337-6278) or visit http://www.energysmartnola.info/ihd-pilot/ for additional information about the program.

Sincerely,

Entergy New Orleans, Inc.
Energy Smart In-Home Display Pilot Program Team

Energy Smart IHD Pilot...e-mail "rejection" letter...applicant not eligible

Dear (Applicant Name??????)

Thank you for your interest in participating in the Energy Smart In-Home Display (IHD) Pilot Program.

Unfortunately, your application did not meet the eligibility requirements for the program for the following reason.

(...highlight reason here...)

If you are an Entergy New Orleans, Inc. electric customer, we invite you to visit the Energy Smart website at www.energysmartnola.info for additional information on energy efficiency programs you can participate in.

Sincerely,

Entergy New Orleans, Inc.
Energy Smart In-Home Display Pilot Program Team

Dear **Energy Smart** Participant,

Thank you aga n for your participation in the **Energy Smart In-Home Display (IHD) Pilot Program.**

This is just a reminder that your new smart meter will be installed within the next 2-3 weeks. During that time, your new In-Home Display (IHD) monitoring device will also be delivered.

If you are not home, the IHD device will be mailed to you via UPS mail services.

If you have any questions, please call the **Energy Smart IHD Support Center** Monday to Friday between 8 a.m. – 6 p.m. toll free at **1-855-33-SMART** (1-855-337-6278), or visit the website at www.energysmartnola.info/ihd-pilot/ .

Thank you again for your participation!

Sincerely,

Entergy New Orleans, Inc.
Energy Smart In-Home Display Pilot Program Team

Congratulations! Your old electric meter has been changed-out and a new smart meter has been installed.

In-conjunction with the new meter, the new In-Home Display monitoring device you are now receiving, will enable you to use the new smart meter technology.

The new technology will allow you to view your estimated energy usage and energy cost, as well as estimate your monthly electric cost from inside your home.

In-order for the In-Home Display device to be activated, you must perform the following tasks:

1. The In-Home Display device must be connected to a electrical outlet using the power cord that comes with the device, and
2. The Energy Smart IHD Support Center must be contacted 24 hours after plugging in the IHD device by phone toll free at **1-855-33-SMART** (1-855-337-6278) or via email at www.energysmart@entergy.com. Be sure to include the "MAC address" and "Install Code" found on the back of your IHD device in the subject line of your email.

Instructions for the IHD device are enclosed in the IHD delivery package. Instructions can also be found on the website at www.energysmartnola.info/ihd-pilot/ .

If you have any questions, please call the **Energy Smart IHD** support center Monday to Friday between 8 a.m. – 6 p.m. toll free at **1-855-33-SMART** (1-855-337-6278).

Thank you again for your participation!

Sincerely,

Entergy New Orleans, Inc.
Energy Smart In-Home Display Pilot Program Team

"Energy Smart is a comprehensive energy efficiency plan developed by the New Orleans City Council and administered by Entergy New Orleans, Inc."

Congratulations! Your old electric meter has been changed-out and a new smart meter has been installed.

In-conjunction with the new meter, the new In-Home Display monitoring device you are now receiving, will enable you to use the new smart meter technology.

The new technology will allow you to view your estimated energy usage and energy cost, as well as estimate your monthly electric cost from inside your home.

In-order for the In-Home Display device to be activated, you must perform the following tasks:

1. The In-Home Display device must be connected to a electrical outlet using the power cord that comes with the device, and
2. The Energy Smart IHD Support Center must be contacted 24 hours after plugging in the IHD device by:

    a. phone toll free at **1-855-33-SMART** (1-855-337-6278), or
    b. via email at energysmart@entergy.com. Please be sure to include the "MAC address" in the subject line of your email. The "MAC address" is a 4-character alpha-numeric code that is located in bold print on the outside of the In-Home Display device packaging box.

Instructions for the IHD device are enclosed in the IHD delivery package. Instructions can also be found on the website at www.energysmartnola.info/ihd-pilot/ .

If you have any questions, please call the **Energy Smart IHD** support center Monday to Friday between 8 a.m. – 6 p.m. toll free at **1-855-33-SMART** (1-855-337-6278).

Thank you again for your participation!

Sincerely,

Entergy New Orleans, Inc.
Energy Smart In-Home Display Pilot Program Team

"Energy Smart is a comprehensive energy efficiency plan developed by the New Orleans City Council and administered by Entergy New Orleans, Inc."

Subject: Replacement of Defective In-Home Display Monitoring Devices

Dear ***Energy Smart*** Participant,

Thank you again for your participation in the **Energy Smart In-Home Display (IHD) Pilot Program.**

We have determined that the vendor-installed software in your IHD is not compatible with your recently-installed new meter. The vendor has corrected this software issue that has affected less than thirty (30) of the devices.

We attempted to deliver your new In-Home Display monitoring device to replace the defective unit you currently have.

Please contact us at the **Energy Smart IHD Support Center** Monday to Friday between 8 a.m. – 6 p.m. toll free at **1-855-33-SMART** (1-855-337-6278), to discuss how we can coordinate the exchange of your defective unit for a replacement unit during a timeframe that is workable for you.

We apologize for this inconvience and we thank you again for your participation!

Sincerely,

Entergy New Orleans, Inc.
Energy Smart In-Home Display Pilot Program Team

"Energy Smart is a comprehensive energy efficiency plan developed by the New Orleans City Council and administered by Entergy New Orleans, Inc."

Note: Information in "item 2b" of this document has been revised to correct the Energy Smart email address and clarify the equipment code location of the In-Home Display monitoring device

Dear Energy Smart Participant,

Congratulations once again!

Your old electric meter has been changed-out and a new smart meter has been installed. If your old meter has not been changed, the new meter is scheduled to be installed within the next week.

In-conjunction with the new meter, you have been provided a new In-Home Display monitoring device, which will enable you to use the new smart meter technology. If you have not received your new device, it will also be delivered to you within the next week via UPS.

The new technology will allow you to view your estimated energy usage and energy cost, as well as estimate your monthly electric cost from inside your home.

In-order for the In-Home Display device to be activated, you must perform the following tasks:

1. The In-Home Display device must be connected to a electrical outlet using the power cord that comes with the device. and
2. The Energy Smart IHD Support Center must be contacted 24 hours after plugging in the IHD device by.
    a. phone toll free at **1-855-33-SMART** (1-855-337-6278), or
    b. via email at energysmart@entergy.com. **Please** be sure to include the "MAC address" in the subject line of your email. The "MAC address" is a 4-character alpha-numeric code that is located in bold print on the outside of the In-Home Display device packaging box.

Instructions for the IHD device are enclosed in the IHD delivery package. Instructions can also be found on the website at www.energysmartnola.info/ihd-pilot/ .

If you have any questions, please call the **Energy Smart IHD** support center Monday to Friday between 8 a.m. – 5 p.m. toll free at **1-855-33-SMART** (1-855-337-6278).

Thank you again for your participation!

Sincerely,

Entergy New Orleans, Inc.
Energy Smart In-Home Display Pilot Program Team

"Energy Smart is a comprehensive energy efficiency plan developed by the New Orleans City Council and administered by Entergy New Orleans, Inc."

Subject: Reminder ...Activation of Your In-Home Display Monitoring Device

Dear ***Energy Smart*** Participant,

Thank you again for your participation in the **Energy Smart In-Home Display (IHD) Pilot Program.**

Our pilot program records indicate your In-Home Display (IHD) device is not activated and is not connected to the new smart meter technology that will allow you to view your estimated energy usage and energy cost from inside your home.

We want you to begin enjoying the benefits of the pilot program as soon as possible. The activation and connection process is simple and involves the two (2) simple steps that are outlined below.

1. The In-Home Display device must be connected to a electrical outlet using the power cord that comes with the device, and
2. The Energy Smart IHD Support Center must be contacted 24 hours after plugging in the IHD device by:

    a. phone toll free at **1-855-33-SMART** (1-855-337-6278), or
    b. via email at energysmart@entergy.com. Please be sure to include the "MAC address" in the subject line of your email The "MAC address" is a 4-character alpha-numeric code that is located in bold print on the outside of the In-Home Display device packaging box

Instructions for operating the device are enclosed in the packaging box in which the device was delivered. Instructions can also be found on the Energy Smart website at www.energysmartnola.info/ihd-pilot .

If you have any questions or require any assistance please call the **Energy Smart** IHD support center Monday to Friday between 8 a.m. – 6 p.m. toll free at **1-855-33-SMART** (1-855-337-6278)

Sincerely,

Entergy New Orleans, Inc
Energy Smart In-Home Display Pilot Program Team

"Energy Smart is a comprehensive energy efficiency plan developed by the New Orleans City Council and administered by Entergy New Orleans, Inc."

EnergySmart
A New Orleans Program

Entergy
ENTERGY NEW ORLEANS, INC.

Date:

Dear <Customer Name>

Thank you once again for your participation in the New Orleans Energy Smart In-Home Display pilot program. The pilot program, designed to help customers lower their energy costs through awareness of their energy usage, officially launched on March 1 and will run for a one-year period through March 1, 2013.

At this time, your in-home display device should be fully-activated. We hope it is providing you valuable information to help you save energy, save money and take control of your energy bill.

Now that you have had access to the information from the device, you may be interested in once again reviewing the IHD Instructions provided with your device. The instructions provide a description of each data output screen, login instructions for the online portal and energy saving tips. Please note that the monthly billing estimate from your device will be most accurate after the device has been operational for a one-month period.

Here's some additional information to help keep you updated on the in-home display program benefits and performance:

- **Online Access** - When away from home, you have the option of viewing your energy usage and other information provided by your in-home display device via the internet through Entergy's **myAccount online** feature. You can register or access myAccount online by clicking here. Specific instructions on how to access portal data once logged in to myAccount online can be found on page 12 in the IHD Instructions.

- **Energy Saving Tips** - We will periodically email you energy saving tips and information to help you learn more about saving energy and lowering your energy usage.

- **Tell Us What You Think** – This pilot is designed for customer feedback. We will periodically request your feedback on the program through a few online surveys. You will receive the first survey in April. The consolidated survey results from pilot participants will be available on the Energy Smart website so that you and other Entergy New Orleans customers can follow the experiences of pilot participants throughout the year.
Note: Please be assured that all survey data will be reported in consolidated format and no specific customer results will be presented.

If you have any questions or concerns, please call us toll-free at 1-855-33SMART (1-855-337-6278).

Thank you again for your participation in the Energy Smart in-home display pilot program, and thank you for being a valued customer of Entergy New Orleans.

Sincerely,

Entergy New Orleans, Inc.
Energy Smart In-Home Display Pilot Program Team

Energy Smart is a comprehensive energy efficiency plan developed by the New Orleans City Council and administered by Entergy New Orleans, Inc.

Energy Smart IHD Pilot – "follow-up e-mail…customer is home and IHD delivered, or customer not at home and IHD delivered via UPS

Dear *Energy Smart* Participant,

Thank you again for your participation in the ***Energy Smart In-Home Display (IHD) Pilot Program***

This is just a reminder regarding the In-Home Display (IHD) monitoring device you recently received. You must perform the following tasks in-order for the device to be activated:

1. The In-Home Display device must be connected to a electrical outlet using the power cord that comes with the device, and
2. The Energy Smart IHD Support Center must be contacted 24 hours after connecting the IHD device by phone toll free at **1-855-33-SMART** (1-855-337-6278) or via email at www.energysmart@entergy.com. Be sure to include the "MAC address" and "Install Code", found on the back of your IHD device, in the subject line of your email.

Instructions for the IHD device are enclosed in the IHD delivery package. Instructions can also be found on the website at www.energysmartnola.info/ihd-pilot/ .

If you have any questions, please call the **Energy Smart** IHD support center Monday to Friday between 8 a.m. – 6 p.m. toll free at **1-855-33-SMART** (1-855-337-6278).

Thank you again for your participation!

Sincerely,

Entergy New Orleans, Inc.
Energy Smart In-Home Display Pilot Program Team

Energy Savings Tips and Information

Thank you again for your participation in the **Energy Smart In-Home Display (IHD) Pilot Program.** We hope your in-home display device is providing you valuable information to help you save energy, save money and take control of your energy bill.

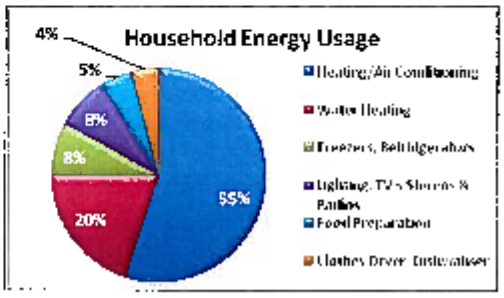
As we mentioned in one of our earlier communications, we will periodically send information regarding energy savings tips, ideas and energy efficiency programs. We hope this information can help you take control of your energy use.

What are the top two users of energy in your home?

Air conditioning and water heating are your largest energy users.

Air conditioning consumes up to **55 percent** of household energy and water heating consumes up to **20 percent** of energy usage.

See the graph for the breakdown of energy use for the average home.



Tips for lowering your air-conditioning energy usage and cost:

- Set your thermostat to 78 degrees for summertime usage and your heater to 68 degrees in the winter.
- Clean or change A/C filters every three months.
- Perform seasonal A/C maintenance. (Note: Energy Smart offers an A/C Tune Up Program that provides customer an immediate $75 discount off their invoice when using participating local contractors.)
- If you are considering purchasing and installing a new central or window A/C Unit, Energy Smart offers A/C rebates of up to $1,000 to offset the cost of a new unit.

Tips for lowering your water heater energy usage and cost:

- Adjust the water temperature to 120 degrees.
- If your water heater is warm-to-the-touch, consider adding pre-cut jacket or blanket insulation to reduce heat loss and save energy.
- Interested in purchasing a solar water heater? Energy Smart offers rebates up to $1,000 for the purchase and installation of a qualified solar water heater from a participating local contractor. You can also learn about state and federal incentives.

Want more ways to save money? Visit the Energy Smart website at **energysmartnola.info** for energy efficient rebates and incentives, and the Entergy New Orleans website at **entergyneworleans/savemoney** for energy saving tips and tools.

Thank you again for your participation in the Energy Smart in-home display pilot program and thank you for being a valued customer of Entergy New Orleans.

Sincerely,

Entergy New Orleans, Inc
Energy Smart In-Home Display Pilot Program Team

Energy Smart is a ratepayer-funded energy efficiency plan developed by the New Orleans City Council and administered by Entergy New Orleans, Inc.

EnergySmart
A New Orleans Program

Dear Energy Smart Participant,

Thank you again for your participation in the **Energy Smart In-Home Display (IHD) Pilot Program.**

We attempted to install your new smart meter today but could not safely gain access to your existing meter for one or more of the following reasons:

- ☐ Cannot Locate Meter
- ☐ Shrubbery Obstruction
- ☐ Enclosed Meter
- ☐ Gate Locked
- ☐ Dog
- ☐ Other ____________________

Please contact us at the **Energy Smart IHD Support Center** Monday to Friday between 8 a.m. – 6 p.m. toll free at **1-855-33-SMART** (1-855-337-6278), to discuss how we can safely gain access to your existing meter on your property.

Sincerely,

Entergy New Orleans, Inc.
Energy Smart In-Home Display Pilot Program Team

Entergy
ENTERGY NEW ORLEANS, INC.

Energy Smart is a comprehensive energy efficiency plan developed by the New Orleans City Council and administered by Entergy New Orleans, Inc.

EnergySmart
A New Orleans Program

Dear Energy Smart Participant,

Sorry we missed you!

Thank you for your participation in the Energy Smart In-Home Display (IHD) Pilot Program.

Your electric meter has been replaced with a new smart meter.

Since you were not at home, your IHD monitoring device will be mailed to you via UPS, along with instructions.

If you have any questions, please call the Energy Smart IHD support center Monday to Friday between 8 a.m. – 6 p.m. toll free at 1-855-33-SMART (1-855-337-6278).

You may also visit the Energy Smart website at www.energysmartnola.info/ihd-pilot for additional information about the program or access an online version of the IHD device instructions.

Thank you again for your participation!

Sincerely,

Entergy New Orleans, Inc.
Energy Smart In Home Display Pilot Program Team

Entergy
ENTERGY NEW ORLEANS, INC.

Energy Smart is a comprehensive energy efficiency plan developed by the New Orleans City Council and administered by Entergy New Orleans, Inc.

C - Optimal Energy EM&V Report

Provided as a separate document.

D - CLEAResult Deemed Savings Review

Provided as a separate document.

Optimal ENERGY *Integrated Energy Resources*

Energy Smart New Orleans Impact Evaluation

for

Program Year 1

Prepared for

CLEAResult/Entergy

by:

Optimal Energy, Inc.

May 11, 2012

Optimal Energy, Inc.
802.453.5100

www.optenergy.com

14 School Street
Bristol, VT 05443

Contents

Tables

EXECUTIVE SUMMARY

This report presents the results from the impact evaluation of Energy Smart's full year one portfolio of residential, commercial, and industrial efficiency programs. The impact evaluation consisted of two main components – a complete tracking data analysis from all data in CLEAResult's tracking databases, and a detailed project file review selected by using stratified random sampling methods on the population of projects in the tracking database. As shown in table E.1, the impact evaluation resulted in a realization rate of very close to one, indicating that there are very good data verification and quality control procedures in place.

Table E.1 Total Impact Evaluation Results

Program	Reported kWh Savings	Verified kWh Savings	kWh Realization rate	Reported kW Savings	Verified kW Savings	kW Realization Rate
CFL Direct Install	3,726,006	3,776,511	1.01	604	612	1.01
AC Tune-Up	429,291	406,374	0.95	223	221	0.99
Residential Solutions	3,080,830	2,984,079	0.97	623	749	1.20
Energy Star Air Conditioner	134,655	152,201	1.13	49	56	1.14
New Homes	207,067	207,067	1.00	65	65	1.00
Low Income	419,858	419,208	1.00	67	95	1.42
Solar Hot Water	5,438	5,438	1.00	1	1	1.00
Commercial and Industrial	7,809,811	7,891,461	1.01	1,326	1,338	1.01
Total	**15,812,956**	**15,842,339**	**1.0**	**2,958**	**3,137**	**1.06**

The evaluation also identified several key recommendations to ensure that the high quality of the data continues, and that program savings estimates are accurate. These include:

- Ensure that the project savings information is updated based on post-inspection verification information.
- Ensure that the instructions for which wattage CFLs should replace any given incandescent bulb are consistent between the Residential Solutions program, the CFL DI program, and the deemed savings documentation. These instructions should be based on the requirement of maintaining the same lumens pre- and post-installation. Any reduction in light output after the direct install will make it more likely for the customer to switch back to incandescent, thus negating the energy savings.
- Ensure that envelope measures for detached homes with multiple dwelling units are only counted once. This was especially an issue for the low-income program, which had many projects in 2-3 family homes.

- Include the lighting calculator with the commercial lighting project files. This will make it far easier to verify savings, and update savings after any post-installation verifications.
- Ensure that all contractors are using the most up-to date version of the lighting calculator.
- Consider adding a factor representing HVAC interactive effects for residential savings calculations.

INTRODUCTION

EVALUATION OBJECTIVES

This report presents the results from the impact evaluation of Energy Smart's full Year 1 portfolio of residential, commercial, and industrial electric efficiency programs. The first program year runs from April 2011 through March 2012. The key objective from this evaluation is to provide verification of the gross energy impacts reported in CLEAResult's tracking database. To this end, the evaluation combines a review of the tracking databases used by CLEAResult with a thorough engineering review of project files from a statistically significant sampling of projects done through the year. During the file review, the evaluation asks:

- Are the Year 1 deemed savings calculations used correctly for the project?
- Do the efficiency and size assumptions used in the deemed savings calculations match the equipment specifications from the project application?
- Are the project files internally consistent? Do the findings in any post-installation inspections match the application and invoice?
- If the post-installation inspection finds different specifications than the original application, were the reported savings updated in the tracking database?
- Does the equipment specification meet the minimum efficiency required in the program guidelines?
- Is the project appropriately defined as early retirement retrofit vs. lost opportunity?[1] Is the baseline defined appropriately?

This evaluation does not attempt to calculate net savings, provide recommendations on program processes, or verify any of the approved assumptions from the deemed savings document. However, there is a parallel effort reviewing deemed savings assumptions and calculations that will feed into the deemed savings used for program year 2.

PROGRAM DESCRIPTIONS

This evaluation covers Energy Smart's portfolio of 9 programs that ran during the first program year. These programs are:

- **Residential Solutions** – rebates on energy audits for residential households, as well as any appropriate shell/air-sealing measures identified during the audit. The Residential Solutions Program also had a component that did direct, no-cost

[1] Early retirement retrofit and lost opportunity are the two main types of efficiency projects. For an early retirement retrofit, an efficiency program encourages retiring a piece of equipment before the end of its useful life, while in a lost opportunity project, the equipment has failed and needs to be replaced anyway, so the efficiency program is trying to encourage the customer to install a high efficiency unit, rather than a code compliant unit. Therefore, the baseline efficiency for the early retirement retrofit is the existing equipment, while the baseline for the lost opportunity is the code-compliant unit. These baselines are often different because code changes over time, and so a lot of older equipment would not be compliant with current code.

installation of CFLs, low-flow showerheads, and faucet aerators in large multifamily buildings.

- **CFL Direct Install –** free CFL bulbs directly installed into residencies
- **Low Income –** Free energy audits, insulation, air sealing, and energy star HVAC equipment to low-income households
- **Energy Star Air Conditioning –** rebates on Energy Star certified room air conditioners, central air conditioners, and heat pumps.
- **Energy Efficient New Homes** – rebates for efficient new residential construction, either through lower HERS ratings or through prescriptive paths relating to lighting, HVAC, domestic hot water, and efficient windows.
- **AC Tune-Up -** $75 towards the tune-up of existing residential central air conditioner or heat pump system
- **Solar Water Heater** – Pilot program promoting the installation of residential passive solar hot water systems
- **Small Commercial and Industrial** – Rebates for efficiency projects at small commercial facilities
- **Large Commercial and Industrial** - Rebates for efficiency projects at large commercial facilities.

For each program, Entergy New Orleans has program oversight, administers funds collected through customer base rates, manages the CLEAResult contract, and aids in program communications, marketing and outreach. CLEAResult, as program implementer, conducts outreach, approves customer eligibility, recruits and trains contractors, processes all rebate applications, conducts quality control and post-installation inspections, and tracks the projects and associated savings in centralized tracking databases. Deemed savings were used to calculate the energy reduction in all cases except for certain non-lighting C&I projects, where a custom approach was used. CLEAResult performed ongoing quality control through post-installation inspections for either 100% of installed projects or a random sampling of projects, depending on the program.

METHODOLOGY AND PROGRAM LEVEL RESULTS

This section describes the data collection activities and analytic methods implemented as a part of the impact evaluation.

DATABASE REVIEW

The first part of the evaluation consisted of a review of CLEAResult's tracking database. We looked at all entries in the database to ensure that the databases were clearly navigable, all necessary entries were captured, and that there were no obvious outliers or duplicates.

STRATIFIED RANDOM SAMPLING

An extract of CLEAResult's tracking database dated mid-April 2012 was used to select a sample of projects that would undergo detailed review. As of this date, there were still a few projects to be counted for the 2011 program year that were not finalized in the database. To the extent that this is true, the reported savings shown in this report may be slightly lower than the final reported savings for 2011. However, this small difference will not affect any of the conclusions from the report. In general, stratified random sampling was used for each program to select a statistically significant, representative sample of projects for review.

As described below, for most programs, the evaluation used stratified random sampling to select statistically significant samples for detailed project file review. Stratified random sampling is a statistical technique where you split a population into various strata in ascending order of one key value. This can greatly reduce the coefficient of variation in each stratum, thereby reducing the sample size necessary to achieve adequate statistical precision. Specific information on the sampling techniques and results for each program are given below.

CFL DIRECT INSTALL

Savings data for the CFL Direct Install Program were analyzed by address and project. There were 4,617 unique homes visited as part of the program, and each household achieved an average mean savings of 807 kWh. Table 1 below gives the savings per bulb, the total number of bulbs installed, and the total savings reported in the tracking database.

Table 1: Savings by CFL Wattage for the CFL DI Program

	15 Watt equivalent	20 Watt equivalent	23 Watt Equivalent	Total
# of bulbs	74,933	9,736	5,585	**90,254**
kWh Saved per Bulb	36.5	58.3	75.8	**n/a**
kW Saved per Bulb	0.006	0.009	0.012	**n/a**
Total kWh Savings	2,735,055	567,609	423,343	**3,726,006**
Total kW Savings	450	88	67	**604**

In order to minimize the amount of project files needed for review, stratified random sampling was used. Before final sample selection, the database was reviewed to check for outliers and missing values, and the individual savings calculations were reviewed to ensure

that they were equal to the total claimed savings. Project records were sorted from smallest to largest kWh claim, and placed into three strata such that each contained approximately one-third of the program total. Table 2 below shows the reported kWh, kW, and number of projects in each sampling stratum.

Table 2: CFL DI Program Strata Description

Sampling Strata	Reported Gross kWh	Reported Gross kW	Projects	Coefficient of Variation
1	1,246,598	203	3,039	0.47
2	1,239,900	202	1,300	0.13
3	1,239,508	200	762	0.30
TOTAL	3,726,006	604	5,101	0.69

Finally, a sample of projects from each stratum was selected. The number of projects selected from each stratum is dependent on the coefficient of variation of the reported savings within that stratum. Table 3 gives the sample information.

Table 3: CFL DI Reviewed Project Information

Sampling Strata	Number of Applications	Reported kWh	kWh Weights	Number of sampled projects	kWh of sampled projects	% of Total Sampled
1	3,039	1,246,598	33%	10	4,771	0.4%
2	1,300	1,239,900	33%	1	986	0.1%
3	762	1,239,508	33%	4	11,637	0.9%
TOTAL	**5,101**	**3,726,006**	**100%**	**15**	**17,394**	**0.5%**

Table 4 shows the results of the quantitative project file review.

Table 4: CFL DI Impact Results

	Reported	Realization Rate	Verified	Relative Precision at 90% confidence level
kWh	3,726,006	1.01	3,776,511	2%
kW	604	1.01	612	2%

Some general observations from the database and project file review:

- As evidenced by the realization rate of close to one and the low relative precision, CLEAResult has done an excellent job in accurately applying the deemed savings methodology to the project as defined in the project application.
- The realization rate of 1.01 is due to a couple projects in the sample set where savings for 9 watt bulbs were not included. Most projects did not include the installation of any 9 watt CFLs, but where there were 9 watt bulbs specified on the application, the associated savings were not captured in the database.

- The deemed savings used for New Orleans does not include any factor to account for reduced cooling load due to the lower waste heat of the CFLs compared to incandescent bulbs. Assuming that these interactive HVAC effects are similar to those used on the commercial side, and that most CFLs installed through the program are installed in cooled spaces, this could increase energy savings by 5%, and demand savings by 10%. **We recommend that interactive HVAC effects be included in deemed savings calculations going forward. There would also be a corresponding penalty in increased gas or electric use due to heating; however, given New Orleans's climate, this would likely be much smaller than the air conditioning savings.**
- The worksheet used by the direct install volunteers is not consistent with the wattage assumptions used in the deemed savings document. For example, the sheet shows that a 13 watt CFL should replace a 60 watt incandescent, while the deemed savings document assumes a 15 watt CFL replaces a 40 watt incandescent. **The worksheet and/or the deemed savings assumptions need to be updated in order that the reported savings are an accurate reflection of what was installed. Further, we believe that the replacement assumptions in the deemed savings document represent an increase in lumens and that the volunteers most likely made their replacement decisions based on the recommendations on the application. It is therefore likely that the reported savings are lower than actual savings; however, it is impossible to know for sure without on-site inspections or interviews with program participants. In the future, the application sheet should be reviewed to 1) maintain consistency with the deemed savings approach; and, 2) to ensure that following the replacement instructions in the application does not result in a significant change in lighting output.**
- There were a few instances where the savings from the same project application were split up into multiple line items in the tracking database, showing different installation dates. **For clarity, each project should contain one line on the database.**

AC TUNE-UP

Savings data for the AC Tune-up Program were analyzed by address and application. There were 830 discrete projects in the tracking database. Each project achieved average mean savings of 517 kWh, for a total reported savings of 429,291 kWh.

In order to minimize the amount of project files needed for review, stratified random sampling was used. Before final sample selection, the database was reviewed to check for outliers and missing values. Project records were sorted from smallest to largest kWh claim, and placed into three strata, each with approximately one-third of the total program savings. Table 5 below shows the reported kWh, kW, and number of projects in each sampling stratum.

Table 5: AC Tune-Up Program Strata Description

Sampling Strata	Reported Gross kWh	Reported Gross kW	Projects	Coefficient of Variation
1	143,062	71	351	0.04
2	143,829	79	225	0.01
3	142,400	73	254	0.48
TOTAL	**429,291**	**223**	**830**	**0.79**

Next, a sample of projects from each stratum was selected. The number of projects selected from each stratum is dependent on the coefficient of variance of the reported savings within that stratum. Table 6 gives the sample information.

Table 6: AC Tune-up Reviewed Project Information

Sampling Strata	Number of Applications	Reported kWh	kWh Weights	Number of sampled projects	kWh of sampled projects	% of Total Sampled
1	351	143,062	33%	1	317	0.2%
2	225	143,829	34%	1	615	0.4%
3	254	142,400	33%	10	12,616	8.9%
TOTAL	**830**	**429,291**	**100%**	**12**	**13,548**	**2.8%**

Table 7 shows the results of the quantitative project file review.

Table 7: AC Tune-up Impact Results

	Reported	Realization Rate	Verified	Relative Precision at 90% confidence level
kWh	429,291	0.95	406,374	6.5%
kW	223	0.99	221	8.6%

Some general observations from the database and project file review:

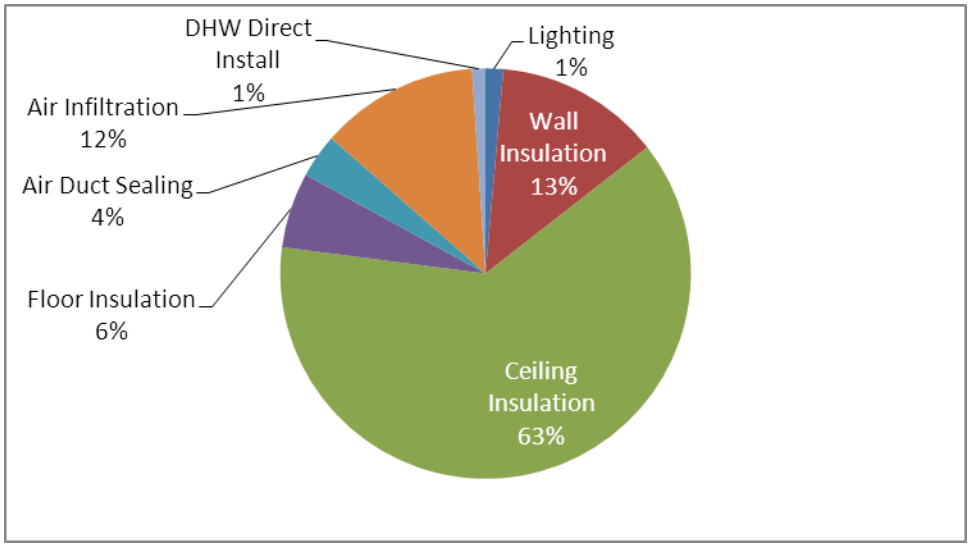
- Realization rate is close to one, showing that savings were captured fairly accurately and consistently.
- For kWh, realization rate is less than one due to one case where a tune-up was not completed due to an evaporator coil that needed replacement, and one entry where the savings was incorrectly entered into the database. The realization rate for kW is higher, due to a project where the kW was entered as 0.

RESIDENTIAL SOLUTIONS

Energy Assessments

There were 610 project applications submitted in the 2011 Residential Solutions Program, at a total of 388 different households. Program reported savings are 1,442,285 kWh. The chart below shows total savings by end use

Table 8: Residential Solutions Savings by End Use



In order to minimize the amount of project files needed for review, stratified random sampling was used. Before final sample selection, the database was reviewed to check for outliers and missing values. Project records were sorted from smallest to largest kWh claim, and placed into three strata, each with approximately one-third of the total program savings. Table 9 below shows the reported kWh, kW, and number of projects in each sampling stratum.

Table 9: Residential Solutions Program Strata Description

Sampling Strata	Reported Gross kWh	Reported Gross kW	Projects	Coefficient of Variation
1	479,396	316	272	0.3
2	481,716	86	74	0.4
3	481,173	48	42	0.5
TOTAL	**1,442,285**	**451**	**388**	**0.99**

Next, a sample of projects from each stratum was selected. The number of projects selected from each stratum is dependent on the coefficient of variance of the reported savings within that stratum. Table 10 gives the sample information.

Table 10: Residential Solutions Reviewed Project Information

Sampling Strata	Number of Applications	Reported kWh	kWh Weights	Number of sampled projects	kWh of sampled projects	% of Total Sampled
1	272	479,396	33%	4	8,012	2%
2	74	481,716	33%	7	49,211	10%
3	42	481,173	33%	8	81,760	17%
TOTAL	**388**	**1,442,285**	**100%**	**19**	**138,983**	**10%**

Table 11 shows the results of the quantitative project file review.

Table 11: Energy Assessment Impact Results

	Reported	Realization Rate	Verified	Relative Precision at 90% confidence level
kWh	1,442,285	0.93	1,346,390	7%
kW	451	0.93	420	27%

Some general observations from the database and project file review:

- The realization rate for this program is slightly lower than that of other programs. This is mostly due to projects that failed the post-inspection but have not been updated in the database. We assume that insulation projects that fail the post-inspection get 0 savings. This is conservative – in reality, there was probably some insulation added, even if it did not reach the required level.
- As program procedure, the vendor is asked to go back and fix any projects that fail inspection. However, there was no hard-copy documentation available showing this procedure, and so the savings were not included in the verified numbers shown above.
- For floor insulation, the program requires insulating up to R-13, but deemed savings are based on R-19 insulation. The reported savings have been appropriately discounted from the deemed savings, so no adjustment was necessary. However, in the future, **the application requirements should match the assumptions in the deemed savings document.**
- It was often difficult to tell how the savings in the database were derived from the information in the application. **We recommend including any savings calculations with the project documentation.**
- There were a few cases where the numbers in the post-installation inspection did not match the numbers used to derive the tracking savings. These instances are reflected in the realization rate. However, they do not significantly affect the gross kWh.

- We recommend setting up the database so it is easier to look at all assessments and projects done by a single participant.

Multi-Family Direct Install

Multi-Family Direct Install was performed as an initiative within the Residential Solutions Program. This initiative performed the direct installation of CFLs, faucet aerators, and low-flow showerheads in each unit of large multi-family complexes. Since some of the units visited were for low-income family, this initiative also produced some savings for the low-income program. In total, there were six multi-family complexes visited, for total reported savings of 1,946,167 kWh. As part of the impact evaluation, we reviewed the invoice for one of the 6 projects, representing 20% of the total savings for the program, and reviewed the calculations used for the savings in all projects.

There were no problems with the project file review – the project documents were internally consistent and matched the number of bulbs used for the savings calculations. However, there is a major source of uncertainty regarding the assumed baseline. In the deemed savings document, it is assumed that a 15 watt CFL replaces a 40 watt incandescent, while in the multi-family calculations, it is assumed that a 15 watt CFL replaces a 60 watt CFL. Since 15 watt CFLs are the most common type to be installed, this change would lower program savings to 1,588,254 kWh, or 81% of the original reported savings. In the evaluators' opinion, a 15 watt CFL is more likely to replace a 60 watt incandescent than a 40 watt incandescent, and so the savings reported in the program are correct. However, **going forward care should be taken to give the contractors or volunteers conducting the installations clear instructions as to what wattage CFLs should replace standard incandescent bulbs; this guidance should be consistent with both the CFL Direct Install Program and the deemed savings assumptions.**

Since we did not adjust kWh savings for the multifamily direct install program, the realization rate is 1.0. For kW savings, we found an error in the calculation that was causing a significant underestimation of savings for CFLs. We recalculated the demand reduction using the appropriate delta wattage, and a coincidence factor of 0.225, derived from the Deemed Savings Document. As a result, total kW savings from the program increase from 204 kW to 387 kW, for a realization rate of 1.9.

Table 12: Multi-Family DI Impact Results

		Reported Savings	Realization Rate	Verified Savings
LI	kWh	307,622	1	307,622
	kW	32	1.90	60
Non-LI	kWh	1,638,545	1	1,638,545
	kW	172	1.90	327
Total	kWh	1,946,167	1	1,946,167
	kW	204	1.90	387

Finally, it is likely that the savings shown here are still an underestimate, since they do not count for interactive HVAC effects. **We recommend that, going forward, the contractors or volunteers track whether or not the light is installed in a conditioned space, and include a multiplier to account for HVAC interactive effects.**

Total Residential Solutions Savings

Finally, Table 13 shows the total savings for the energy assessment measures and component of the Multi-Family Direct Install Initiative that is attributable to the Residential Solutions Component. The rest of the savings from the initiative will be counted under the Low-Income program.

Table 13: Total Residential Solutions Savings

		Reported Savings	Realization Rate	Verified Savings
Energy Assessment	kWh	1,442,285	0.93	1,346,390
	kW	451	0.93	420
Multi-Family	kWh	1,638,545	1	1,638,545
	kW	172	1.9	327
Total	kWh	3,080,830	0.97	2,984,935
	kW	623	1.20	747

ENERGY STAR AIR CONDITIONER

There were 246 projects on 218 homes as part of the Energy Star Air Conditioner Program in 2011. Each project achieved mean savings of 547 kWh, or 618 kWh per household, for a total reported savings of 134,655 kWh.

In order to minimize the amount of project files needed for review, stratified random sampling was used. Before final sample selection, the database was reviewed to check for outliers and missing values. Project records were sorted from smallest to largest kWh claim, and placed into three strata, each with approximately one-third of the total program savings. Table 14 below shows the reported kWh, kW, and number of projects in each sampling stratum.

Table 14: Energy Star AC Program Strata Information

Sampling Strata	Reported Gross kWh	Reported Gross kW	Projects	Coefficient of Variation
1	45,115	19	165	0.3
2	45,706	17	61	0.58
3	43,834	14	20	0.13
TOTAL	**134,655**	**49**	**246**	**1.06**

Next, a sample of projects from each stratum was selected. The number of projects selected from each stratum is dependent on the coefficient of variance of the reported savings within that stratum. Table 15 gives the sample information.

Table 15: Energy Star AC Reviewed Project Information

Sampling Strata	Number of Applications	Reported kWh	kWh Weights	Number of sampled projects	kWh of sampled projects	% of Total Sampled
1	165	45,115	34%	4	1,400	3%
2	61	45,706	34%	14	11,353	25%
3	20	43,834	33%	2	4,377	10%
TOTAL	**246**	**134,655**	**100%**	**20**	**17,130**	**13%**

Table 16 shows the results of the quantitative project file review.

Table 16: Energy Star AC Impact Results

	Reported	Realization Rate	Verified	Relative Precision at 90% confidence level
kWh	134,655	1.13	152,201	14%
kW	49	1.14	56	15%

Some general observations from the database and project file review:

- The higher than one realization rate is due to two instances where there were two AC systems installed in a single application, but savings were only reported for one. The "quantity" field in the database was correctly entered as 2, but the savings only reflected one installed unit.
- Projects with more than one AC system were inconsistently entered into the database. Sometimes when there were multiple rebates in the same application, they were entered as one line, sometimes as multiple lines, and sometimes only the savings for one of the units were entered. Going forward, care should be taken to enter the projects into the tracking database clearly and consistently.

NEW HOMES

There were 101 homes that participated in the New Homes program. The average savings were 2,050 kWh per home, for a total 207,067 kWh saved. Out of the 101 participating homes, 93 used the performance path, 15% of which got a HERS rating of 70 or less for 2,087 kWh savings, and 85% got a HERS rating of 70-85, for 1,044 kWh of savings. The 8 homes that used the prescriptive path all achieved between 3,000 kWh and 4,000 kWh.

Since the savings variance between projects for the program is so small, we used simple random sampling to save time and effort over using stratified sampling methods. We chose a

sample of 5 projects. The sampling was not completely random – we made sure to inspect at least one of the 8 homes that used the prescriptive path. In this way, we could ensure that both the prescriptive path and the performance path savings calculations are being applied correctly.

As shown in Table 17, the deemed savings for all projects were internally consistent and applied correctly, giving realization rates of 1.0.

Table 17: New Homes Impact Results

	Reported Savings	Realization Rate	Verified Savings
kWh	207,067	1.0	207,067
kW	65	1.0	65

Some general observations from the database and project file review:

- It was impossible to tell where the deemed savings come from or how they were calculated based on the project documentation. **We recommend including savings calculations in the project documentation.**
- In the prescriptive path, the deemed savings used for lighting are based on a single kWh number from the Energy Smart Appendix. **In the future, we recommend using savings based on the actual amount of fixtures installed.**

LOW-INCOME

In the 2011 program year, there were a total of 166 low-income projects at 120 different low income buildings. Of the 166 projects, 89 were air conditioner replacements, and 79 were non-air conditioner projects, equating to 17% of the savings from air conditioners, and 83% from insulation, air sealing, and duct sealing. In total, the 2011 Low-Income Program had reported savings of 112,236 kWh.

For sampling, we split up the projects into air-conditioner projects and non-air conditioner projects, as shown in Table 18.

Table 18: Low-Income Program Sampling Description

	Reported Gross kWh	Reported Gross kW	Projects
AC	19,530	7.891	89
Non-AC	92,706	27.5	79
TOTAL	**112,236**	**35**	**168**

Next, a sample of projects was selected from each category. The number of projects selected from each category is dependent on the coefficient of variance of the reported savings. Table 19 gives the sample information.

Table 19: Low-Income Reviewed Project Information

	Number of Applications	Reported kWh	kWh Weights	Number of sampled projects	kWh of sampled projects	% of Total Sampled
AC	89	19,530	17%	9	2,234	11%
Non-AC	79	92,706	83%	15	36,991	40%
TOTAL	**168**	**112,236**	**100%**	**24**	**39,225**	**35%**

Table 20 shows the results of the quantitative project file review. It also includes the component of the Multi-Family Direct Install savings that were counted towards low-income.

Table 20: Low-Income Impact Results

		Reported Savings	Realization Rate	Verified Savings
Low-Income	kWh	112,236	0.99	111,586
	kW	35	0.99	35
Multi-Family	kWh	307,622	1.0	307,622
	kW	32	1.9	60
Total	kWh	419,858	1.0	419,208
	kW	67	1.4	95

Realization rates for both kWh and kW are very close to one, demonstrating CLEAResult's good data verification procedures.

Some general observations from the database and project file review:

- There were several projects where in 2-3 unit multi-family buildings where invoices were not included in the project documentation, so it was difficult to tell whether savings estimate were accurate. After discussion with CLEAResult, the invoices were provided and the reported savings were verified.
- There were no invoices provided with the project documentation of several projects.
- The realization rate is slightly below one due to certain instances where the savings calculations were not modified to reflect the information in the post-installation inspection.

SOLAR HOT WATER

The 2011 solar hot water program consisted of two projects, installed by the same contractor on neighboring buildings. We reviewed one out of the two projects installed, and found no errors. Therefore, as shown in Table 21, this program has a realization rate of 1.0.

Table 21: Solar Hot Water Impact Results

	Reported Savings	Realization Rate	Verified Savings
kWh	5,438	1.0	5,438
kW	0.84	1.0	0.84

COMMERCIAL AND INDUSTRIAL

In order to both increase the total population of Commercial and Industrial projects and to streamline evaluation efforts, the small and large C&I programs were combined into one population. There were a number of projects for the C&I programs that are counted towards program year one, but that were not yet finalized while this analysis was being done. The stratified sampling analysis proceeded without these projects in the total population, but the resulting realization rate is applied to the total year one savings in Table 24.

The small and large commercial and industrial programs saved 6,449,390 kWh from 97 projects. Of the 97 projects, 94% were lighting projects, and 6% were HVAC projects. This equates to 93% of the savings coming from lighting projects, and 7% coming from non-lighting projects.

For sampling, due to the large difference in average savings between lighting and non-lighting projects, and because we wanted to be sure to review some non-lighting projects, we split up the projects into 3 strata of lighting projects in addition to non-lighting projects. Table 22 below shows the distribution.

Table 22: C&I Program Strata Description

Strata	Reported Gross kWh	Reported Gross kW	Projects
1	2,015,231	355	74
2	2,026,234	368	13
3	1,984,690	381	2
non-lighting	423,235	130	6
Total	**6,449,390**	**1,235**	**97**

Next, a sample of projects was selected from each category. The number of projects selected from each category is dependent on the coefficient of variance of the reported savings. Table 23 gives the sample information.

Table 23: C&I Program Reviewed Project Information

Sampling Strata	Number of Applications	Reported kWh	kWh Weights	Number of sampled projects	kWh of sampled projects	% of Total Sampled
1	74	2,015,231	31%	2	49231	2%
2	13	2,026,234	31%	2	438614	22%
3	2	1,984,690	31%	2	1984690	100%
Non-Lighting	6	423,235	7%	2	312,978	74%
TOTAL	**95**	**6,449,390**	**100%**	**8**	**2,785,513**	**43%**

Table 24 shows the results of the quantitative project file review. The savings in this table are larger than in the previous tables because they include projects that had not yet been finalized at the time of the analysis.

Table 24: C&I Impact Results

	Reported	Realization Rate	Verified	Relative Precision at 90% confidence level
kWh	7,809,811	1.01	7,891,461	1.3%
kW	1,326	1.01	1,338	1.1%

Some general observations from the database and project file review:

- Most of the savings from the large chiller project at 1555 Poydras Street come because the project is defined as a retrofit – in fact, the installed chiller is not significantly more efficient than minimum energy code requirements. **For large custom retrofit projects, it should be noted in the project files that the existing chiller is in working condition, and a baseline shift should be used to calculate future savings and TRC**.
- For completeness, the excel lighting survey files should be included in the project files. This will aid future evaluations, and make it easier to update savings based on the results of any post-installation verification.
- Some contractors have been using outdated versions of the lighting tool. We recommend ensuring that all contractors are using the current version of the lighting tool, and that care be taken to make sure contractors switch to new versions as updates are released.

CONCLUSION

DATABASE REVIEW

For the 2011 program year, project information was split between two separate databases. This made it significantly more difficult to access and manipulate the data for the impact evaluation. However, a single new database is in use starting for the 2012 program year. This will likely reduce future error on reported savings. Since the databases reviewed are no longer in use, we will not get into detailed comments specific to the databases used in 2011. However, in general:

- Applications with multiple projects were sometimes entered as one line in the database, and sometimes as multiple lines. **We recommend that these projects be entered consistently, and that there always be a unique identifier for project application.**
- There are several instances where two lines of the database have the same project name, project code, and installation name. In these cases, it is very difficult to tell whether the two lines are duplicates or two different projects from the same application. **We recommend that, at the least, project code be unique for each line.**
- There are many instances of projects missing database fields such as project, project code, or zip code. This is likely a function of using two separate databases in 2011, which will resolve itself in 2012.
- We recommend creating a user manual for the database that gives clear descriptions of each field.

TOTAL RESULTS

As seen in Table 25, even though kWh realization rates from individual programs varied from 0.93 to 1.0, the overall verified savings is extremely close to the reported savings. This indicates that CLEAResult did a good overall job calculating and reporting deemed savings, and that, while there were some errors, they were not systemic, and were instead evenly distributed around the mean savings.

Table 25: Total Results

Program	Reported kWh Savings	Verified kWh Savings	kWh Realization rate	Reported kW Savings	Verified kW Savings	kW Realization Rate
CFL Direct Install	3,726,006	3,776,511	1.01	604	612	1.01
AC Tune-Up	429,291	406,374	0.95	223	221	0.99
Residential Solutions	3,080,830	2,984,079	0.97	623	749	1.20
Energy Star Air Conditioner	134,655	152,201	1.13	49	56	1.14
New Homes	207,067	207,067	1.00	65	65	1.00
Low Income	419,858	419,208	1.00	67	95	1.42
Solar Hot Water	5,438	5,438	1.00	1	1	1.00
Commercial and Industrial	7,809,811	7,891,461	1.01	1,326	1,338	1.01
Total	**15,812,956**	**15,842,339**	**1.0**	**2,958**	**3,137**	**1.06**

CONCLUSIONS AND NEXT STEPS

The realization rate of close to 1.0 for kWh shows that, in general, CLEAResult's quality control and verification procedures are rigorous and ensure high quality tracking data. However, there are a few key recommendations that would further improve the accuracy of the tracking data.

- Ensure that the project savings information is updated based on post-inspection verification information.
- Ensure that the instructions for which wattage CFLs should replace any given incandescent bulb are consistent between the Residential Solutions program, the CFL DI program, and the deemed savings documentation. These instructions should be based on the requirement of maintaining the same lumens pre- and post-installation. Any reduction in light output after the direct install will make it more likely for the customer to switch back to incandescent, thus negating the energy savings.
- Ensure that envelope measures for detached homes with multiple dwelling units are only counted once. This was especially an issue for the low-income program, which had many projects in 2-3 family homes.
- Include the lighting calculator with the commercial lighting project files. This will make it far easier to verify savings, and update savings after any post-installation verifications.
- Ensure that all contractors are using the most up-to date version of the lighting calculator.
- Consider adding a factor representing HVAC interactive effects for residential savings calculations.

It is important that thorough project file reviews are conducted for the first few years of new program activity. However, once the above recommendations have been implemented and the new database is in use, it is likely that New Orleans stakeholders will be confident that CLEAResult's ongoing quality control and data verification procedures are ensuring that reported savings correctly reflect the actual implemented project specifications and correctly apply the deemed savings documents. In this case, it may be appropriate to conduct a less thorough review of the project files and instead focus evaluation resources on specific program areas which get a lot of savings and are highly uncertain. These evaluation areas may include:

- Evaluation of net savings, as opposed to gross savings.
- On-site verification to ensure that projects are being installed to the correct specification.
- On-site light logging to ensure that the hours of operation used in the deemed savings approach reflect actual hours of operation.
- An evaluation looking at how to improve program processes and procedures, as opposed to impacts.
- Review of specific parameters in the deemed savings document with a high perceived uncertainty.

Optimal ENERGY *Integrated Energy Resources*

MEMORANDUM

To: Jonathan Kleinman, CLEAResult
cc:
From: Cliff McDonald, Mike Guerard
Date:
Subject: New Orleans Deemed Savings Review

INTRODUCTION

The goal of this report is to present a summary of the findings and recommendations from the evaluation of CLEAResult's recommended changes to New Orlean's deemed savings. This report outlines Optimal's methodology for review, general overarching recommendations, and suggests possible additional measures to add to the CLEAResult efficiency programs. The full document showing CLEAResult's recommendations, with Optimal's specific comments and edits, is included as an appendix to this report.

METHODOLOGY

For each measure promoted as part of CLEAResult's efficiency programs in New Orleans, Optimal Energy:

1. Reviewed CLEAResult's suggested changes to make sure they are appropriate and comport with industry best practices.
2. Reviewed the assumed baseline efficiency level to make sure it comports with local and federal energy codes.
3. Reviewed the criteria for the efficient equipment to ensure that the programs are promoting cost-effective technology with above-code energy savings.
4. To the extent available, reviewed algorithms and input assumptions to ensure they comport with industry standards and best practices.
5. For measures where input assumptions are not available, compared savings estimates to those used in similar regions to ensure no significant discrepancies.

GENERAL OBSERVATIONS AND OVERARCHING RECOMMENDATIONS

In general, we agree with the majority of CLEAResult's recommended changes and find that, once these changes are incorporated, New Orlean's deemed savings will be consistent with best practices and savings estimates from other jurisdictions. However, we do have several comments, both overarching and for specific measures.

Specific comments will be given in the next section. In general for the deemed savings document, we recommend:

1. **Many input assumptions unclear:** For measures where CLEAResult has recommended a new approach to estimating savings, this approach is clear and well documented. However, for many of the other measures it is unclear how the savings are derived, and what input assumptions are being used. The magnitude of these estimates is in line with the deemed savings from other jurisdictions; however, in order to increase transparency and ease future update processes, we recommend all assumptions be recorded in the deemed savings document. If based on engineering equations, algorithms and source data should be provided. If based on modeling, all modeling inputs should be described, as well as any calibration process. Without this information, future updates to savings numbers (due to code improvements, changing market practices, etc.) may not be internally consistent if only a single parameter in a given model needs to be changed but a consultant needs to build an entirely new model.
2. **Including Operation and Maintenance (O&M) and gas savings:** The Total Resources Cost test (TRC) is designed to include the total benefits to society of implementing efficiency, and not just the electric benefits (i.e. total resources, not the electric resources). As such, any ancillary O&M benefits or gas benefits should be included in the TRC. If only electric savings are allowed, measures that may have significant societal benefits – such as LEDs and shell measures – may have trouble passing the TRC. We therefore recommend that the deemed savings include estimates for gas savings for shell measures and O&M savings for lighting measures. For measures where the savings are based on modeling, the gas savings should be available from the same model used to derive the electric savings. The best source for O&M savings is likely the Vermont Technical Resource Manual, which has a comprehensive list of lifetimes and replacement costs for lamps and ballasts.
3. **Add a systematic approach for dealing with early retirement retrofits:** In most cases, the current deemed savings assume that the efficient equipment is being installed when the current equipment has failed and would have needed to be replaced by a code compliant equipment, even in the absence of an incentive. However, in many cases, the efficiency program prompts the early retirement of existing equipment that has not yet failed. This equipment may be ten or more years old and thus significantly less efficient than current code compliant equipment. In these situations, it makes sense to count the larger savings from the existing equipment baseline for a few years, and then shift the baseline to include fewer savings in the out-years when the existing equipment would have failed and needed replacement, even in the absence of the efficiency program. Alternatively, to make the calculations easier, instead of a baseline shift, the initial savings could be counted every year but for a reduced measure life to account for the reduced savings in the out years. A similar issue arises for measures such as lighting where codes are expected to get more stringent in the near future. We recommend that systematic approaches be developed for dealing with these issues, and clearly stated in the deemed savings document.

4. **Add information necessary to screen for cost-effectiveness**: While this document does a good job of documenting annual savings, there are many inputs needed for the TRC screening that are not given. These include measure life, incremental cost, O&M savings, and gas savings. We recommend that these inputs are included in the deemed savings document, to ensure that each measure is screened consistently.

MEASURE SPECIFIC RECOMMENDATIONS

CLEAResult's document with suggested deemed savings calculations is provided as an appendix with our comments and editorial suggestions. However, all non-minor comments on specific measures are also called out in this section.

1. **Solar Screens:** the base solar heat gain coefficient (SHGC) is assumed to be 0.75, including factors to account for natural shading, such as trees, etc. This seems high, considering IRC 2006 requires 0.4 for hot climates. It seems like this has been the requirement at least as far back as IRC 2000. Using typical SHGC numbers from cooler climates may not apply here, as there are only SHGC code requirements for climate zones 1-3. We recommend either lowering the value from in the model and rerunning, or adding a condition that existing SHGC must be greater than a certain value – say, 0.7.
2. **Variable Speed Pool Pumps:** CLEAResult's proposed procedure is clear and well sourced. However, the final savings estimate is based on the assumption that the pool is in use 365 days a year. This seems high even for a New Orleans climate, and we recommend either finding a source to back up the assumption, or using a more conservative estimate.
3. **Commercial HVAC measures:** The CEE efficiencies listed in the document do not all match current CEE specifications, which have recently been updated. See the Appendix for specific comments and updates. Secondly, the recommended kW calculations imply a coincidence factor of one. This is higher than that used in most jurisdictions, more typically around 0.8. Third, although CLEAResult's proposed equivalent full load hours for cooling (EFLH) look reasonable, they are actually slightly lower than the ~2500 full load hours implied by the existing deemed savings values for residential installations. Typically residential hours are lower than commercial hours, as households often turn off or setback their thermostat for long periods during the day and at night. We recommend ensuring that a consistent methodology is used to calculate the EFLH for both residential and commercial HVAC installations. Finally, CLEAResult recommends using ASHRAE 90.1 – 2007 as the baseline for retrofit applications. We believe that there is justification for using a lower baseline, as typical HVAC equipment has a life of 15-20 years, and so many existing installations have been bought well before the date ASHRAE 2007 came into effect in Louisiana. Instead of ASHRAE 90.1-2007, we suggest using the 2008 federal standards, which are only slightly different from the previous standard set in 1997[1].
4. **Commercial Chillers:** Water cooled chillers are rated in kW/ton, and so current equations do not apply. We recommend developing an alternate algorithm based on

[1] See: http://www1.eere.energy.gov/buildings/appliance_standards/commercial/pdfs/ashrae_products/66fr3336.pdf

kW/ton, using the kW/ton at full load to calculate demand reductions and the IPLV to calculate the energy savings. As stated above, we recommend developing a coincidence factor for the peak demand reduction for HVAC measures.

5. **Room Air Conditioner Replacement:** CLEAResult's recommendations for this measure seem to be left out of the document. The deemed savings in the current Frontier document looks ok. However, assumptions regarding coincidence factors should be made explicit.
6. **Residential HVAC measures:** As stated previously, we recommend that the methodology for developing residential EFLH be updated to ensure consistency with the commercial side.
7. **Lighting Measures:** Starting in 2012, new federal lighting standards will start significantly shifting the baseline technology. We recommend that the deemed savings document and the CLEAResult lighting calculator explicitly state how this will affect the claimed savings. We recommend using baseline shift in the year that the new standard would begin the specific lighting type. However, simpler methodologies, such as simply assuming a T8 baseline even when T12s are being replaced, may also be appropriate.

ADDITIONAL MEASURES

In addition to the review of the current deemed savings, Optimal performed quick review of the measures offered in New Orleans compared to the measures offered in similar programs around the country to see if any significant savings opportunities are being missed. On the residential side, the current list of measures is complete. On the commercial side, there are some opportunities to add measures that could procure significant additional savings:

1. **Refrigeration measures:** There are currently no commercial refrigeration programs in the deemed savings documentation. This is an important opportunity, as refrigeration is a significant portion of the electric load for many commercial building types, and current technology has the potential to reduce this load significantly and cost-effectively. Refrigeration technology that could be promoted includes door heater controls, ECM evaporator fan motors, LED case lighting, cooler night covers, strip curtains, electronic defrost control, evaporator fan controls, vending misers, solid and glass door reach-in refrigerators and freezers, zero-energy doors, commercial ice makers, and door heater controls. Cost and savings information for commercial ice makers, and reach-in refrigerators and freezers can be taken from the Energy Star calculator. Characterizations for many of the other measures may be adopted from the TRMs of other jurisdictions such as Vermont, Massachusetts, and New York. Much additional information is given in this 2009 report by Navigant Consulting: http://apps1.eere.energy.gov/buildings/publications/pdfs/corporate/commercial_refrig_report_10-09.pdf
2. **Dual enthalpy economizer controls:** Dual enthalpy economizer controls save cooling energy by bringing in outside air when the total enthalpy (sensible and latent heat) of the outside air is less than that of the indoor air. Since the savings for the measure is very

weather dependent, we recommend developing savings using either bin analysis or modeling with TMY3 data for New Orleans.

3. **Variable Speed Drives:** Variable speed drives (VSDs) save energy by reducing the speed of a motor during less than full load conditions. Since power requirements vary with the cube of the speed, VSDs have the potential for significant savings. Since the savings are highly dependent on the motor application, size, and weather, it is very difficult to develop deemed savings for VSDs. However, many jurisdictions do offer VFDs for smaller motors for common applications (supply fan, chilled water pumps, etc.) on a prescriptive basis, based on modeling for typical operating conditions, or on evaluation data from actual installations.

APPENDIX: CLEARESULT RECOMMENDATIONS WITH OPTIMAL COMMENTS

Entergy New Orleans EnergySmart Program
Deemed Savings Evaluation

Prepared By:
CLEAResult – Core Engineering Services (CES)
Kyle Hemmi
David Rocha

Table of Contents

ENTERGY NEW ORLEANS ENERGYSMART PROGRAM DEEMED SAVINGS EVALUATION

DEEMED SAVINGS EVALUATION OBJECTIVE

CLEAResult is pleased to perform a detailed review of deemed savings currently used in the Entergy New Orleans EnergySmart Programs. The purpose of this evaluation is to review current deemed savings and related calculation methods, highlight any issues or areas of concern that require updates or modifications, and provide a detailed account of our findings, including any proposed updates or modifications.

ENERGYSMART PROGRAM OVERVIEW

The City Council of New Orleans has created sustainable energy efficiency programs through the Energy Smart Programs. In 2011, Entergy New Orleans and the New Orleans City Council, through the program administrator CLEAResult, will be offering the following Energy Smart energy efficiency programs:

1. Residential Solutions Program
2. Small Commercial & Industrial Solutions Program
3. Large Commercial & Industrial Solutions Program
4. Residential Weatherization-Ready Program
5. Residential ENERGY STAR Air Conditioning Program
6. Energy Efficient New Homes Program
7. Residential Direct Install CFL's Program
8. Residential AC Tune-up Program
9. Solar Hot Water Heater Program (Pilot)
10. One Stop Shop for Energy Efficiency

CALCULATION METHODOLOGIES

The following are the New Orleans City Council approved deemed savings documents used in the Entergy New Orleans EnergySmart Programs. The Frontier document provides detailed deemed savings values with additional information about the measure, savings baseline assumptions and applicable installation and efficiency standards. The ICF document is a simple listing of generic deemed savings values in a tabular format.

1. **Frontier Deemed Savings** - This document was prepared by Frontier Associates LLC. It is titled "Entergy New Orleans Deemed Savings, Installation & Efficiency Standards for Residential and Small Solutions Programs" dated March 2009. It includes the following 23 measures:

Table 1 - Frontier Deemed Savings Measure List

#	Measure	Group
1	Central Air Conditioner Replacement	HVAC
2	Heat Pump Replacement	HVAC
3	Ground Source Heat Pump	HVAC
4	Window Air Conditioners	HVAC
5	Split System and Single-Package Air Conditioners	HVAC
6	Split System and Single-Package Heat Pumps	HVAC
7	Ceiling Insulation	Envelope
8	Wall Insulation	Envelope
9	Floor Insulation	Envelope
10	Energy STAR Windows	Envelope
11	Air Infiltration	Envelope
12	Solar Screens	Envelope
13	Duct Efficiency Improvement	HVAC
14	Water Heater Replacement	Water Heating
15	Water Heater Jackets	Water Heating
16	Water Heater Pipe Insulation	Water Heating
17	Low Flow Shower Head	Water Heating
18	Faucet Aerators	Water Heating
19	Energy STAR Refrigerators	Appliance
20	Energy STAR Dishwashers	Appliance
21	Energy STAR Clothes Washers	Appliance
22	CFL	Lights
23	Water Heating Replacements - Solar Water Heating	Water Heating
23	Solar Electric (PV)	Solar

2. **ICF Deemed Savings** - This document was developed by ICF International for the ENO Energy Smart Plan Docket# UD-08-02 dated July 2, 2009. This document is titled "Appendix 6 – Deemed Savings Tables". This document includes 740 line items each representing a deemed savings values for a specific energy efficiency measure.

RESIDENTIAL SOLUTION PROGRAM

Program Objective

The Residential Energy Solutions Program is designed to help residential customers understand, identify and implement energy efficiency improvements in their homes. Below is the list of measures currently being offered by the Program. A description of each measure, deemed savings calculation methodology, identified problems to deemed savings and recommendations are presented in the following pages.

1. Ceiling Insulation*
2. Wall Insulation*
3. Floor Insulation*
4. Air Sealing*
5. Duct Sealing*
6. Solar Screens*
7. Direct Install**
    a. Low Flow Showerheads
    b. Low Flow Faucet Aerators
    c. Hot water tank wrap
    d. Pipe insulation
    e. CFL Bulbs
8. Variable Speed Pool Pump***
9. Heat Pump water heater***
10. Advanced Power Strip***

* Contractor installed requires an Energy Assessment/Audit.
** Contractor does not require an Energy Assessment/Audit.
*** Mail–in rebate available to customer or installer.

Ceiling Insulation

Description: Ceiling insulation will increase the insulation levels in eligible homes up to a minimum value of R-30. Incentive and savings are based on the square footage of conditioned space in the home. The home must have electric air conditioning and current insulation levels must be less than R-22 to qualify. The maximum rebate allowed for this Program is $1,000.

Existing Deemed Savings: Frontier deemed savings assumes that treated ceilings will be insulated to R-30.

Table 2 – [Frontier] Ceiling Insulation Deemed Savings

Table 1. Ceiling Insulation Deemed Savings

Climate Zone - New Orleans, LA					
Ceiling Insulation					
	kWh Savings	kWh Savings	kWh Savings	Summer Peak kW Savings	
Ceiling Insulation Base R-value	Gas Heat	Electric Heat	Heat Pump	Gas Heat & Electric Heat	Heat Pump
	(per sq. ft.)	(per sq. ft.)	(per sq. ft.)	(per sq. ft.)	(per sq. ft.)
R-0	3.47	4.65	3.55	0.000826	0.000826
R-1 to R-4	1.47	2.74	2.03	0.000516	0.000528
R-5 to R-8	0.77	1.43	1.06	0.000252	0.000252
R-9 to R-14	0.42	0.79	0.58	0.000130	0.000130
R-15 to R-22	0.20	0.39	0.28	0.000063	0.000063

Problems: None

Recommendations: None

Wall Insulation

Description: Wall insulation will increase the insulation levels in eligible homes up to a minimum value of R-11. Incentive and savings are based on the square footage of the wall area in the home. The home must have electric air conditioning and existing insulation levels must be R-0 to qualify. The maximum rebate allowed for this Program is $1,000.

Existing Deemed Savings: Frontier Deemed savings is based on treated wall area (gross wall area less window and door openings) going from R-0 to R-11, for various heating and cooling types.

Table 3 - [Frontier] Wall Insulation Deemed Savings

Table 1. Wall Insulation Deemed Savings

Wall Insulation – Climate Zone New Orleans				
Electric A/C Gas Heat kWh Savings per sq. ft.	Electric A/C Electric Heat kWh Savings per sq. ft.	Electric A/C Heat Pump kWh Savings per sq. ft.	Summer Peak kW Savings per sq. ft.	
			Gas Heat & Electric Heat	Heat Pump
0.77	2.94	1.77	0.000571	0.000571

Problems: None

Recommendations: None

Comment [CM1]: Current characterization looks ok. May want to consider adding an above-code tier (R-38 is standard in Northeast).

Comment [CM2]: Code requires wall insulation at R-13. However, logistically you can only retrofit a wall to R-11 in an existing 2x4 cavity, so this characterization is good. For any new construction projects, higher than code insulation should be required.

Floor Insulation

Description: Floor insulation will increase the insulation levels in eligible homes up to a minimum value of R-13. Incentive and savings are based on the square footage of treated floor in conditioned space. The home must have electric air conditioning and existing insulation levels must be R-0 to qualify. The maximum rebate allowed for this Program is $1,000.
Existing Deemed Savings: The Frontier Deemed savings assumes a home without insulation under floor (above a conditioned space) and adding at minimum R-19 of insulation.

Table 4 - [Frontier] Floor Insulation Deemed Savings

Table 1. Floor Insulation Deemed Savings

Floor Insulation - Climate Zone New Orleans, LA				
Electric A/C And Heating Type	Site Built Home		Manufactured Home	
	kWh Savings per sq. ft.	Summer Peak kW Savings per sq. ft.	kWh Savings per sq. ft.	Summer Peak kW Savings per sq. ft.
Gas Heat	0.12	0.000184	0.10	0.000226
Electric Heat	1.56	0.000184	1.26	0.000226
Heat Pump	0.79	0.000184	0.64	0.000226

Problems: Existing Frontier Deemed Savings will be updated to correspond with IECC 2009 residential energy code requirements for floor insulation. In IECC 2009, the minimum floor insulation for a residential building is R-13. The Frontier Deemed Savings is based on adding a minimum of R-19 floor insulation.

Recommendations: Revise the Frontier Deemed Savings by adding an R-13 tier that corresponds to IECC 2009 requirements in Climate Zone 2 (New Orleans). In addition, since there will now be an R-13 tier, we recommend removing the language pertaining to a special R-15 allowance for manufactured homes and having those cases utilize the R-13 tier deemed savings. To update these savings new residential energy models will be performed using EnergyGauge. An example workpaper describing the EnergyGauge modeling approach can be found in Appendix G.

Comment [CM3]: These recommendations look good.

Air Sealing

Description: This measure reduces the air infiltration into a home using a pre and post blower door test to determine the air leakage reduction. Savings and incentives are on a per CFM(50) reduction basis. The home must have electric air conditioning and air infiltration must be at least 10% greater than the required minimum ventilation rate to qualify.

Existing Deemed Savings: Frontier Deemed Savings uses pre- and post-blower test results to calculate the CFM reduction at 50 Pascal. The table below is based on a New Orleans climate and for various heating types.

Table 5 - [Frontier] Air Infiltration Deemed Savings

Table 1. Air Infiltration Deemed Savings

	KWh Impact per CFM_{50} Reduction			KW Impact per CFM_{50} Reduction
City	Gas Heat	Resistance Heat	Heat Pump Heat	
New Orleans	0.506	0.983	0.598	0.00049

Problems: None

Recommendations: None

Comment [CM4]: Agree. Input assumptions and derivations are unclear. However, the savings numbers look reasonable.

Duct Sealing

Description: This measure reduces duct leakage by sealing leaky ducts with approved sealant materials. Savings and incentives are based on per conditioned square foot, and are dependent on reaching the required tightness as outlined. In addition the homes must also have a blower door test pre and post to ensure proper ventilation in the home. The home must have a starting total leakage value of at least 20% CFM 25, final duct leakage of 10% CFM 25 or less, and the home must have electric air conditioning to be eligible.

Existing Deemed Savings: Frontier Deemed Savings uses pre- and post-duct pressurization test (e.g. Duct Blaster™) results to calculate the CFM reduction. The table below is based on a New Orleans climate and for various heating types.

Table 6 - [Frontier] Duct Efficiency Improvement Deemed Savings

Table 1. Duct Efficiency Improvement Deemed Savings

Duct Efficiency Improvement				
	Electric AC Gas Heat	Electric AC Electric Heat	Electric AC Heat Pump	Summer Peak
Weather Zone	Avg. kWh Savings per sq. ft. of conditioned space	Avg. kWh Savings per sq. ft. of conditioned space	Avg. kWh Savings per sq. ft. of conditioned space	Avg. kW Savings per sq. ft. of conditioned space
New Orleans (adjusted from Houston)	0.804	1.86	1.187	0.00053

Problems: None

Recommendations: None

Comment [CM5]: If not already required, we recommend that ducts be required to run through an unconditioned space to be eligible for the measure.

Comment [CM6]: What does "adjusted from Houston" mean? How was this adjustment made? If these savings were calculated with a model, can't it just be run using New Orleans weather?

Comment [CM7]: Agree, but would like more insight into savings calculations.

Solar Screens

Description: This measure is only available if it is recommended during an Energy Smart Assessment conducted by a trained contractor. Solar screen decrease the amount of sunlight for east and west facing windows that receive direct sun exposure. Solar screens must block at least 65% of solar heat gain. The savings are based per square foot of treated window area.
Existing Deemed Savings: Frontier Deemed Savings is based on total window area, but is limited to windows facing predominately east or west.

Table 7 - [Frontier] Solar Screens Deemed Savings

Table 1. Solar Screens Deemed Savings

Solar Screens				
Weather Zone	Electric AC Gas Heat	Electric AC Electric Heat	Electric AC Heat Pump	Summer Peak
	Avg. kWh Savings per sq. ft.	Avg. kWh Savings per sq. ft.	Avg. kWh Savings per sq. ft.	Avg. kW Savings per sq. ft.
New Orleans, LA	4.94732	3.21452	4.01182	0.001349

Problems: None

Recommendations: None

Comment [CM8]: Base SHGC is assumed to be 0.75, including factors to account for natural shading, such as trees, etc. This seems high, considering IRC 2006 requires 0.4 for hot climates. It seems like this has been the requirement at least as far back as IRC 2000. Using typical SHGC numbers from cooler climates may not apply here, as there are only SHGC code requirements for zones 1-3. Suggest either lowering the value from in the model and rerunning, or adding a condition that existing SHGC must be greater than a certain value – say, 0.7 (in which case I would think window films would be highly desirable).

Direct Install Measures

Description: The direct install measures are installed by a contractor. This is a no cost installation of any 3 or more of the following measure types by a Participating Contractor or Energy Consultant. Installations must be performed by a Participating Energy Consultant. Homes must have an electric water heater to qualify. Following is the list of direct install measures:

1. Low Flow Showerheads
2. Low Flow Faucet Aerators
3. Hot water tank wrap
4. Pipe insulation (up to 6 feet)
5. CFL Bulbs* (optional) - available to any customer. May be installed in conjunction with either the Water Heater measures or an Assessment. This measure will follow the procedures and deemed savings approach discussed in the Direct Install CFL Program, which can be found in Appendix E – Direct Install CFL and LED Deemed Savings Tables.

Existing Deemed Savings: Savings for Low Flow Showerheads, Aerators, Tank Wrap, and Pipe insulation are based on Frontier Deemed savings (see existing deemed savings tables below).

Table 8 - [Frontier] Water Heating Efficiency Measures

Table 1. Low-flow Showerheads Deemed Savings

Low Flow Showerheads	
kWh Savings per home	Peak kW Savings per home
124	0.013

Table 1. Faucet Aerator Deemed Savings

Faucet Aerators	
KWh Savings per home	Peak kW Savings per home
133	0.0114

Deemed Savings

Table 1. Water Heater Jacket Deemed Savings

Water Heater Jacket	
KWh Savings per home	Peak kW Savings per home
55	0.0096

Table 1. Water Heater Pipe Insulation Deemed Savings

Water Heater Pipe Insulation	
KWh Savings per home	Peak kW Savings per home
40	0.004

Problems: None

Recommendations: None.

Comment [CM9]: No derivations are provided for these measures. The savings assumptions (water use per day, delivered water temperature, source water temperature, assumed water heater efficiency, etc.) should be presented for full transparency. However, all savings numbers look reasonable.

Variable Speed Pool Pumps

Comment [CM10]: Current procedure assumes 365 days/year operation – accurate in NO?

Description: This measure is for the replacement of single speed pool pumps with qualifying variable speed models. Incentive is available as a mail-in rebate to the customer and installer.
Existing Deemed Savings: This measure is based on the ICF Deemed Savings measure list. The measure is titled "High Efficiency Pool Pump & Timer" and the savings are 1,637 kWh and 0.42 kW. It is based on a per unit replacement.

Problems: The ICF Deemed Savings for Pool Pumps is not clear on how the savings were developed.

Recommendations: It is recommended a new more transparent deemed savings methodology be used. The new deemed savings values are below (see Appendix C – Work Paper, Variable Speed Pool Pump for savings methodology).

Table 9 - [Recommended] Variable Speed Pool Pump Deemed Savings

Measure Description	Replace a single-speed pool pump and motor with a variable speed pool pump and motor, or replace a single-speed pool motor with a variable speed pool motor for residential pool filtration.
Market Sector	Residential
Base Case Description	High Efficiency Single-Speed Pool Pump and Motor
Measure Unit	Per Pump
Unit kWh Savings	2,420 kWh per year
Unit kW Savings	0.67 peak kW
Unit Therm Savings	none
Unit Water Savings	none

Heat Pump Water Heater

Description: This measure is for the replacement of a standard electric water heater with a Heat pump water heater. Heat Pump Water Heaters (HPWH) save electricity when compared to conventional electric resistance water heaters. HPWH use the heat from the surrounding air and transfer it to the water inside the tank. Incentives are available as a mail-in rebate to the customer. The new Heat Pump water heater must have an Energy Factor of at least 2.0 to qualify.

Existing Deemed Savings: This measure is based on the ICF Deemed Savings measure list. The measure is titled "Heat Pump Water Heater" and the savings are 2,749 kWh and 0.31 kW. It is based on a per unit replacement.

Problems: It is not clear how the ICF Deemed Savings was developed for HPWHs. Since there are climate specific and interactive space conditioning variables associated with this measure, a more detailed savings methodology is required.

Recommendations: It is recommended a new deemed savings methodology be used. The new deemed savings values are below. These savings below are based on a recent Texas PUC filing for HPWH deemed savings (see Appendix D – Excerpt of Texas PUCT Heat Pump Water Heater for savings methodology). The values below have been adjusted for the New Orleans climate.

Table 10 - [Recommended] Heat Pump Water Heater Deemed Savings

HPWH kWh Savings

Demand/Energy	Water Heater Location	Heating Type	HPWH Size Range, Gallons			
			40-49	50-59	60-79	80 and above
Energy (kWh)	Conditioned Space	Gas	1,427	1,713	2,037	2,382
	Conditioned Space	Heat Pump	1,220	1,501	1,820	2,161
	Conditioned Space	Elec. Resistance	993	1,270	1,583	1,920
	Unconditioned Space	All	1,266	1,555	1,882	2,231
Demand (kW)	Conditioned Space	All	0.18	0.21	0.25	0.28
	Unconditioned Space	All	0.15	0.18	0.22	0.26

Comment [CM11]: Agree with assessment and proposed methodology

Advanced Power Strips

Description: This measure is for the replacement of existing standard power strips with an advanced power strip that can turn off electricity current to appliances that are not being used. Incentive is available as a mail-in rebate to the customer.

Existing Deemed Savings: No deemed savings values have been established or approved by the Entergy New Orleans and the New Orleans City Council.

Problems: No deemed savings values exist.

Recommendations: It is recommended the deemed savings values presented below be used for Advanced Power Strips (see Appendix A – Work Paper, Smart Strips for savings methodology).

Table 11 - [Recommended] Advanced Power Strips Deemed Savings

Estimated Savings

Advanced Power Strip	kW per unit	Annual kWh per unit
4 – Receptacle	0.007 kW	49 kWh
5 – Receptacle	0.007 kW	49 kWh
7 – Receptacle	0.010 kW	87 kWh
12 – Receptacle	0.012 kW	121 kWh

Comment [CM12]: Savings numbers are consistent with the latest evaluations. If the relevant information can be collect, may consider differentiating between home offices.

SMALL AND LARGE C&I SOLUTIONS PROGRAM

Objective

The Program seeks to help small business customers make energy efficient decisions by providing them access to technical knowledge on energy assessments and financial incentives to improve the efficiency of their buildings. The Energy Smart C&I Energy Solutions Program is offered to all Entergy New Orleans Governmental, Commercial and Industrial electric customers with a peak demand less than 100 kW for Small Commercial and over 100kW for Large Commercial.

Below is the list of measures currently being offered by the Program. A description of each measure, deemed savings calculation methodology, identified problems to deemed savings and recommendations are presented in the following pages.

1. Lighting Efficiency
2. Energy Management & Controls Systems
3. Premium Efficiency Motors
4. Unitary AC and HP equipment
5. Chillers

Lighting Efficiency

Description: Lighting retrofit for existing facilities.

Existing Deemed Savings: No deemed savings values have been established or approved by the Entergy New Orleans and the New Orleans City Council.

Problems: There is no council approved lighting efficiency deemed savings. Currently CR is using a lighting retrofit deemed savings calculator from the Arkansas Quick Start Commercial programs that CLEAResult runs for Entergy Arkansas. This savings methodology was approved by the Arkansas Public Service Commissions' Order Number 12, Docket No. 06-004-R and subsequent Docket No 07-152-TF.

There are several problems with this lighting calculator:

- No exterior lighting
- No new construction. New Orleans commercial energy code is ASHRAE 90.1-2007 (IECC 2009)
- Several newer lighting technologies are not represented, including Light Emitting Diodes (LEDs) and fixtures using reduced wattage T5HOlamps, and there is no external system in place to keep the tool (in particular the wattage table) updated

Recommendations: CLEAResult recommends using a calculation methodology based upon the Lighting Measurement & Verification Guidelines currently approved for Texas, where Entergy also runs commercial programs. These calculation approaches have been approved by the Texas Public Utility Commission (PUCT) and address the issues and shortcomings of the current calculation approach by incorporating newer lighting technologies, exterior lighting and new construction. Texas also has a wattage table (fixture code) system in place that is updated on a monthly basis by a third party to ensure that the latest technologies are incorporated in an unbiased fashion.

Comment [CM13]: GENERAL: Consider adding O&M benefits and/or fossil fuel increases. Would help LEDs pass the TRC.

Operating Hours and coincidence factors look very reasonable, but I'm curious where they come from. I don't think I've seen stipulated CFs by building type before. The proposed approach to LEDs is also appropriate.

This methodology was originally approved in the Commercial and Industrial (C&I) Measurement & Verification (M&V) Guidelines by the PUCT under Project #30331. Details from that filing can be found in Appendix C. Updates to the assumed stipulated values for the operating hours and coincidence factors (by building type) were made in 2011 under Project # 39146. An excerpt from that filing showing the approved stipulated values can be found in Appendix C. That petition also points out that it is appropriate to apply stipulated values such as these for lighting measures across regions because lighting is not a weather-sensitive measure and there is little variation in operating schedules from one region to another, hence we recommend no adjustments based upon weather

> *… In general terms, the transferability of interval load data is determined by the degree to which the power consumption of the equipment is affected by weather conditions. As such, rating transferability requires evaluating schedule variability and the variability of the end-use due to weather.*
> *Table below summarizes the general transferability ratings for the lighting end-use. Due to the low variability of schedules and weather for both indoor and outdoor lighting, there is a high degree of data transferability across regions and it is appropriate to assume very similar annual operating hours across different regions. To the extent that utility system peak periods are similar, it is likewise appropriate to assume very similar peak coincidence factors across different regions.*

Trasferability of Data across Geographic Regions

Analysis Group	***Schedule Variability***	***Weather Variability***	***Transferability Rating***
Lighting – Exterior	*Low*	*Low*	*High*
Lighting – Interior	*Low*	*Low*	*High*

> *Source: KEMA. End-Use Load Data Update Project Final Report: Phase 1: Cataloguing Available End-Use and Efficiency Measure Load Data. Prepared for the Northwest Power and Conservation Council and Northeast Energy Efficiency Partnerships, November 2009…*

A simplified calculator will apply the formulas and stipulated values as described in these filings on a project-by-project basis, allowing for a high level of accuracy in the savings calculation and detailed documentation of the individual technologies installed for that project. An example of this calculator (Lighting Survey Form_2011_v4.01.xls) has been provided to show how the calculations are facilitated as provide an example of the Lighting Wattage Table used. CLEAResult will simplify the user-input ("Inventory" tab) to make it easier on contractors to identify the correct fixture and we propose replacing the part-number-specific LED fixtures codes with generic LED fixture codes("LED001" through "LED200" to represent a 1 watt and 200 watt LED fixture respectively). The current approach of maintaining every individually-approved LED product in the listing in untenable over time (especially as LED products become more and more prolific) and it is extremely confusing for the program participants.

To ensure that savings are properly calculated on projects involving LEDs, only approved LED products are incentivized, and that all projects involving LEDs are properly documented, the following documentation requirements will be put in place[2]:

1) Documentation showing that the product is already on the applicable DesignLights Consortium (DLC) or Energy Star listing as an approved product. The following should be maintained in the project file:

[2] Verification protocols exist for all measures installed through CLEAResult's Energy Smart Programs. Here we seek to present and elaborate only on the additional protocols that are particular to commercial LED lighting products.

a. Product specification sheet(s) showing the details on the installed product (need to be able to match the part number to the DLC or Energy Star listing);
b. Inspection report and/or Invoice/Packing Slip that clearly shows the installed product (part number);

Due to the sophistication and complexity of LED products (compared to non-LED technologies), CLEAResult's Core Engineering Services (CES) will periodically review a sample of LED projects to ensure correct application of this atypical methodology.
Similarly, because the non-LED products are better understood and standardized, we did not propose simplifying non-LED products in the wattage listing in the same way, as those products are far more standardized and far better understood by the program participants.

Energy Management & Controls Systems

Description: Installation of energy management controls systems.
Existing Deemed Savings: No deemed savings values have been established or approved by the Entergy New Orleans and the New Orleans City Council.

Problems: There is no council approved Energy Management & Controls Systems deemed savings. CR is presently treating controls project on case-by-case basis. This measure shall be treated as custom measure and shall follow the appropriate M&V procedures.

Recommendations: Custom measures such as this, should follow IPMVP procedures. Custom measures will require an M&V Report and will follow IPMVP.

Comment [CM14]: Agree with this recommendation. Care should be taken that M&V costs do not add significantly to project total.

Unitary AC and HP Equipment (under 5.4 tons)

Description: This measure is for the replacement of Unitary AC and HP equipment (under 5 tons) in commercial applications.
Existing Deemed Savings (Example): Presently CLEAResult uses the Frontier Deemed saving to calculate A/C unitary equipment savings. Below is a sample of the tables used in the Frontier Deemed Savings for Unitary AC and HP equipment under 5.4 tons.

Comment [CM15]: 65,000 Btu/h is about 5.4 tons.

Table 12 - [Frontier] Unitary AC Equipment Deemed Savings

Table 1. Cooling Demand Savings (kW)

Size (tons)	ARI Rated BTU/Hr		SEER Range					
	Minimum	Maximum	14.00-14.49	14.50-14.99	15.00-15.99	16.00-16.99	17.00-17.99	18+
1.5	15,000	20,999	0.13	0.16	0.19	0.24	0.31	0.32
2	21,000	26,999	0.17	0.21	0.25	0.31	0.41	0.42
2.5	27,000	32,999	0.21	0.26	0.31	0.39	0.52	0.53
3	33,000	38,999	0.25	0.31	0.37	0.47	0.62	0.64
3.5	39,000	44,999	0.30	0.36	0.43	0.55	0.72	0.74
4	45,000	50,999	0.34	0.42	0.49	0.63	0.83	0.85
5	57,000	62,999	0.42	0.52	0.62	0.79	1.04	1.06

Table 1. Cooling Energy Savings (kWh)

Size (tons)	ARI Rated BTU/Hr		SEER Range					
	Minimum	Maximum	14.00-14.49	14.50-14.99	15.00-15.99	16.00-16.99	17.00-17.99	18+
1.5	15,000	20,999	344	485	626	729	1,001	1,068
2	21,000	26,999	459	647	834	973	1,335	1,424
2.5	27,000	32,999	574	808	1,043	1,216	1,669	1,780
3	33,000	38,999	688	970	1,252	1,459	2,003	2,136
3.5	39,000	44,999	803	1,132	1,460	1,702	2,337	2,492
4	45,000	50,999	918	1,293	1,669	1,945	2,670	2,848
5	57,000	62,999	1,147	1,616	2,086	2,432	3,338	3,560

Table 1. Heat Pump Energy Savings

Heat Pump – Energy Savings (Heating kWh Only), Climate Zone New Orleans					
	HSPF Range				
Size (tons)	8.2 - 8.3	8.4 - 8.5	8.6 - 8.7	8.8 - 8.9	9.0 - 9.1
1.5	67	90	113	136	158
2.0	89	120	151	180	210
2.5	111	150	188	226	263
3.0	133	179	226	271	316
3.5	155	209	263	316	369
4.0	178	239	301	362	421
5.0	222	299	376	452	527

Problem: Unitary AC Equipment savings are not appropriate for commercial buildings. The existing Frontier Deemed Savings is more suitable for residential buildings since the EFLH (approx. 2,388) and baselines are similar to the Energy Star calculator for residential cooling equipment. A more appropriate method is to use EFLHs based on representative commercial building type.

Recommendation: It is recommended the table below be used to calculate energy savings for Unitary AC equipment. The table below lists the heating and cooling equivalent full load hours (EFLH) for several building types in the New Orleans area. These values were generated for the New Orleans climate based on analysis of multiple data resources, including cooling degree days (CDD) and heating degree days (HDD) for New Orleans, ENERGY STAR data, the Commercial Buildings Energy Consumption Survey (CBECS), and data gathered in CLEAResult utility programs.

Comment [CM16]: It would be nice to see more info on how these were derived. The residential equations seem to imply about 2500 EFLH, higher than most numbers listed here. Typically, residential heating and cooling EFLH are lower than commercial.

Table 13 - Heating and Cooling EFLHs (New Orleans, LA)

Building Type	Cooling EFLH	Heating EFLH
College	2051	237
Convenience	3904	445
Fast Food	3202	374
Grocery	2846	267
Hospital	2592	208
Hotel	2210	237
Large Office	2584	237
Motel	2325	237
Nursing Home	2311	148
Public Assembly	2370	119
Religious Worship	1910	59
Restaurant	2448	320
Retail	2309	119
School	1546	148
Service	2280	119
SF Residential	1637	519
Small Office	2007	237
Warehouse	2137	59

Problem: Baselines need to be updated.

Recommendation: The tables below will be used to establish the baseline efficiency and the new equipment minimum efficiency. Baseline efficiencies are based on either IECC 2009 or Federal Standards (whichever is higher) and minimum efficiency requirements are based upon CEE Tier 2 recommendations.

Table 14 - AC Unitary Equipment Baseline and Minimum Efficiency under 5 tons

Equipment Type	Heating Type	Sub-Category	Baseline Efficiency (Retrofits and New Const.)		CEE Tier 2 Minimum Efficiency	
<65,000 Btu/h	All	Split System	11	EER	12.5	EER
			13	SEER	15	SEER
		Packaged	11	EER	12	EER
			13	SEER	14	SEER

Table 15 - HP Equipment Baseline and Minimum Efficiency under 5 tons

Equipment Type	Heating Type	Sub-Category	Baseline Efficiency (Retrofits and New Const.) $EER_{Baseline}$		CEE Tier 2 Minimum Efficiency EER_{new}	
<65,000 Btu/h	All	Split System	11	EER	12.5	EER
			13	SEER	15	SEER
			7.7	HSPF	8.5	HSPF
		Packaged	11	EER	12	EER
			13	SEER	14	SEER
			7.7	HSPF	8	HSPF

Sample Equations: $kW_{savings} = \left(\frac{12}{EER_{Baseline}} - \frac{12}{EER_{new}}\right) \times tons$

$$kWh_{savings} = \left(\frac{12}{SEER_{Baseline}} - \frac{12}{SEER_{new}}\right) \times tons \times Cooling\ EFLH$$

$$Heat\ Pump\ Heating\ kWh_{savings} = kBTUh \times \left(\frac{1}{HSPF_{Baseline}} - \frac{1}{HSPF_{new}}\right) \times Heating\ EFLH$$

**For EFLH see* Table 14 - Heating and Cooling EFLHs (New Orleans, LA)

Comment [CM17]: Agree that baseline and efficient EER/SEERs need to be updated. See comments in table for changes in values.

Comment [CM18]: This 15 SEER for CEE Tier 2 qualifications. http://www.cee1.org/files/CEE_Comm HVAC_UnitarySpec2012.pdf

Comment [CM19]: Current CEE Tier 2 is 9.0 HSPF. http://www.cee1.org/files/CEE_Comm HVAC_UnitarySpec2012.pdf

Comment [CM20]: Current CEE Tier 2 is 15 SEER. http://www.cee1.org/files/CEE_Comm HVAC_UnitarySpec2012.pdf

Comment [CM21]: Current CEE Tier 2 is 8.5 HSPF. http://www.cee1.org/files/CEE_Comm HVAC_UnitarySpec2012.pdf

Comment [CM22]: Recommend developing a coincidence factor. Coincidence factors for HVAC measures are typically in the range of 0.8.

Unitary AC and HP Equipment (> 5 tons and ≤ 20 tons)

Description: This measure is for the replacement of Unitary AC and HP equipment. This deemed savings is for units greater than 5 tons and under 20 tons, in commercial applications.
Existing Deemed Savings (Example): Presently CLEAResult uses the Frontier Deemed saving to calculate A/C unitary equipment. The following tables are used to estimate the savings for Unitary AC equipment **(larger than 5 tons and under 20 tons)**.

Table 1. Units greater than 65,000 Btu/h and less than 135,000 Btu/h

For units greater than 65,000 Btu/h and less than 135,000 Btu/h	
New Orleans, LA	
kW per EER-Ton	kWh per EER-Ton
0.09	333

Table 2. Units greater than 135,000 Btu/h and less than 240,000 Btu/h

For units greater than 135,000 Btu/h and less than 240,000 Btu/h	
New Orleans, LA	
kW per EER-Ton	kWh per EER-Ton
0.10	241

Below are a list concerns and recommended updates for these measures:

Comment [CM23]: Agree mostly, see comments regarding CF and specific baseline/CEE tiers

Problem: The baselines for the Frontier Deemed savings for Unitary AC and Heat Pump Equipment needs to be updated.

Recommendations: For retrofit applications, the effective baseline shall be based on ASHRAE 90.1-2007 before the 1/1/2010. The minimum efficiency for new equipment shall be based on ASHRAE 90.1-2007 after the 1/1/2010 addendum updates.

Table 16 - AC Unitary Equipment Baseline and Minimum Efficiency

Type	Size	Heating Type	Sub-Category	ASHRAE 90.1-2007 before 1/1/2010 Baseline		ASHRAE 90.1-2007 after 1/1/2010 New	
Air Cooled (Cooling Mode)	≥ 65,000 Btu/h and <135,000 Btu/h	Electric Resistance (or None)	Split System and Single Package	10.30	EER	11.2	EER
				10.50	IEER	11.4	IEER
		All other		10.10	EER	11.0	EER
				10.30	IEER	11.2	IEER
	≥ 135,000 Btu/h and <240,000 Btu/h	Electric Resistance (or None)	Split System and Single Package	9.70	EER	11.0	EER
				9.90	IEER	11.2	IEER
		All other		9.50	EER	10.8	EER
				9.70	IEER	11.0	IEER
	≥ 240,000 Btu/h and <760,000 Btu/h	Electric Resistance (or None)	Split System and Single Package	9.50	EER	10.0	EER
				9.60	IEER	10.1	IEER
		All other		9.30	EER	9.8	EER
				94.00	IEER	9.9	IEER
	≥ 760,000 Btu/h	Electric Resistance (or None)	Split System and Single Package	9.20	EER	9.7	EER
				9.30	IEER	9.8	IEER
		All other		9.00	EER	9.5	EER
				9.10	IEER	9.6	IEER

Comment [CM24]: Should consider adding a baseline adjustment provision for early retirement retrofits.

Comment [CM25]: There is potentially justification for assuming a lower baseline than that presented for retrofit applications. Typical estimates of unitary AC equipment lifetime range from 15 to 20 years. Assuming the existing unit is approximately halfway through it's expected lifetime, it would be 7-10 years old. It's not clear what the LA energy code was at the time, but one could argue that the 2008 federal standards (only slightly different from the previous standards set in 1997) would be a reasonable baseline.

Comment [CM26]: Typo in table for <760,000 All other iEER

Table 17 - HP Equipment Baseline and Minimum Efficiency

Type	Size	Heating Type	Sub-Category	ASHRAE 90.1-2007 before 1/1/2010 Baseline		ASHRAE 90.1-2007 after 1/1/2010 New	
Air Cooled (Cooling Mode)	≥ 65,000 Btu/h and <135,000 Btu/h	Electric Resistance (or None)	Split System and Single Package	10.1	EER	11.0	EER
				10.3	IEER	11.2	IEER
		All other		9.9	EER	10.8	EER
				10.1	IEER	11.0	IEER
	≥ 135,000 Btu/h and <240,000 Btu/h	Electric Resistance (or None)	Split System and Single Package	9.3	EER	10.6	EER
				9.4	IEER	10.7	IEER
		All other		9.1	EER	10.4	EER
				9.2	IEER	10.5	IEER
	≥ 240,000 Btu/h	Electric Resistance (or None)	Split System and Single Package	9.0	EER	9.5	EER
				9.1	IEER	9.6	IEER
		All other		8.8	EER	9.3	EER
				8.9	IEER	9.4	IEER
Air Cooled (Heating Mode)	≥ 65,000 Btu/h and <135,000 Btu/h (Cooling Capacity)	___	47°F db/43°F wb Outdoor Air	3.2	COP	3.3	COP
			17°F db/15°F wb Outdoor Air	2.2	COP	2.25	COP
	≥ 135,000 Btu/h (Cooling Capacity)	___	47°F db/43°F wb Outdoor Air	3.1	COP	3.2	COP
			17°F db/15°F wb Outdoor Air	2.0	COP	2.05	COP

Problem: AC Equipment savings for Group 1 (5 to 20 tons) is not appropriate for commercial building applications. The Frontier Deemed Savings calculations for AC equipment (greater than 5 tons and under 20 tons) uses very simplistic equations (shown below).

kW savings = 0.09 * (Unit EER – Baseline EER) * tons
kWh savings = 333 * (Unit EER – Baseline EER) * tons

Recommendation: It is recommended a more appropriate savings calculation method be used. This new method will use Pre- and Post-efficiencies and an EFLH based on facility type. See example equations below.

Sample equations:

Comment [CM27]: These equations make sense, but recommend adding a coincidence factor for demand.

The proposed methodology is to use the Full-Load efficiency to calculate the demand savings and the Part-Load Efficiency to calculate the energy savings, based on the equations shown below. Where necessary, EER and SEER conversions will be based on the following equation EER = (SEER – 6) x 0.75 +6.

$$kW_{savings} = \left(\frac{12}{EER_{old}} - \frac{12}{EER_{new}}\right) \times tons$$

$$kWh_{savings} = \left(\frac{12}{IEER_{old}} - \frac{12}{IEER_{new}}\right) \times tons \times Cooling\ EFLH$$

$$Heat\ Pump\ Heating\ kWh_{savings} = kBTUh \times \left(\frac{1}{COP_{Baseline}} - \frac{1}{COP_{new}}\right) \times \frac{Heating\ EFLH}{3.413}$$

**For EFLH see* Table 14 - Heating and Cooling EFLHs (New Orleans, LA)

Chillers

Description: This measure is for the replacement of existing chillers with new high efficiency chillers.

Existing Deemed Savings: No deemed savings values have been established or approved by the Entergy New Orleans and the New Orleans City Council.

Problems: Presently there are no approved Deemed Savings for Water Chilling Equipment.

Recommendations: It is proposed to develop a Chiller Calculator. The new chiller calculator will be based on the same approached used for the Unitary AC Equipment. The new Chiller Calculator will account for the latest ASHRAE 90.1-2007 efficiency ratings particularly the Path A and Path B. Similar to unitary equipment, the proposed methodology is to use the Full-Load efficiency to calculate the demand savings and the Part-Load Efficiency to calculate the energy savings. Baseline efficiency shall be based on ASHRAE 90.1-2007 before 1/1/2010. New equipment minimum efficiency shall be based on ASHRAE 90.1-2007 after 1/1/20100. Below is an example of ASHRAE 90.1-2007 Water Chilling Packages Efficiency Requirements. The new equipment minimum efficiency must comply with both the part-load and full-load efficiencies from either the Path A or Path B requirements.

Comment [CM28]: Recommend using CF for chillers.

Table 18 - Water Chilling Equipment Baseline and Minimum Efficiencies

			ASHRAE 90.1-2007 before 1/1/2010 Baseline		ASHRAE 90.1-2007 after 1/1/2010 New			
Equipment Type	Size Category	Units	Full Load	IPLV	Path A Full Load	Path A IPLV	Path B Full Load	Path B IPLV
Air-Cooled Chillers	<150 tons	EER	≥ 9.562	≥ 10.416	≥ 9.562	≥ 12.5	NA	NA
	≥150 tons	EER			≥ 9.562	≥ 12.75	NA	NA
Air-Cooled without Condenser. Electrical Operated	All Capacities	EER	≥10.586	≥11.782	Air-cooled Chillers without condensers must be rated with matching condensers and comply with the air-cooled chiller efficiency requirements			
Water Cooled Electrically Operated Reciprocating	All Capacities	kW/ton	≤0.837	≤0.696	Reciprocating units must comply with water cooled positive displacement efficiency requirements			
Water Cooled Electrically Operated, Positive Displacement	<75 tons	kW/ton	≤0.790	≤0.676	≤0.780	≤0.630	≤0.800	≤0.600
	≥75 tons and <150 tons	kW/ton	≤0.790	≤0.676	≤0.775	≤0.615	≤0.790	≤0.586
	≥150 tons and <300 tons	kW/ton	≤0.717	≤0.627	≤0.680	≤0.580	≤0.718	≤0.540
	≥300 tons	kW/ton	≤0.639	≤0.571	≤0.620	≤0.540	≤0.639	≤0.490
Water Cooled Electrically Operated Centrifugal	<150 tons	kW/ton	≤0.703	≤0.669	≤0.634	≤0.596	≤0.639	≤0.450
	≥150 tons and <300 tons	kW/ton	≤0.634	≤0.596	≤0.634	≤0.596	≤0.639	≤0.450
	≥300 tons and <600 tons	kW/ton	≤0.576	≤0.549	≤0.576	≤0.549	≤0.600	≤0.400
	≥600 tons	kW/ton	≤0.576	≤0.549	≤0.570	≤0.539	≤0.590	≤0.400

$$kW_{savings} = \left(\frac{12}{Full\ load\ EER_{old}} - \frac{12}{Full\ load\ EER_{new}}\right) \times ton$$

$$kWh_{savings} = \left(\frac{12}{Part\ load\ EER_{old}} - \frac{12}{Part\ load\ EER_{new}}\right) \times tons \times Cooling\ EFLH$$

**For EFLH see* Table 14 - Heating and Cooling EFLHs (New Orleans, LA)

Comment [CM29]: Water cooled chillers are rated in kW/ton, not EER. Recommend developing alternate savings approach for water cooled chillers using kW/ton at full load for kW savings, and IPLV for kWh savings.
Recommend developing Coincidence factor for chillers. Typical values are ~0.8.

RESIDENTIAL WEATHERIZATION READY PROGRAM

Objective

The objective of the Energy Smart Weatherization Ready Program is to improve the energy efficiency, comfort and affordability of homes for New Orleans' residents who qualify under federal guidelines for the Weatherization Assistance Program (WAP).

The Weatherization Assistance offering identifies homes that require minor home repairs and/or basic weatherization measures and have NOT been completed as part of the federal Weatherization Assistance Program (WAP). The Program Implementers work with partnering agencies to identify qualifying customers. Qualifying customers are first provided with a no cost Energy Assessment, which is conducted by a Program-retained Energy Consultant. After the Energy Assessment, the Program Implementer will create a work order for energy efficiency opportunities based on need and budget. A participating contractor will be scheduled to complete installation of these additional measures. Since the Program and all of the installed measures are offered at no cost to the customer, contractors are compensated directly by the Program for completed work.

Following is a list of measures that are offered under this Program.

1. Ceiling Insulation
2. Wall Insulation
3. Floor Insulation
4. Air Sealing (includes general weatherization improvements)
5. Duct Sealing
6. Faucet Aerator
7. Low Flow Showerhead
8. Water Heater Jacket
9. Water Heater Pipe Insulation
10. Room Air Conditioner (RAC)

Existing Deemed Savings: This Program uses the Frontier Deemed Savings. The measures and saving methodology used in this Program are similar to those used in the Residential Solution Program and Residential Energy Star Air Conditioning Program.

Problems: For measures 1 through 9 see Residential Solutions Program. For measure 10 see Energy Star Air Conditioning Program.

Recommendations: For measures 1 through 9 see Residential Solutions Program. For measure 10 see Energy Star Air Conditioning Program.

RESIDENTIAL ENERGY STAR AIR CONDITIONING PROGRAM

Objective

The Energy Smart Residential ENERGY STAR Air Conditioning Program is designed for ENO residential electric customers. The Program seeks to achieve energy savings by promoting the installation of higher quality ENERGY STAR Air Conditioner, increase sales of ENERGY STAR rated central air conditioners and heat pumps, and create greater customer awareness and demand for these high efficiency units.

Following are the list of measures offered under this Program.

1. Central Air Conditioner Replacement
2. Heat Pump Replacement
3. Room Air Conditioner Replacement

Comment [CM30]: No recommendations for room air replacement?

Central Air Conditioner Replacement

Description: This measure is for the replacement of Unitary AC and HP equipment. Presently CLEAResult uses the Frontier Deemed saving to calculate A/C unitary equipment under 5 tons.

Existing Deemed Savings: Below is a sample of the tables used in the Frontier Deemed Savings for Unitary AC equipment under 5 tons.

Table 19 - [Frontier] Deemed Savings for Unitary AC equipment under 5 tons

Table 1. Cooling Demand Savings (kW)

Size (tons)	ARI Rated BTU/Hr		SEER Range					
	Minimum	Maximum	14.00-14.49 Packaged Units Only	14.50-14.99	15.00-15.99	16.00-16.99	17.00-17.99	18+
1.5	15,000	20,999	0.13	0.16	0.19	0.24	0.31	0.32
2	21,000	26,999	0.17	0.21	0.25	0.31	0.41	0.42
2.5	27,000	32,999	0.21	0.26	0.31	0.39	0.52	0.53
3	33,000	38,999	0.25	0.31	0.37	0.47	0.62	0.64
3.5	39,000	44,999	0.30	0.36	0.43	0.55	0.72	0.74
4	45,000	50,999	0.34	0.42	0.49	0.63	0.83	0.85
5	57,000	62,999	0.42	0.52	0.62	0.79	1.04	1.06

Table 1. Cooling Energy Savings (kWh)

Size (tons)	ARI Rated BTU/Hr		SEER Range					
	Minimum	Maximum	14.00-14.49 Packaged Units Only	14.50-14.99	15.00-15.99	16.00-16.99	17.00-17.99	18+
1.5	15,000	20,999	344	485	626	729	1,001	1,068
2	21,000	26,999	459	647	834	973	1,335	1,424
2.5	27,000	32,999	574	808	1,043	1,216	1,669	1,780
3	33,000	38,999	688	970	1,252	1,459	2,003	2,136
3.5	39,000	44,999	803	1,132	1,460	1,702	2,337	2,492
4	45,000	50,999	918	1,293	1,669	1,945	2,670	2,848
5	57,000	62,999	1,147	1,616	2,086	2,432	3,338	3,560

Problems: Deemed savings column heading needs to be re-labeled.

Recommendations: Update Frontier Deemed Savings tables to match ENERGY STAR requirements. This is accomplished by relabeling a column heading to say "Packaged Units Only". The updated column heading are shown in yellow above.

Comment [CM31]: Agree with this change.

Heat Pump Replacement

Description: This measure is for the replacement of HP equipment. Presently CLEAResult uses the Frontier Deemed saving to calculate HP equipment under 5 tons.

Existing Deemed Savings: Below is a sample of the tables used in the Frontier Deemed Savings for HP equipment under 5 tons.

Table 20 - [Frontier] HP equipment cooling savings under 5 tons

Table 1. Cooling Demand Savings

Size (tons)	ARI Rated BTU/Hr		SEER Range					
	Minimum	Maximum	14.00-14.49 Packaged Units Only	14.50-14.99	15.00-15.99	16.00-16.99	17.00-17.99	18+
1.5	15,000	20,999	0.12	0.16	0.2	0.21	0.24	0.32
2	21,000	26,999	0.16	0.22	0.27	0.28	0.32	0.43
2.5	27,000	32,999	0.20	0.27	0.34	0.34	0.4	0.54
3	33,000	38,999	0.25	0.32	0.4	0.41	0.48	0.65
3.5	39,000	44,999	0.29	0.38	0.47	0.48	0.56	0.76
4	45,000	50,999	0.33	0.43	0.54	0.55	0.64	0.87
5	57,000	62,999	0.41	0.54	0.67	0.69	0.8	1.08

Table 2. Cooling Energy Savings

Size (tons)	ARI Rated BTU/Hr		SEER Range					
	Minimum	Maximum	14.00-14.49 Packaged Units Only	14.50-14.99	15.00-15.99	16.00-16.99	17.00-17.99	18+
1.5	15,000	20,999	320	466	611	837	901	1,057
2	21,000	26,999	427	621	815	1,116	1,201	1,409
2.5	27,000	32,999	534	776	1,019	1,395	1,502	1,761
3	33,000	38,999	640	932	1,223	1,673	1,802	2,114
3.5	39,000	44,999	747	1,087	1,427	1,952	2,102	2,466
4	45,000	50,999	854	1,242	1,631	2,231	2,403	2,818
5	57,000	62,999	1,067	1,553	2,038	2,789	3,003	3,523

Table 21 - [Frontier] HP equipment heating savings under 5 tons

Table 1. Heat Pump Energy Savings

Heat Pump – Energy Savings (Heating kWh Only), Climate Zone New Orleans						
	HSPF Range					
Size (tons)	8.0 - 8.1	8.2 - 8.3	8.4 - 8.5	8.6 - 8.7	8.8 - 8.9	9.0 - 9.1
1.5	?	67	90	113	136	158
2.0	?	89	120	151	180	210
2.5	?	111	150	188	226	263
3.0	?	133	179	226	271	316
3.5	?	155	209	263	316	369
4.0	?	178	239	301	362	421
5.0	?	222	299	376	452	527

Problems: Deemed savings column heading needs to be re-labeled to say for "Packaged Units Only". In addition new heating savings needs to be added for HSPF Range 8.0 – 8.1.

Recommendations: Update the Frontier Deemed Savings table column headings for Heat Pump equipment cooling and heating to say "Packaged Units Only". In addition new heating savings for the HSPF range of 8.0-8.1 are shown in the table below.

Comment [CM32]: Assumes ~2635 FLH

Comment [CM33]: Recommend revising the column headers to be more explicit about the range of covered efficiencies – e.g., "≥8.0 and <8.2," "≥8.2 and <8.4," etc.

Comment [CM34]: Agree with these changes

Table 22 - [Recommended] HP equipment heating savings under 5 tons

Heat Pump – Energy Savings (Heating kWh Only), Climate Zone New Orleans						
HSPF Range						
Size (tons)	**8.0 - 8.1 Packaged Units Only**	**8.2 - 8.3**	**8.4 - 8.5**	**8.6 - 8.7**	**8.8 - 8.9**	**9.0 - 9.1**
1.5	41	67	90	113	136	158
2.0	55	89	120	151	180	210
2.5	69	111	150	188	226	263
3.0	82	133	179	226	271	316
3.5	96	155	209	263	316	369
4.0	110	178	239	301	362	421
5.0	137	222	299	376	452	527

Comment [CM35]: Assumes ~400 FLH. Recommend revising the column headers to be more explicit about the range of covered efficiencies – e.g., "≥8.0 and <8.2," "≥8.2 and <8.4," etc.

ENERGY EFFICIENT NEW HOMES PROGRAM

Objective

ENERGY SMART New Homes Program aims to develop the market in New Orleans for energy efficient new and remodeled homes. This Program offers incentives and promotion to Homebuilders who build homes more efficient than code.

Measures

Performance Path:

The Program offers incentives for achieving third-party verified, high efficiency HERS ratings of 85 or less. The table below describes the incentives available for the measures.

Table 23 – Performance Path Measure Summary

Measure Type	Measure Description
Home Energy Rating	Residential new construction property receiving a HERS score of 70 or less
Home Energy Rating	Residential new construction property receiving a HERS score of 85 - 71

Performance Path HERS Rating

Description: Incentive will be provided for Residential new construction that receive a HERS score less than a certain value.

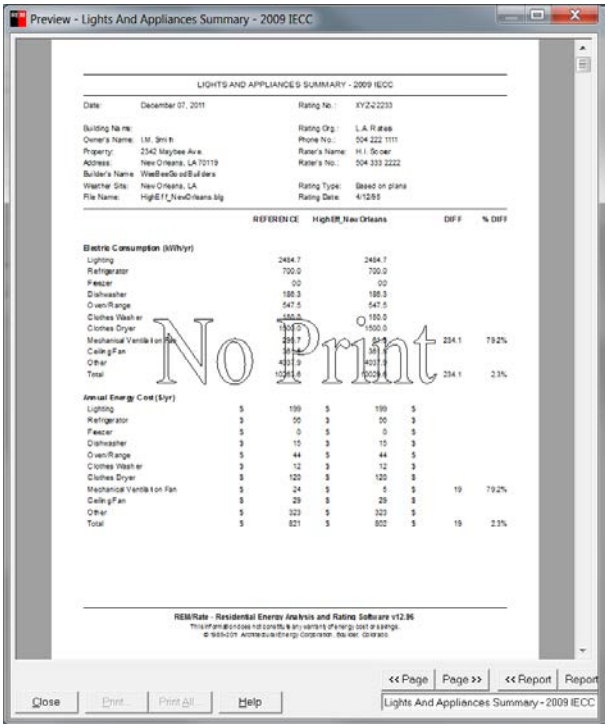
Existing Deemed Savings: No savings values established and approved by the commission.

Problems: No savings values established and approved by the commission.

Recommendations: CLEAResult proposes using the existing calculation features in REM/*Rate*™ to estimate energy savings. Savings will be calculated by comparing an IECC 2009 Reference Home with the designed home as shown in the example below which shows an annual kWh savings of 234.1 kWh.

Comment [CM36]: Agree with this recommendation.

REM/Rate™ is a user-friendly, yet highly sophisticated, residential energy analysis, code compliance and rating software developed specifically for the needs of HERS providers. It is already used to generate the HERS score to determine whether the home qualifies and at what level, so the same HERS providers can easily provide the associated savings documentation on a home-by-home basis. REM/Rate™ software calculates heating, cooling, hot water, lighting, and appliance energy loads, consumption and costs for new and existing single and multi-family homes. Climate data is available for cities and towns throughout North America.



The Energy Star Advanced Lighting Package option was removed from the Performance Path HERS Rating path because advanced lighting is already incorporated into the HERS score and credit for those technologies (claimed savings and incentives) is already captured in the whole-building assessment.

Prescriptive Path:
In addition, the Program offers a Prescriptive Path for Contractors who prefer that over the Performance Path. Incentives are available for specific measures implemented per the table below.

Table 24 - Prescriptive Path Measure Summary

Measure Type	Measure Description
Central HVAC System	Replacement of existing unitary equipment with high efficiency equipment.
Heat Pump (avg. 3 ton)	Replacement of existing heat pump with high efficiency equipment.
Energy Star Advanced Lighting Package	Installation of 60% ENERGY STAR hard-wired fixtures, and 100% Energy Star qualified ceiling fans.
Heat Pump DHW	This measure is for the replacement of a standard electric water heater with a Heat Pump water heater.
ENERGY STAR Windows	Windows must have a U-factor of 0.40 or less AND an SHGC of 0.27 or less to be ENERGY STAR qualified.

Prescriptive Path Central HVAC System, Heat Pump, and Heat Pump DHW Measures

Description: The measures and saving methodology used for Central HVAC Systems and Heat Pumps are the same as those used in the Energy Star Air Conditioning Program.

Existing Deemed Savings: These measures use the Frontier Deemed Savings. The measures and saving methodology used for Central HVAC Systems and Heat Pumps are the same as those used in the Energy Star Air Conditioning Program. The measure and saving methodology used for Heat Pump DHW and Heat Pumps is the same as that used in the Residential Solutions Program.

Problems: For Heat Pump DHW, see Residential Solutions Program; For Central HVAC Systems and Heat Pumps, see Energy Star AC Program

Recommendations: For Heat Pump DHW, see Residential Solutions Program; For Central HVAC Systems and Heat Pumps, see Energy Star AC Program

Prescriptive Path Advanced Lighting Measures

Description: Installation of 60% ENERGY STAR hard-wired fixtures, and 100% Energy Star qualified ceiling fans.

Existing Deemed Savings: No savings values established and approved by the commission.

Problems: No savings values established and approved by the commission.

Recommendations: The hard-wired Lighting component of this measure will follow the procedures and deemed savings approach discussed in the Direct Install CFL Program, which can be found in Appendix E – Direct Install CFL and LED Deemed Savings Tables. Hard-wired lighting can include both EnergyStar approved CFL and LED lighting products. For the ceiling fan component, we propose using recently adopted EnergyStar Ceiling Fan deemed savings approved by the Public Utility Commission of Texas (PUCT). See Appendix B – Approved Texas Deemed Savings for EnergyStar Ceiling Fans.

Comment [CM37]: O&M savings/baseline adjustment?

Comment [CM38]: For fans, baseline should be adjusted to account for the federal standards. EStar calculator has baseline as 60 watt bulb, so adjustment wouldn't take place until 2014.

Prescriptive Path Energy Star Windows

Description: Installation of Energy Star Qualified Windows

Existing Deemed Savings: Frontier Deemed Savings below.

Table 25 - [Frontier] Energy Star Window Deemed Savings

Table 1. Energy Star® Windows Deemed Savings

Energy Star® Windows		
	kWh Savings per sq. ft.	kW Savings per sq. ft.
Climate Zone: New Orleans, LA		
Installed in home with non-electric heating	3.29	0.002037
Installed in home with electric resistance heating	5.54	0.002037
Installed in home with heat pump	4.43	0.002037

Problems: Energy STAR requirements are not up to date.

Recommendations: Update Frontier TRM for ENERGY STAR Windows since the efficiency requirements have changed. Deemed savings has U-factor of 0.40 or less and SHGC of 0.40 or less. New ENERGY STAR requirements are U-factor 0.60 or less, and SHGC of 0.27 or less. To update these savings new residential energy models will be performed using EnergyGauge. An example workpaper describing the EnergyGauge modeling approach can be found in Appendix G.

Comment [CM39]: Agree with this recommendation

RESIDENTIAL DIRECT INSTALL CFL'S PROGRAM

Objective

The objective of the Residential Direct Install CFL Program is to increase the market penetration of ENERGY STAR- qualified compact fluorescent lamps (CFLs) in the New Orleans area through direct home installation of CFLs through partnership with local non-profits and customer education.

Measures

Description: Customers participate in the Program by signing up through web link on the Green Light New Orleans website and applying online (greenlightneworleans.org), calling the Sub-Contractor directly, or calling the Energy Smart Information Center. The ENO customer will be contacted within seven business days to schedule their installation date. The Sub-Contractor will send installers to the customer's home to replace all of the incandescent bulbs with CFLs (except specialty bulbs).

After the project has been completed the Program Implementer will schedule a field tech to go out to the residence to verify the project was installed correctly and that all the information about the project that was reported is accurate. Verifications will be performed on a random sampling of projects.

Existing Deemed Savings: The council approved deemed savings for Direct Install CFLs is based on ICF Deemed Savings (see Table 27). However the CLEAResult NOLA team is presently using a modified deemed savings as shown in Table 28 below.

Table 26 - [ICF] Direct Install CFL Deemed Savings

CFL	Annual Energy Savings (kWh)
15 WATT	37
20 WATT	58
23 WATT	76
27 WATT	107

Table 27 - [Modified] Direct Install CFL Savings

Incan Watts	Replace w/ CFL Watts	Est. Hrs/Day	Est. Savings kWh/yr
60	14	2.2	36.5
75	20	2.9	58.3
100	23	2.7	75.8

Problems: Direct Install CFL need to be adjusted to account for changing federal baselines.

Recommendations: CES proposes to improve the deemed savings tables for CFLs. The new method will account for baseline changes each year because of federal standards, savings dependent on room type "operating hours", and will include both CFL and LED savings, since the program will endeavor to incorporate LED technologies in the near future. See Appendix E – Direct Install CFL and LED Deemed Savings Tables for the proposed savings.

Comment [CM40]: This savings estimates should reflect baseline adjustments for imminent federal standards. In Appendix E, it appears that the first year saving have been adjusted to account for the new standards taking effect for 100W incandescents in 2012 and 75W incandescents in 2013, but there needs to be a baseline shift to account for the changing baseline over the life of the installed measures. For example, assume a typical 75W incandescent lamp has an average life of 1,000 hours. Using the annual operating hours assumptions from Appendix E, a lamp in a "Living Room" applications would last a little over a year. The average lifetime of an ENERGY STAR CFL is 10,000 hours which would be >11 years in the same application. For a CFL measure, the claimed savings should be adjusted to account for the fact that the customer would have had to replace the existing incandescent upon failure at some point in year 2 with a federal standard compliant lamp.

Comment [CM41]: Agree with these recommendations.

RESIDENTIAL AC TUNE-UP PROGRAM

Objective

The **Energy Smart** Residential A/C Tune-Up Program is designed for ENO residential electric customers. The A/C Tune-up Program seeks to achieve energy savings by promoting higher quality A/C Tune-ups and to improve operating efficiency of existing central A/C systems. Entergy New Orleans residential electric customers are eligible to receive rebates for having an A/C Tune-up performed on their existing central A/C. Customers who qualify for the Program and have an A/C Tune-up performed will receive a rebate in the form of a discount on the contractor's invoice. The participating contractor will then submit the required paperwork to CLEAResult for reimbursement of the rebated amount.

Comment [CM42]: Not clear how the number was derived, but ~12% savings does not sound unreasonable.

Existing Deemed Savings: The deemed savings are based on the ICF Deemed Measure list as shown below.

Table 28 - [ICF] AC Tune-up Deemed Savings

Group	Heat Type	Cooling Type	kWh	kW
Single-Family	Gas Furnace	Central AC	615	0.35
Single-Family	Heat pump	Elec Backup	773	0.35
Single-Family	Electric Res	Central AC	615	0.35
Single-Family	Gas Furnace	No AC	0	0.35
Single-Family	Electric Furnace	No AC	0	0.35
Multi-Family	Heat pump	Elec Backup	340	0.14
Multi-Family	Electric Res	Central AC	317	0.14
Multi-Family	Electric Furnace	No AC	0	0.14
Mobile	Gas Furnace	Central AC	521	0.27
Mobile	Heat pump	Elec Backup	717	0.3
Mobile	Electric Res	Central AC	521	0.27
Mobile	Gas Furnace	No AC	0	0.27
Mobile	Electric Furnace	No AC	0	0.27

Problems: None

Recommendations: It should be noted that the ICF Measure List include savings for buildings with No A/C and Gas Heating. Since these systems are not part of this electric Program they will not be used. The items highlighted in Table 29 - [ICF] AC Tune-up Deemed Savings will be omitted.

SOLAR HOT WATER HEATER PROGRAM (PILOT)

Objective

Replacement of existing electric domestic water heater with a solar water heater

Existing Deemed Savings: Deemed savings are based on the ICF Deemed Measure list as shown below.

Table 29 - [ICF] Solar Water Heater Deemed Savings

Energy Savings (kWh)	Demand Savings (kW)
2,628	0.42

Problems: None

Recommendations: None

Comment [CM43]: No recommendations. Savings Estimates agree with numbers from the Solar Rating and Certification Corporation.

APPENDIX A – WORK PAPER, SMART STRIPS

Residential Advanced Power Strips (Smart Strips)
Revision # - None
Revision Date - None

Residential Advanced Power Strips (APS) or Smart Strips – Plug Load Controls
Point of Sale or Direct Install

Summary Characteristics for Advanced Power Strips or Smart Strips

Measure Description	Consumer purchasing Advanced Power Strip (APS), Smart Strip (or equivalent) to be installed in their home to reduce energy used by typical consumer electronic equipment that has a sleep or standby mode. The APS can sense when the control equipment enters sleep mode and then totally de-energizes that equipment and all switched equipment.			
Market Sector	Residential – Point of Sale or a Direct Install Program			
Base Case Description	Power Strip with surge protection without controls			
Measure Unit	Advanced Power Strip or Smart Strip with controlled receptacles that turns off power to the controlled receptacle when the device goes into sleep mode or standby mode.			
Unit kWh Savings (Annual)	49 kWh[1]		4 – Receptacle – 2 Switched	
	49 kWh[1]		5 – Receptacle – 2 Switched	
	87 kWh[1]		7– Receptacle – 4 Switched	
	121 kWh[2]		12 – Receptacle – 8 Switched	
Unit kW Savings	0.007 kW[1]		4 – Receptacle – 2 Switched	
	0.007 kW[1]		5 – Receptacle – 2 Switched	
	0.012 kW[1]		7– Receptacle – 4 Switched	
	0.017 kW[2]		12 – Receptacle – 8 Switched	
Unit Therm Savings	There are no Therm savings associated with this measure			
Unit Water Savings	There are no water savings associated with this measure			
Base Case Cost[3]	$15 Power strip with 4 – 7 uncontrolled receptacles $30 power strip with 12 uncontrolled receptacles			
Measure Cost[3]	$30/4-plug	$30/5-plug	$40/7-plug	$55/12-plug
Incremental Measure Cost	$15-25			
Measure Life	3 years[1]			
Notes Limitations	There is not an ENERGY STAR qualified Smart Strip or a CEE approved Smart Strip			

Measure Description

The intent of this measure is to replace, or install new, a power strip for residential electronics, that will de-energize certain receptacles when the control device enters a standby mode. Modern electronic equipment typically has a sleep mode or standby mode that, while is lower than normal operating power, still consumes electricity year round. The occupant selects which receptacle to use in a Smart Strip. Smart Strips typically have 4 to 12 receptacles, 2 to 8 of which are controlled by the strip. They save electricity when the controller detects the control equipment has entered a low power mode (sleep, standby) and then completely de-energizes the control and switched device.

Baseline Equipment

The baseline equipment is assumed to be a standard power strip with multiple receptacles used to power an entertainment center or computer.

Eligible Equipment

The Smart Strip must contain at least two (2) receptacles which are controlled by. Manufacturer specifications must describe the occupant based control function of the Smart Strip receptacle.

There are two general types of smart strips; Occupancy based and Load-Sensing. The total rated amperage for the Smart Strip must be 20 Amps or less but 15 amps is considered the typical size. Currently there is neither an ENERGY STAR certified or CEE approved Smart Strip.

Efficiency Level Required

None

Measure Review

This work paper relies primarily on one technical resource – the 2010 NYSERDA Measure Savings Database (Revision 13), which includes Smart Strips. Other documents reviewed referenced the same NYSERDA measure characterization, or contained data obtained or derived from older studies. The NYSERDA database is therefore the most appropriate source for proposed savings estimate.

Savings Calculations

For 5 and 7-plug smart strips, the 2010 NYSERDA Measure Savings match the numbers calculated from the River Region Calculator. CLEAResult Core Engineering has updated the spreadsheet on 9/26/2011 and estimated the savings of 12-plug smart strips.

Definition of Variables

There are no variables considered in this Work Paper. The savings are estimated from the referenced source. Savings for APSs with twelve (12) receptacles are approximated from the available data.

Estimated Savings

Advanced Power Strip	kW per unit	Annual kWh per unit
4 – Receptacle	0.007 kW	49 kWh
5 – Receptacle	0.007 kW	49 kWh
7 – Receptacle	0.010 kW	87 kWh
12 – Receptacle	0.012 kW	121 kWh

Measure Life

The measure life is assumed to be 3 years[1].

Measure Cost

Price premium for controlled switches varies from $30 to $55.

Incremental Cost

The incremental cost between a regular power strip and a Smart Strip with the same number of receptacles varies depending on where purchased. On average, the incremental cost is estimated at $15 for 4 and 5-plug strips, and $25 for 7 and 12-plug strips.

Evaluation Parameters

The evaluation protocol for this measure is:

- Verification of the purchase of an APS or Smart Strip at the point of sale, or as a direct install
- Documenting the total number of receptacles for the purchased/installed product
- Documenting how many receptacles are switched by the APS or Smart Strip
- Documenting the purchase price for the Smart Strips

Examples of Qualifying Equipment

Search for Advanced Power Strips (APS), Smart Strips, and Tricklestar (referenced 9/26/2011).

References

1. The 2010 NYSERDA Measure Savings Database (Revision 13)
2. APS Measure Characterization spreadsheet
3. Online search on 9/29/2011

APPENDIX B – APPROVED TEXAS DEEMED SAVINGS FOR ENERGYSTAR CEILING FANS

Approved Texas Deemed Savings for EnergyStar Ceiling Fans (Project Number 38025)

ENERGY STAR Ceiling Fans

Measure

Purchase an ENERGY STAR ceiling fan and light kit.

Baseline

The baseline is a conventional non-ENERGY STAR labeled ceiling fan and light kit.

Installation & Efficiency Standard

The table below displays the ENERGY STAR requirements for eligible ceiling fans.

ENERGY STAR Specifications for Ceiling Fans

1. Specification defines residential ceiling fan airflow efficiency on a performance basis: CFM* of airflow per watt of power consumed by the motor and controls. Efficiency is measured on each of 3 speeds.
2. At low speed, fans must have a minimum airflow of 1,250 CFM* and an efficiency of 155 CFM/Watt
3. Qualifying ceiling fan models must come with a minimum 30-year motor warranty; one-year component(s) warranty; and 2-year light kits warranty.
4. At high speed, fans must have a minimum airflow of 5,000 CFM* and an efficiency of 75 CFM/Watt
5. Integral or attachable lighting, including separately sold ceiling fan light kits, must meet certain requirements of the RLF specification. See QPI form for specific requirements.

Calculation of Deemed Savings

Energy savings were calculated using the ENERGY STAR Ceiling Fan Savings Calculator found on the ENERGY STAR website. Peak demand savings were calculated using separate coincidence factors for the lighting and the fan motor portion of the ceiling fan savings. For lighting a coincidence factor of 0.08 was applied (referenced from the CFL METERING STUDY FINAL REPORT, Prepared for: Pacific Gas & Electric Company, San Diego Gas & Electric Company, Southern California Edison Company, 2005). For the fan motor a coincidence factor of 0.446 was applied (derived from EnergyGauge software ceiling fan profiles).

Deemed Savings

ENERGY STAR ® Ceiling Fan	
Energy (kWh) Savings	Peak (kW) Savings
141	0.011

Estimated Useful Life

The estimated useful life (EUL) is established at 10 years based upon the ENERGY STAR Savings Calculator for ceiling fans available for download at: http://www.energystar.gov/ia/business/bulk_purchasing/bpsavings_calc/Ceiling_Fan_Savings_Calculator_Consumer.xls.

APPENDIX C – WORK PAPER, VARIABLE SPEED POOL PUMP

Variable Speed Pool Pump
Revision # - None
Revision Date - None

Variable Speed Pool Pump

Retrofit or New Construction

Table 1: Summary Characteristics for Variable Speed Pool Pumps

Measure Description	Replace a single-speed pool pump and motor with a variable speed pool pump and motor, or replace a single-speed pool motor with a variable speed pool motor for residential pool filtration.
Market Sector	Residential
Base Case Description	High Efficiency Single-Speed Pool Pump and Motor
Measure Unit	Per Pump
Unit kWh Savings	2,420 kWh per year
Unit kW Savings	0.67 peak kW
Unit Therm Savings	none
Unit Water Savings	none

Base Case Cost	$345.04 (equipment) + $357.12 (labor) = $702.16[1]
Measure Cost	$1200 (equipment) + $357.12 (labor) = $1557.12[2]
Incremental Measure Cost	$854.96
Measure Life	10 years1
Notes Limitations	This measure does not fall under Federal DOE or EPA Energy Regulations.

Measure Description

- This work paper documents the energy and demand savings values used to forecast the impacts of installing a variable speed swimming pool filtration pump in new construction or to replace an existing single-speed pool filtration pump in the residential sector.

Baseline Equipment

- Residential swimming pool pumps are used to circulate and filter swimming pool water in order to remove particulate debris and maintain clarity.
- Residential pump motors range in size from ½ to 3 horsepower, and are operated an average of about 4.2 hours per day, but in some cases up to 10 hours per day.
- Residential pump motors draw approximately one kW per nominal horsepower.
- Baseline is a high efficiency single-speed pool pump.

Eligible Equipment

- Rebates are for private, residential, in-ground pools with filtration pumps.
- The customer must be a NOLA electrical customer.
- If retrofit, the existing residential pool filtration pump to be replaced must be single-speed.

- The new residential pool filtration pump must be a variable-speed pump that includes controllers that are capable of switching motor speeds automatically if a controller is not already included with the new pump.

Efficiency Level Required

- This measure does not fall under Federal DOE or EPA Energy Regulations.
- The new residential pool pump must be a variable-speed pump that includes controllers that are capable of switching motor speeds automatically if a controller is not already included with the new pump.

Measure Review

The primary source of measure savings comes from the DEER database1 as well as PG&E's Variable Speed Pool Pump Work Paper.2

Savings Calculations

Energy Savings

Energy use and savings estimates here are based on the "typical" residential, private, in-ground pool as determined by the "Evaluation of Year 2001 Summer Initiatives Pool Pump Program" conducted by ADM Associates. This pool has a 25,000 gallon volume, has 1.5 inch PVC plumbing, a diatomaceous earth filer, a 1.5 HP pump, and operates 4.2 hours per day, turning over and filtering approximately 2/3 of the pool volume each day.[3] Its hydraulic performance is represented by the California Energy Commission's "Curve A".[4] "Curve A" is defined by a mathematical relationship between flow rate and system head. Symbolically this is written as $H = 0.0167*F^2$, where H is the total system head in feet of water and F is the flow rate in gallons per minute (gpm). The parameter that describes pump efficiency performance is the "Energy Factor", which is defined as Flow (gpm) * 60/Power (Watts), when the pump is operating on one of the CEC specified pool hydraulic system curves. The Energy Factor has units of gal/watt-hour.

The purpose of the energy savings analysis is to estimate as closely as possible what future measurement and valuation may find. By using hydraulic "Curve A" which has been shown to be representative of the swimming pool market, and the related Energy Factor as certified by the manufacturer or found by testing, is the best and most accurate estimation methodology and offers the best likelihood of predicting what future evaluations may find. The table below show s the energy savings that results when a single speed pump is replaced with a variable speed pool pump for pool filtration. This analysis assumes that an average of 15,000 gallons is filtered per day. This was calculated based on the ADM study, which found that the average pool owner operates their pump for 4.2 hours per day.3 The pool industry recommends that residential pool owners operate their filtration pump for 6 to 8 hours per day (an average of about 7 hours per day). Therefore, 4.2 hours divided by 7 hours equals 0.6, which means that typical residential pool owners are filtering about 60% of their pool water each 24-hour period. Although the average pool holds 25,000 gallons of water, typical practice is to filter 15,000 gallons per day (0.6 * 25,000 gallons = 15,000 gallons). The energy factors are obtained from the California Energy Commission Appliance Database, which lists test data provided by

manufacturers.[5] The 1.5 HP base case pump used in this workpaper makes these savings conservative, as field experience shows that most single-speed pumps that are replaced or retrofitted are between 1.5 HP and 2 HP, making the actual base case energy use larger than shown here.

Table 2: Energy Savings Analysis for Variable Speed Pumps

Description	Daily Gallons Pumped	Energy Factor (Gal/Watt-hr)	Daily Energy Use (kWh/day)	Annual Energy Use (kWh/yr)	Energy Savings (kWh/yr)
1.5 HP, 1.6 SF, Single Speed	15,000	1.85	8.108	2959	Base Case
3 HP, 1.32 SF, Variable Speed	15,000	1.82 (3450 rpm)	8.242	3008	2420
		10.15 (1000 rpm)	1.478	539	

These energy savings were calculated as follows:

$$Energy\ Savings\ (kWh) = \frac{Daily\ Gallons\ Pumped}{Change\ in\ Energy\ Factor} * \left(\frac{1kW}{1000watts}\right) * 365\ days/year$$

Comment [CM44]: Is it accurate to assume pool is operational all year round in LA?

Where:

$Daily\ Gallons\ Pumped$ = assumed to be 15,000 Gallons3

$Energy\ Factor\ (\frac{gal}{watt-hour}) = Flow(gpm) * \frac{60}{Power}(watts)$, as defined by "Curve A"

Therefore, following the example above, Energy Savings = 15,000 gal/day / (10.15-1.85 gal/watt-hr)*1kw/1000watts*365 days/year = **2,420 kWh/year savings for a typical pool pump**.

Demand Savings

As with the electric energy savings estimation methodologies above, the power demand reduction can be determined by the same pump efficiency performance data reported in "Curve A" as the flow rate in gallons per minute at various pool pump operating points. The non-coincident demand reduction is shown in the table below. This was calculated by first dividing the daily volume of water to be filtered by the flow rate to determine the number of pumping hours per day. The flow rate at the operating point on system "Curve A" was obtained from the California Energy Commission Appliances Database.5 The daily energy use (kWh from Table 2) was divided by the daily pumping hours to yield the pump power demand (kW). The demand reduction is the difference between the power demand of the single speed pump and the power demand of the variable speed pump operating at 1000 rpm.

Table 3: Non-coincident Demand Reduction for Variable Speed Pool Pumps

Description	Daily Gallons Pumped	Pump Flow Rate (GPM)	Daily Pumping Hours (hrs/day)	Daily Energy Use (kWh/day)	Pump Power Demand (kW)	Power Demand Reduction (kW)
1.5 HP, 1.6 SF, Single Speed	15,000	67	3.73	8.108	2.17	Base Case
3 HP, 1.32 SF, Variable Speed	15,000	71 (3450 rpm)	3.52	8.242	2.34	0.07
		22 (1000 rpm)	11.4	1.478	0.13	2.04

These demand savings were calculated as follows:

$$Demand\ Savings\ (kW) = CF * [\left(\frac{Pre\ Daily\ Energy\ Use\ \left(\frac{kWh}{day}\right)}{Pre\ Daily\ Pumping\ \frac{Hours}{Day}}\right) - \left(\frac{Post\ Daily\ Energy\ Use\ \left(\frac{kWh}{day}\right)}{Post\ Daily\ Pumping\ \frac{Hours}{Day}}\right)]$$

Where:

$$Daily\ Pumping\ \frac{Hours}{Day} = \frac{Daily\ Gallons\ Pumped}{Pump\ Flow\ Rate\ (GPM)} * 1hr/60min$$

$$Daily\ Energy\ Use\ \left(\frac{kWh}{day}\right) = \frac{Daily\ Gallons\ Pumped}{Energy\ Factor} * \left(\frac{1kW}{1000watts}\right)$$

CF = Coincidence Factor = 32.9%, since on-peak pumping is estimated to be practiced by 32.9% of the pool owner population.2

Therefore, following the example above, the Demand Savings= 32.9%* [(8.108/3.73)-(1.478/11.4)] = **0.67 kW demand savings for a typical pool pump**.

Measure Life

- The effective life for this measure is 10 years.1

Measure Cost

- The base case equipment cost for this measure is taken from DEER MeasureID D03-966 and is equal to $345.04.**Error! Bookmark not defined.** Labor cost to install the base ase single speed pump is equal to $357.12.**Error! Bookmark not defined.** Therefore, the total base case cost is $702.16.
- The measure equipment cost is approximately $1,200. The measure labor cost for installation of the pool pump is assumed to be the same as the base case labor cost and is equal to $357.12. Therefore, the total measure cost is $1,557.12.
- The incremental cost is equal to the difference between the measure cost and the base case cost. Therefore, the incremental cost is $854.96.

Evaluation Parameters

The evaluation protocol for this measure is verification of installation. The following information should be collected and documented for each installation of a new, variable-speed pool filtration pump:

- Pool Builder/Maintenance Company Information
  - Company Name
  - Contact Name
  - Date Submitted
  - Contact Phone
  - Email Address
- Customer Information
  - Customer Name
  - Daytime Phone
  - Installation Address
  - Energy Account Number
  - Mailing Address
  - Email Address
- Installation Date of Pump
- Installation Cost of Pump
- Existing Pool or New Construction?
- Home Type (Single Family, Duplex, Triplex, or Four-Plex)
- Manufacturer and Model Number of New Pump

Examples of Qualifying Equipment

The following table includes several varieties of qualifying variable-speed pool pumps. This is not an all-inclusive list, but provides a few examples.

Table 4: Examples of Variable Speed Pool Pumps with Costs

Manufacturer	Model	Cost
Hayward	EcoStar 3400VSP	$1,279
Hayward	EcoStar SVRS	$1,399
Jandy	JEP (2 HP)	$1,079
Jandy	JEP (1.5 HP)	$990
Sta-Rite	Intellipro VS+SVRS	$1,029
Sta-Rite	Intellipro VS-3050	$879

APPENDIX D – EXCERPT OF TEXAS PUCT HEAT PUMP WATER HEATER WORK PAPER

DOCKET NO. 39796

PETITION OF ELECTRIC UTILITY MARKETING MANAGERS OF TEXAS TO APPROVE DEEMED SAVINGS DERIVED FOR NEW MEASURE	§ § § § §	**PUBLIC UTILITY COMMISSION OF TEXAS**

PETITION TO APPROVE DEEMED SAVINGS ESTIMATES FOR NEW RESIDENTIAL HEAT PUMP WATER HEATER MEASURE FOR ENERGY EFFICIENCY PROGRAMS

TO THE HONORABLE PUBLIC UTILITY COMMISSION OF TEXAS:

NOW COMES, AEP Texas Central Company, AEP Texas North Company, CenterPoint Energy Houston Electric, LLC, El Paso Electric Company, Entergy Texas, Inc., Oncor Electric Delivery Company LLC, Southwestern Electric Power Company, Texas-New Mexico Power Company, and Southwestern Public Service Company, (the Electric Utilities or Joint Petitioners) pursuant to P.U.C. SUBST. R. 25.181(i)(4) file this Petition to approve deemed savings values for a new residential heat pump water heater (HPWH) measure. In support thereof, the Electric Utilities would respectfully show as follows:

I. INTRODUCTION

P.U.C. SUBST. R. §25.184(d)(2) previously governed the Measurement and Verification (M&V) Guidelines and Stipulated Values, prior to its repeal in the Public Utility Commission of Texas' (Commission or PUC) Order in Project No. 33487. The Commission's repeal of §25.184 removed deemed savings estimates from the rule so that such materials could be more easily modified to reflect changes in circumstances relating to energy efficiency. In its Order in Project No. 33487, the Commission also amended §25.181 to include a process in new amended subsection §25.181(i)(4) for electric utilities to make changes to standardized materials (such as standardized forms, procedures, deemed savings estimates and program templates) utilized in their energy efficiency programs. This Petition presents proposed modifications to standardized procedures and deemed savings estimates as contemplated in §25.181(i)(4). Accordingly, the Electric Utilities' petition for the approval of a residential HPWH energy efficiency measure and

VI. SUMMARY OF PROPOSED CHANGES

A single change is proposed: the adoption of a residential HPWH energy efficiency measure with an estimated useful life of thirteen years and deemed electric demand and energy savings for the installation of an HPWH in a residential application as presented in Tables 1 through 5.

The proposed deemed savings are intended to be valid for installation in a retrofit application (replacement of an electric storage water heater) or in new construction. Four basic variables specify the appropriate deemed demand and energy savings values for a given project:

- the climate zone,
- the HPWH tank size,
- the HPWH installed location (Conditioned vs. Unconditioned Space), and
- for HPWH installations in conditioned space, the building heating type (electric resistance, air-source heat pump, or gas furnace)

Deemed savings are specified for heat pump water heaters installed in four size ranges: 40-49 gallon, 50-59 gallons, 60-79 gallons, and 80 or more gallon sizes. These sizes correspond to the four basic sizes of HPWHs commercially available at the time these deemed savings were developed as discussed above (see Market Availability). These deemed savings are not considered applicable to any future integrated heat pump water heater products that may appear on the market with tank size below 40 gallons.

Table 1. Residential HPWH Deemed Savings for Climate Zone 1, Amarillo, TX

Savings (Units)	Water Heater Location	Heating Type	HPWH Tank Size Range, Gallons			
			40-49	50-59	60-79	80 and above
Energy (kWh)	Conditioned Space	Gas	1,318	1,598	1,914	2,253
		Heat Pump	956	1,227	1,536	1,867
		Elec. Resistance	559	822	1,122	1,444
	Unconditioned Space	All	1,183	1,455	1,764	2,095
Demand (kW)	Conditioned Space	All	0.17	0.2	0.24	0.27
	Unconditioned Space		0.13	0.17	0.2	0.24

Appendix A. Working Papers for Residential Heat Pump Water Heater Deemed Savings

This document presents deemed savings for the installation of heat pump water heaters (HPWH) in lieu of standard electric storage water heaters (EWH) on a per-unit basis. The deemed savings are derived such that savings can be attributed to the installation according to the storage capacity of the installed unit, and are based on the assumption that most units are installed to replace similarly-sized EWHs. Deemed savings for this measure account for the interaction between a HPWH installed inside conditioned space and a home's air-conditioning equipment, estimating an electric cooling energy benefit and a heating penalty for homes with three primary heating types: gas furnace (for which there is no electric heating penalty), electric resistance, and heat pump.

Deemed savings herein developed are for heat pump water heaters installed in the residential market. Deemed savings are applicable to both new construction and retrofit installations: for new construction, homes must be all-electric, and for retrofit, the unit being replaced must be an electric, storage-type water heater with capacity between 40 and 80 gallons and maximum energy input of 4.5 kilowatts. Units with maximum energy input over 4.5 kW are ineligible.[10]

Definition of Baseline Condition

The baseline condition is an electric storage water heater. The baseline efficiency is based on Title 10, Department of Energy, Sub Chapter D, Energy Conservation, Part 430 - Energy Conservation Program for Consumer Products, (10 CFR Part 430.32); Energy factor as of January 20, 2004.

$$\text{Energy Factor}_{Base} = 0.97 - 0.00132 \times \text{Rated Storage Volume (gal)}$$

Application of this equation to the tank sizes for which deemed savings are developed produce the base energy factors (EF_{Base}) listed in Table A-1.

Table A-1. Baseline Energy Factor (EF_{Base}) by Storage Volume

Tank Size (Gal)			
40 - 49	**50 - 59**	**60 - 79**	**80 and up**
0.917	0.904	0.884	0.864

The Energy Factors of baseline electric storage water heaters range from 0.92 for a 40-49 gallon unit to 0.86 for a unit with an 80 gallon tank or larger.

Definition of Efficient Condition

The efficient condition is a heat pump water heater that meets ENERGY STAR® qualifications.[11]

---

[10] Note that this exclusion does not apply to electric resistance storage water heaters that have two 4.5 kW heating elements, but are designed such that these elements do not simultaneously engage.

[11] ENERGY STAR® Requirements (as of January 2011) HPWH must have a maximum current rating of 24 amperes, voltage no greater than 250 volts, and a transfer of thermal energy from one temperature to a higher

An EF of 2.2 was used to develop the efficient condition: this EF is the average efficiency of the HPWH on the market as of July 2011.

HPWH Performance Adjustment for Ambient Temperature

The efficiency of a HPWH decreases with the ambient temperature. Accordingly, energy factors for HPWHs are adjusted for inlet air temperature, which varies by weather zone, time of year, and HPWH location (conditioned vs. unconditioned space). The values and equations presented in Table 6 are used to characterize the conditions surrounding the HPWH (inlet air temperature).

Table 6. Ambient Air Temperature (T_{amb}) within selected Climate Zone

Water Heater Location	Ambient Air Temperature (T_{amb})
Conditioned Space	68°F (Heating Season)[b] 78°F (Cooling Season)[c]
Unconditioned Space (Garage)[d]	Average Seasonal Temperature[a] + 11°F (Heating Season) Average Seasonal Temperature[a] + 7°F (Cooling Season)

a. Average Seasonal Temperature is the average monthly dry bulb temperature for the selected climate zone.

b. Heating Season is defined as the months where the average monthly temperature is less than 65°F.

c. Cooling Season is defined as the months where the average monthly temperature is greater than or equal to 65°F.

d. Seasonal temperature adjustments for HPWHs installed in unconditioned space are made using the garage temperature adjustments recommended in ASHRAE 152-2004 (Tables 6.1b and 6.2b) on the assumption that the garage is the likely place for Texas HPWH installations outside of conditioned space.

The following performance adjustment (PA) equations adjust the average HPWH EF of 2.2 based on the ambient temperatures (T_{amb}). PAs were estimated for each month by weather zone.

Equations for Performance Adjustment Based on Ambient Temperature:[12]

$$PA[\%] = 0.08008 \times T_{amb}^2 + 0.0011 \times T_{amb}^2 - 0.4833 \times T_{amb} + 0.00857, \text{ when } T_{amb} > 32°F$$

$$PA\ [\%] = \frac{1}{EF} - 1, \text{ when } T_{amb} \leq 32°F$$

$$EF_{adj} = EF \times (1 + PA[\%])$$

---

temperature level for the purpose of heating water. Unit must have "integrated" or "drop-in" configuration. EF>= 2.0, first-hour rating (FHR) >= 50 gal/hr, Warranty >= 6 yrs on sealed systems, Safety UL 174 & UL 1995.

[12]Kelso, J., Incorporating Water Heater Replacement into The Weatherization Assistance Program, May 2003. D&R International, Ltd. Information Tool Kit.

The energy factors for HPWHs that result from the performance of these adjustments (EF_{adj}) are presented in Table 7 for Climate Zone 5 – El Paso, TX.

Table 7. Adjusted HPWH Energy Factors (EF) for Zone 5, El Paso, TX

Month	Conditioned Space	Unconditioned Space
January	2.14	2.01
February	2.14	2.05
March	2.14	2.11
April	2.35	2.25
May	2.35	2.46
June	2.35	2.69
July	2.35	2.67
August	2.35	2.6
September	2.35	2.44
October	2.14	2.3
November	2.14	2.07
December	2.14	1.98

Deemed Savings Fundamentals

A few important decisions and assumptions underlie this deemed savings analysis.

Weather Zones

This deemed savings analysis of HPWHs has been performed for 5 different areas of the state (weather zones) using weather data from specific cities to characterize those 5 zones. In the past, deemed savings in Texas have generally been presented for four weather zones: Amarillo (Zone 1), Dallas (Zone 2), Houston (Zone 3) and Corpus Christi (Zone 4). This formulation has required extending the Dallas results to El Paso, despite significant climatic differences between Dallas and El Paso. For these deemed savings, a fifth weather zone – El Paso (Zone 5) – has been included in the analysis.

Market Availability

Review of currently available heat pump water heaters that have been certified by ENERGY STAR®[13] reveals that HPWHs for the residential market come in four basic tank sizes: 40 gal, 50 gal, 60-65 gal, and 80 gal. For the tanks in the 60-65 gallon range, a 65-gallon tank was assumed in this analysis.

[13] Water Heater, Heat Pump for Consumers. DOE ENERGY STAR® Program. Online. Available: http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=WHH. Accessed July 2011. See link, Qualified Heat Pump Water Heaters.

Impact Estimates

Impacts are estimated by comparing the energy usage of HPWHs with that of electric storage water heaters in meeting the same levels of demand for hot water under the same conditions. However, for a HPWH installed inside conditioned space, estimating the total impact on household energy usage requires not only estimating the energy that a HPWH uses to heat water, but also estimating the heating penalty and cooling benefits from the extraction of heat from the conditioned air. Additionally, a number of factors affect the overall energy impacts of heating water with these two technologies, which must be taken into account.

Factors Affecting Water Heater Energy Usage

The key variables that affect the energy savings presented in this document are as follows:

- Hot water consumption (gallons per day)
- Climate city (e.g., average ambient temperature, ground water temperature)
- Water heater performance (i.e., Energy Factor)
- Hot water set point
- Inlet water temperature
- Space temperature

Additional Factors Affecting Home Energy Usage when Using an HPWH

The key factors that additionally affect the performance of a HPWH are as follows:

- Water heater location (in conditioned or unconditioned space);
    - Space heating/cooling demand (for units installed in conditioned space); and,
- Incidence of backup (resistance) heating element usage, a function of large draws of hot water during a single event, or closely spaced draws of hot water

A detailed description of the calculations performed to estimate total energy use in the baseline and efficient conditions, including how the above-listed factors affecting residential water heater energy use (electric storage and heat pump) are addressed, is provided in Appendix B.

Appendix B – Calculation Methodology

Deemed savings for this measure are taken by comparing the energy usage associated with the base technology – an electric storage water heater with resistance heating elements only – with that of a heat pump water heater (HPWH). Because HPWHs interact with their surroundings, the electric energy and peak demand savings opportunities they provide vary based on installation location and heating type. Deemed savings are therefore estimated by comparing the total energy use impacts of the two technologies.

The first section of this Appendix presents the general equations used to estimate energy usage in the base (electric resistance only) and change (HPWH) cases. Energy usage impacts of the HPWH are further modified by two factors discussed below:

- The extent to which backup resistance heat elements are employed, and
- Interactive heating and cooling effects (when the HPWH is installed in conditioned space).

Furthermore, the estimation of these deemed savings rely on a number of assumptions and the application of a number of calculations. These three key elements underlie the estimation of energy usage for heating water for domestic hot water use and are presented in the subsequent sections:

- Incoming Water Temperature (Mains temperature from piped water system)
- Household Demand for Hot Water (gallons per day)
- Hourly Profile of Hot Water Usage (for peak coincidence, demand impacts)
- Standby Heat Loss Coefficients

Energy Use Calculations - Baseline Technology

The basic equation used to estimate the energy usage of an electric storage water heater relates the volume of daily water use to a number of factors:

$$Q_{in}\left[\frac{Btu}{day}\right] = \frac{vol \times dens \times c_p \times (T_{tank} - T_{mains})}{EF}$$

Where,

Q_{in} = total water heater energy consumption [Btu/day],
vol = daily draw volume [gal/day],
dens = density of water [lb/gal]
c_p = specific heat of water [Btu/lb-°F],
T_{tank} = tank thermostat setpoint temperature [°F],
T_{mains} = inlet water temperature [°F], and
EF = energy factor.

The energy factor is a blended efficiency estimator: it is designed to account for losses in the conversion of input energy to heat (Recovery Efficiency, RE) as well as the energy required to make up for storage losses, which is a function of tank volume. Some of these inputs vary with time and are calculated; others are standard input values:

Input	Value	Source
vol	Varies by month	See Household Demand for Hot Water
den	8.294 lb/gal	Density of Water
c_p	1.0007 BTU/lb•°F	Specific Heat of Water
T_{tnk}	120 °F	Mfr-recommended (default) set point
T_{mains}	Varies by month	See Entering Water Temperature (T_{mains})
EF	Varies by tank size	Set by Federal Standard: see Definition of Baseline Condition

Efficient Technology – Heat Pump Water Heater

The total impact of an HPWH on residential energy consumption is calculated in two steps: first, the energy associated with heating and storing water is estimated, and second, the heating penalties and cooling benefits are estimated.

Energy Employed in Making and Storing Hot Water

The basic equation used to estimate the energy used by an HPWH is similar to that for baseline electric storage water heaters, with one modification:

$$Q_{in}\left[\frac{Btu}{day}\right] = \frac{vol \times den \times c_p \times (T_{tank} - T_{mains})}{EF(1 + PA)}$$

Where,

Q_{in} = total water heater energy consumption [Btu/day],

vol = daily draw volume [gal/day],

den = density of water [lb/gal],

C_p = specific heat of water [Btu/lb-°F],

T_{tank} = tank thermostat set point temperature [°F],

T_{mains} = inlet water temperature [°F],

EF = energy factor, and

PA = performance adjustment.

The values and sources of information for all variables except the EF (set to 2.2 for HPWHs) and the performance adjustment factor (PA) are the same as described above for baseline electric storage water heaters. The PA is described in detail in deriving the Energy Factors for HPWHs in the main body of this document (see Definition of Efficient Condition). The values in Table 8 represent the different denominators in the equation for calculating the energy used by HPWHs in heating water.

Importantly, not all of the energy for making hot water in a HPWH comes from the heat pump. HPWHs have backup resistance elements, which are called upon in periods of high water draws. Analysis of field test data developed by TIAX, LLC in a 2004 study for the California Energy Commission[14] suggests that approximately 11 percent of the energy used to heat hot water in HPWHs is resistance heat. Accordingly, these deemed savings incorporate an assumption that 11 percent of input energy used to meet the demand for hot water in homes with HPWHs is from the backup resistance elements.

Cooling Benefits and Heating Penalties

Cooling benefits and heating penalties are estimated for HPWHs installed in conditioned space. Assuming that 11 percent of energy input into the HPWH goes to the backup resistance element, cooling benefits and heating penalties are estimated for the 89 percent of hot water that is made with the heat pump. These benefits and penalties are estimated by month, using average monthly ambient temperature by climate zone: in the heating season, a heating penalty is estimated, while in cooling season a cooling benefit is estimated.

In most months, HVAC systems are in either cooling mode or heating mode; however, in transition months there will be a mix of heating and cooling, or limited heating and cooling loads, such that the cooling benefits and/or heating penalties associated with the HPWH are likely offsetting, or negligible. 65 °F is generally considered the thermal balance point of residential buildings: the temperature above which homes are likely in cooling mode, and below which there will be a demand for heat. To control for these transitions and avoid over-application of either cooling benefits or heating penalties, a range was applied: for any month in which the average temperature was within 3 degrees of 65 °F, a home was considered to be in neither heating nor cooling mode. In these months, neither cooling benefits nor heating penalties were applied.

Heating penalties and cooling benefits are calculated by estimating the impact (in BTUs) of operating the heat pump inside the conditioned space and estimating (1) the amount of energy the air conditioner would have required to make that same amount of cool air when the home is in cooling mode, or (2) the amount of energy the electric heating system (electric resistance or heat pump) requires to make up for the heat extracted from the air when the home is in heating mode. Since duct systems are not perfect, a distribution system efficiency of 75% is applied.

[14] Design Refinement and Demonstration of a Market-Optimized Heat-Pump Water Heater. California Energy Commission, April 2004. Prepared by TIAX, LLC. Attachment 2, California Field Test Data and Analysis.

The effect of the HPWH on the ambient space load (cooling or heating) is estimated using the following series of equations from WAPTAC:

$$Q_{spaceload}[Btu] = Q_{reject/in} \times hour_{comp-on}$$

$$Q_{hwload}\left[\frac{10^6\,Btu}{yr}\right] = \frac{vol \times den \times c_p \times \left(T_{tnk} - T_{in}\right) \times 365}{10^6}$$

$$hour_{comp-on}[h] = Q_{hwload} \times 0.4623 + 2.2865$$

The first equation multiplies the rated capacity of the typical HPWH (3,500 Btu/h is used in this analysis) to the compressor runtime to develop the spaceload in Btu/day ($Q_{spaceload}$). The second equation estimates the hot water load in mmbtu/yr. The third equation is the result of a regression analysis relating the daily HPWH compressor runtime (in hrs) to the hot water load; it estimates the number of hours per day that the HPWH must operate to meet its load.

Entering Water Temperature (T_{mains})

The entering water temperature (T_{mains}) is adjusted for each climate zone. The following equation, developed by the National Renewable Energy Laboratory (NREL), is used to calculate the entering water temperature.

$$T_{mains}(°F) = \frac{(avg(T_{air,month}) + offset) + ratio \times (max(T_{air,month}) - min(T_{air,month}))}{2 \times \sin(0.986 \times ((30 \times Month\#) - 15 - lag) - 90°)}$$

Where:

Avg ($T_{air,month}$)	= Annual average air temperature (°F), assumed to be ambient outdoor dry bulb temperature,
Max ($T_{air,month}$)	= Max of monthly mean air temperature (°F),
Min ($T_{air,month}$)	= Minimum monthly mean air temperature (°F),
offset (district water)	= 6°F,
ratio	= 0.4 + 0.01 x ($T_{amb,ave}$ – 44),
lag	= 35 – 1.0 x ($T_{amb,ave}$ – 44), and
$T_{amb,ave}$	= Average annual ambient temperature, by location.

Typical Meteorological Year (TMY) data are used to estimate monthly and annual average ambient temperatures for each of the five cities selected to represent five weather zones in Texas. Application of the NREL equation for T_{mains} to the TMY conditions for the five Texas weather cities provides the monthly estimates of inlet water temperature depicted in Figure 1.

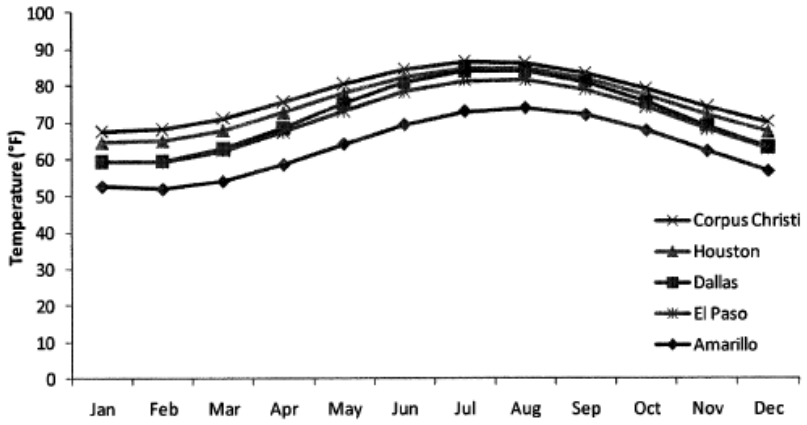


Figure 1. Monthly Mains Water Temperatures (T_{mains}), Representative Cities

The NREL equation provides mains water temperatures that fluctuate as a lagged function of ambient air temperature. Figure 2 illustrates the relationship between T_{mains} and T_{air} for climate zone 1 – Amarillo, TX.

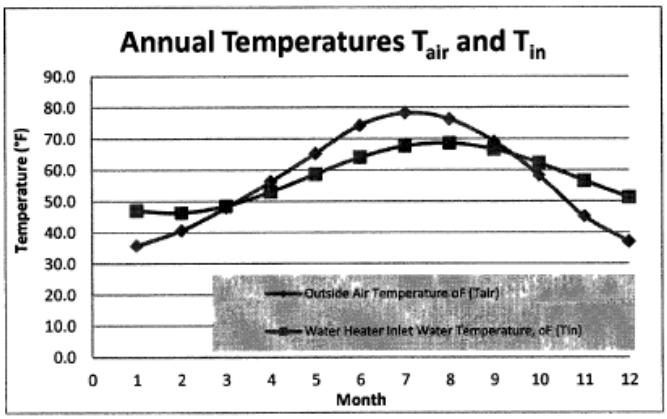


Figure 2. Annual Temperatures T_{air} and T_{in} for Climate Zone 1: Amarillo, TX

Household Demand for Hot Water

The number of people per household is a major driver of hot water consumption. In addition to showers and baths, clothes washers and dishwashers are large users of hot water. The remaining household hot water use is primarily attributed to kitchen and bathroom sinks. As part of the Building America Research Benchmark project, NREL produced the following table in 2004 summarizing residential hot water usage:

Table 9. Water Usage by Hot Water End-Use Point

End-Use	End-Use Water Temperature	Water Usage
Clothes Washer	N/A	$7.5 + 2.5 \times N_{br}$ gal/day (Hot Only)
Dishwasher	N/A	$2.5 + 0.833 \times N_{br}$ gal/day (Hot Only)
Showers and Baths	105 °F	$14 + 4.67 \times N_{br}$ gal/day (Hot + Cold)
Sinks	105 °F	$10 + 3.33 \times N_{br}$ gal/day (Hot + Cold)

Source: *Development of an Energy Savings Benchmark for All Residential End-Uses*. R. Hendron et al. Conference Paper, SIMBUILD 2004 Conference August 4-6, 2004. Online. Available: http://www.nrel.gov/docs/fy04osti/35917.pdf.

For showers and baths, as well as sinks, demand for hot water is determined through the additional step of estimating how much cold water must be mixed with hot water to achieve the desired usage temperature, which varies with T_{mains}.

Because the 2004 work underlying the Building America Benchmark predates changes to water use standards for both clothes washers and dishwashers, and assumes relatively inefficient appliances, the equations for clothes washers and dishwashers were multiplied by adjustment factors to reflect updates in water usage standards promulgated in 2009 (clothes washers) and 2010 (dishwashers). These adjustment factors are provided in Table 10.

Table 10. Water Usage Adjustment Factors, Clothes Washers, and Dishwashers

End-Use	Previous Baseline	Updated Standard	Adjustment Factor
Clothes Washer	39.2 gal/cycle	21.0 gal/cycle	0.54
Dishwasher	8.2 gal/cycle	6.5 gal/cycle	0.79

For the purposes of establishing deemed savings for heat pump water heaters with tanks of different sizes, use of the equations in Table 9 also requires developing a relationship between

tank size and the number of bedrooms in a given home. An underlying assumption of these deemed savings is that heat pump water heaters are sized appropriately for their loads. Standard practice is that water heaters be sized according to their first hour rating (FHR) – the amount of hot water the unit can supply in an hour of operation, starting with a full tank.[15] Review of the first hour rating of available, ENERGY STAR®-listed HPWHs shows that FHR, as expected, increases with tank size:

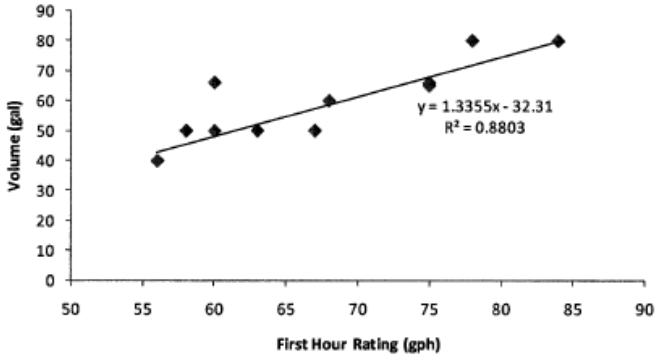


Figure 3. Tank Volume and First Hour Rating

Frontier ran permutations on the FHR tank sizing worksheet provided by DOE[16] to estimate the maximum amount of hot water needed in a given hour in homes with different numbers of bedrooms (based on occupancy assumptions tied to the number of bedrooms). Typical results of those permutations are presented in Figure 4.

[15] Sizing Storage and Heat Pump (with Tank) Water Heaters. USDOE, EERE. Online. Available: http://www.energysavers.gov/your_home/water_heating/index.cfm/mytopic=12990.

[16] Ibid.

2 Bedroom = 3 people			
Use	Average gallons of HW per usage	Times used per 1 hr	Gallons used per 1 hr
Shower	12	2	24
Bath	9	0	0
Shaving	2	0	0
Hands & face washing	4	1	4
Hair shampoo	4	0	0
Hand dishwashing	4	1	4
Automatic dishwasher	14	1	14
Food preparation	5	0	0
Wringer clothes washer	26		
Automatic clothes washer	32	0	0
	Total Peak Hour Demand:		46

3 Bedroom = 4 people			
Use	Average gallons of HW per usage	Times used per 1 hr	Gallons used per 1 hr
Shower	12	2	24
Bath	9	0	0
Shaving	2	1	2
Hands & face washing	4	2	8
Hair shampoo	4	0	0
Hand dishwashing	4	1	4
Automatic dishwasher	14	1	14
Food preparation	5	1	5
Wringer clothes washer	26		
Automatic clothes washer	32	0	0
	Total Peak Hour Demand:		57

4 Bedroom = 5 people			
Use	Average gallons of HW per usage	Times used per 1 hr	Gallons used per 1 hr
Shower	12	2	24
Bath	9	1	9
Shaving	2	1	2
Hands & face washing	4	3	12
Hair shampoo	4	0	0
Hand dishwashing	4	1	4
Automatic dishwasher	14	1	14
Food preparation	5	0	0
Wringer clothes washer	26		
Automatic clothes washer	32	0	0
	Total Peak Hour Demand:		65

5 Bedroom = 6 people			
Use	Average gallons of HW per usage	Times used per 1 hr	Gallons used per 1 hr
Shower	12	3	36
Bath	9	1	9
Shaving	2	1	2
Hands & face washing	4	3	12
Hair shampoo	4	0	0
Hand dishwashing	4	1	4
Automatic dishwasher	14	1	14
Food preparation	5	0	0
Wringer clothes washer	26		
Automatic clothes washer	32	0	0
	Total Peak Hour Demand:		77

Figure 4. Hot Water Tank Sizing Worksheets

Using the regression relationship derived in Figure 3 to estimate the required storage volume to meet the first hour demand for hot water and rounding up to the HPWH with the next highest storage tank size available in the market, a relationship between number of bedrooms and tank size was estimated.

Table 11. Number of Bedrooms, First Hour Demand, and Water Heater Storage Tank Size

Number of Bedrooms (N_{br})	First Hour Demand (gal/hr)	Req'd Storage Volume (gal)	Tank Size (gal)
2	42-46	29	40
3	51-57	44	50
4	59-65	55	65
5	69-77	71	80

Assembling the relationships between water heater tank size, the number of bedrooms in a home, end-point water usage, T_{mains}, and the temperature at which water is used at given endpoints, profiles of daily hot water usage by tank size were developed. Figure 5 shows the monthly usage profiles derived through this approach.

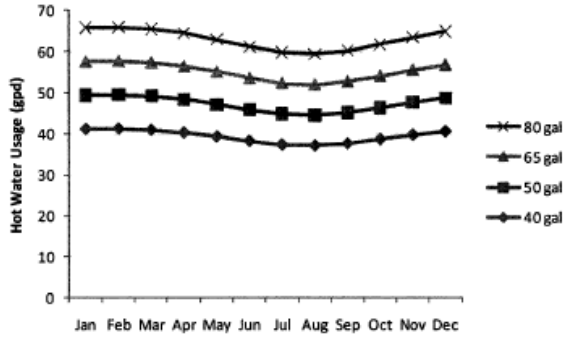


Figure 5. Hot Water Usage by Tank Size, Amarillo TX

Hourly Demand Profile

Figure 6 is the hourly hot water usage profile (gal/hr) for a residential home. This profile was used to develop the resultant peak kW and coincidence factor (CF) for this measure.

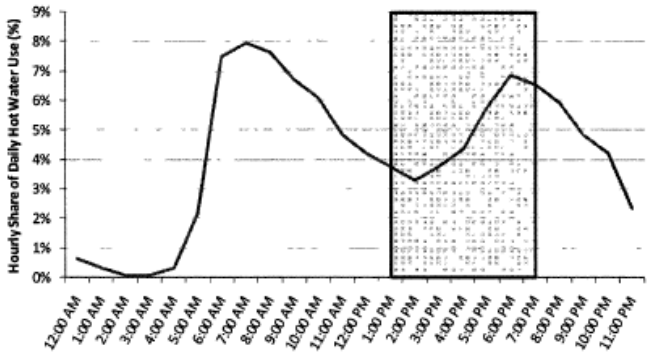


Figure 6. Daily Hot Water Use Profile[17]

Current PUC rules define the summer peak demand period as the hours between 1 PM and 7 PM from June through September. Based on this definition, the peak demand impacts of this measure are associated with the average demand during this window, which is approximately 4.6 percent of daily domestic hot water energy usage.

[17]Source: Building America Appliance and Plug Loads Calculation Tool. Underlying source is DOE 2.2.

Appendix C. Bibliography

American Council for an Energy Efficient Economy. (2011). *Water Heating*. Retrieved September 2011, from ACEEE.org: http://www.aceee.org/consumer/water-heating

Burch, J., & Christensen, C. *Towards Developoment of an Algorithm for Mains Water Temperature.* National Renewable Energy Laboratory.

Burch, J., & Erickson, P. (2004). Using Ratings Data to Derive Simulation-Model Inputs for Storage-Tank Water Heaters. *Solar 2004 Conference* (pp. 393-398). Portland, OR: National Renewable Energy Laboratory.

National Renewable Energy Laboratory. (2004, August). *Development of an Energy Savings Benchmark for All Residential End-Uses.* Retrieved August 2011, from nrel.gov: http://www.nrel.gov/docs/fy04osti/35917.pdf

Oak Ridge National Laboratory. (2002, September). *Field Tests of a "Drop-In" Residential Heat Pump Water Heater.* Retrieved August 2011, from ornl.gov: http://www.ornl.gov/~webworks/cppr/y2002/rpt/115540.pdf

U.S. Department of Energy. (2011, March). *Building America - Resources for Energy Efficient Homes.* Retrieved August 2011, from eere.energy.gov: http://www1.eere.energy.gov/buildings/building_america/analysis_spreadsheets.html

U.S. Department of Energy. (2011). *Estimating a Storage, Demand, or Heat Pump Water Heater's Costs*. Retrieved August 2011, from EnergySavers.gov: http://www.energysavers.gov/your_home/water_heating/index.cfm/mytopic=13010

U.S. Department of Energy. (2011). *Polyurethane Insulation Materials*. Retrieved August 2011, from EnergySavers.gov: http://www.energysavers.gov/your_home/insulation_airsealing/index.cfm/mytopic=11600

U.S. Department of Energy. (2011, April). *Residential Heating Products Final Rule Technical Support Document.* Retrieved August 2011, from eere.energy.gov: http://www1.eere.energy.gov/buildings/appliance_standards/residential/heating_products_fr_tsd.html

U.S. Department of Energy. (2001, January). *Residential Water Heaters Technical Support Document for the January 17, 2001, Final Rule.* Retrieved August 2011, from eere.energy.gov: http://www1.eere.energy.gov/buildings/appliance_standards/residential/waterheat_0300_r.html

U.S. Department of Energy. (201). *Sizing Storage and Heat Pump (with Tank) Water Heaters*. Retrieved August 2011, from EnergySavers.gov: http://www.energysavers.gov/your_home/water_heating/index.cfm/mytopic=12990

U.S. Department of Energy. (n.d.). *Water Heater, Heat Pump for Consumers*. Retrieved August 2011, from EnergyStar.gov: http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=WHH

APPENDIX E – DIRECT INSTALL CFL AND LED DEEMED SAVINGS TABLES

2012 CFL Savings by Room Type

CFL Watter Range	Average CFL	Comparable Incandescent *
9 to 12	12	40
13 to 17	15	60
18 to 25	23	75
26 to 32	27	72

*In 2012, 100 watt incandescent bulbs baselines will drop

kWh Savings

Room Type	Hours of Operation	9-12 W	13-17W	18-25 W	26-32 W
Porch	1027	28.8	46.2	53.4	46.2
Kitchen	1210	33.9	54.5	62.9	54.5
Living Room	864	24.2	38.9	44.9	38.9
Family Room	772	21.6	34.7	40.1	34.7
Dining Room	829	23.2	37.3	43.1	37.3
Bathroom 1	669	18.7	30.1	34.8	30.1
Bathroom 2	669	18.7	30.1	34.8	30.1
Bathroom 3	669	18.7	30.1	34.8	30.1
Bedroom 1	406	11.4	18.3	21.1	18.3
Bedroom 2	406	11.4	18.3	21.1	18.3
Bedroom 3	406	11.4	18.3	21.1	18.3
Bedroom 4	406	11.4	18.3	21.1	18.3
Bedroom 5	406	11.4	18.3	21.1	18.3
Office	708	19.8	31.9	36.8	31.9
Den	435	12.2	19.6	22.6	19.6
Entryway	435	12.2	19.6	22.6	19.6

kW Savings

Room Type	Hours of Operation	9-12 W	13-17W	18-25 W	26-32 W
Porch	1027	0.000	0.000	0.000	0.000
Kitchen	1210	0.002	0.004	0.004	0.004
Living Room	864	0.002	0.004	0.004	0.004
Family Room	772	0.002	0.004	0.004	0.004
Dining Room	829	0.002	0.004	0.004	0.004
Bathroom 1	669	0.002	0.004	0.004	0.004
Bathroom 2	669	0.002	0.004	0.004	0.004
Bathroom 3	669	0.002	0.004	0.004	0.004
Bedroom 1	406	0.002	0.004	0.004	0.004
Bedroom 2	406	0.002	0.004	0.004	0.004
Bedroom 3	406	0.002	0.004	0.004	0.004
Bedroom 4	406	0.002	0.004	0.004	0.004
Bedroom 5	406	0.002	0.004	0.004	0.004
Office	708	0.002	0.004	0.004	0.004
Den	435	0.002	0.004	0.004	0.004
Entryway	435	0.002	0.004	0.004	0.004

2013 CFL Savings by Room Type

CFL Watter Range	Average CFL	Comparable Incandescent
9 to 12	12	40
13 to 17	15	60
18 to 25	23	53
26 to 32	27	72

In 2013, 75 watt incandescent bulbs baselines will drop

kWh Savings

Room Type	Hours of Operation	9-12 W	13-17W	18-25 W	26-32 W
Porch	1027	28.8	46.2	30.8	46.2
Kitchen	1210	33.9	54.5	36.3	54.5
Living Room	864	24.2	38.9	25.9	38.9
Family Room	772	21.6	34.7	23.2	34.7
Dining Room	829	23.2	37.3	24.9	37.3
Bathroom 1	669	18.7	30.1	20.1	30.1
Bathroom 2	669	18.7	30.1	20.1	30.1
Bathroom 3	669	18.7	30.1	20.1	30.1
Bedroom 1	406	11.4	18.3	12.2	18.3
Bedroom 2	406	11.4	18.3	12.2	18.3
Bedroom 3	406	11.4	18.3	12.2	18.3
Bedroom 4	406	11.4	18.3	12.2	18.3
Bedroom 5	406	11.4	18.3	12.2	18.3
Office	708	19.8	31.9	21.2	31.9
Den	435	12.2	19.6	13.1	19.6
Entryway	435	12.2	19.6	13.1	19.6

kW Savings

Room Type	Hours of Operation	9-12 W	13-17W	18-25 W	26-32 W
Porch	1027	0.000	0.000	0.000	0.000
Kitchen	1210	0.002	0.004	0.002	0.004
Living Room	864	0.002	0.004	0.002	0.004
Family Room	772	0.002	0.004	0.002	0.004
Dining Room	829	0.002	0.004	0.002	0.004
Bathroom 1	669	0.002	0.004	0.002	0.004
Bathroom 2	669	0.002	0.004	0.002	0.004
Bathroom 3	669	0.002	0.004	0.002	0.004
Bedroom 1	406	0.002	0.004	0.002	0.004
Bedroom 2	406	0.002	0.004	0.002	0.004
Bedroom 3	406	0.002	0.004	0.002	0.004
Bedroom 4	406	0.002	0.004	0.002	0.004
Bedroom 5	406	0.002	0.004	0.002	0.004
Office	708	0.002	0.004	0.002	0.004
Den	435	0.002	0.004	0.002	0.004
Entryway	435	0.002	0.004	0.002	0.004

2012 LED Savings by Room Type

CFL Watter Range	Average LED	Comparable Incandescent
9 to 12	8.9	40
13 to 17	16.2	60
18 to 25	20.4	75
26 to 32	32.4	72

In 2012, 100 watt incandescent bulbs baselines will drop

kWh Savings

Room Type	Hours of Operation	9-12 W	13-17W	18-25 W	26-32 W
Porch	1027	31.9	45.0	56.1	40.7
Kitchen	1210	37.6	53.0	66.1	47.9
Living Room	864	26.9	37.8	47.2	34.2
Family Room	772	24.0	33.8	42.2	30.6
Dining Room	829	25.8	36.3	45.3	32.8
Bathroom 1	669	20.8	29.3	36.5	26.5
Bathroom 2	669	20.8	29.3	36.5	26.5
Bathroom 3	669	20.8	29.3	36.5	26.5
Bedroom 1	406	12.6	17.8	22.2	16.1
Bedroom 2	406	12.6	17.8	22.2	16.1
Bedroom 3	406	12.6	17.8	22.2	16.1
Bedroom 4	406	12.6	17.8	22.2	16.1
Bedroom 5	406	12.6	17.8	22.2	16.1
Office	708	22.0	31.0	38.7	28.0
Den	435	13.5	19.1	23.8	17.2
Entryway	435	13.5	19.1	23.8	17.2

kW Savings

Room Type	Hours of Operation	9-12 W	13-17W	18-25 W	26-32 W
Porch	1027	0.000	0.000	0.000	0.000
Kitchen	1210	0.002	0.004	0.004	0.003
Living Room	864	0.002	0.004	0.004	0.003
Family Room	772	0.002	0.004	0.004	0.003
Dining Room	829	0.002	0.004	0.004	0.003
Bathroom 1	669	0.002	0.004	0.004	0.003
Bathroom 2	669	0.002	0.004	0.004	0.003
Bathroom 3	669	0.002	0.004	0.004	0.003
Bedroom 1	406	0.002	0.004	0.004	0.003
Bedroom 2	406	0.002	0.004	0.004	0.003
Bedroom 3	406	0.002	0.004	0.004	0.003
Bedroom 4	406	0.002	0.004	0.004	0.003
Bedroom 5	406	0.002	0.004	0.004	0.003
Office	708	0.002	0.004	0.004	0.003
Den	435	0.002	0.004	0.004	0.003
Entryway	435	0.002	0.004	0.004	0.003

2013 LED Savings by Room Type

CFL Watter Range	Average LED	Comparable Incandescent
9 to 12	6.5	40
13 to 17	11.9	60
18 to 25	14.9	53
26 to 32	23.7	72

In 2013, 75 watt incandescent bulbs baselines will drop

kWh Savings

Room Type	Hours of Operation	9-12 W	13-17W	18-25 W	26-32 W
Porch	1027	34.4	49.4	39.1	49.6
Kitchen	1210	40.5	58.2	46.1	58.4
Living Room	864	28.9	41.6	32.9	41.7
Family Room	772	25.9	37.1	29.4	37.3
Dining Room	829	27.8	39.9	31.6	40.0
Bathroom 1	669	22.4	32.2	25.5	32.3
Bathroom 2	669	22.4	32.2	25.5	32.3
Bathroom 3	669	22.4	32.2	25.5	32.3
Bedroom 1	406	13.6	19.5	15.5	19.6
Bedroom 2	406	13.6	19.5	15.5	19.6
Bedroom 3	406	13.6	19.5	15.5	19.6
Bedroom 4	406	13.6	19.5	15.5	19.6
Bedroom 5	406	13.6	19.5	15.5	19.6
Office	708	23.7	34.1	27.0	34.2
Den	435	14.6	20.9	16.6	21.0
Entryway	435	14.6	20.9	16.6	21.0

kW Savings

Room Type	Hours of Operation	9-12 W	13-17W	18-25 W	26-32 W
Porch	1027	0.000	0.000	0.000	0.000
Kitchen	1210	0.003	0.004	0.003	0.004
Living Room	864	0.003	0.004	0.003	0.004
Family Room	772	0.003	0.004	0.003	0.004
Dining Room	829	0.003	0.004	0.003	0.004
Bathroom 1	669	0.003	0.004	0.003	0.004
Bathroom 2	669	0.003	0.004	0.003	0.004
Bathroom 3	669	0.003	0.004	0.003	0.004
Bedroom 1	406	0.003	0.004	0.003	0.004
Bedroom 2	406	0.003	0.004	0.003	0.004
Bedroom 3	406	0.003	0.004	0.003	0.004
Bedroom 4	406	0.003	0.004	0.003	0.004
Bedroom 5	406	0.003	0.004	0.003	0.004
Office	708	0.003	0.004	0.003	0.004
Den	435	0.003	0.004	0.003	0.004
Entryway	435	0.003	0.004	0.003	0.004

Assumptions for calculations

Hours of Operation Source:

	# lamps per space	Annual Operation Hours per room	Lamp-hr/space
Kitchen	5.11	1210	6183
Outdoor	4.06	1027	4170
Utility Room	1.81	888	1607
Living Room	5.97	864	5158
Dining Room	1.23	829	1020
Family Room	2.38	772	1837
Garage	4.23	720	3046
Office	1.16	708	821
Bathroom	6.88	669	4603
Hall	5.12	616	3154
closet	0.77	513	395
Other	2.05	435	892
Bedroom	9.94	406	4036

* Source: DOE 2002 Lighting Analysis

kWh Calculation Equation:

kWh savings = (Baseline wattage – Efficient wattage)*Hours of Operation / 1,000

kW Calculation Equation:

kW Savings = ((Baseline wattage – Efficient wattage)/1,000) * coincidence factor

Coincidence factor assumed to be 8%

APPENDIX F – TEXAS COMMERCIAL LIGHTING MEASUREMENT AND VERIFICATION GUIDELINES (PROJECT NUMBER 30331) AND STIPULATED VALUE UPDATES (PROJECT NUMBER 31946)

2 Simplified M&V Guidelines for Lighting Efficiency Measures

Overview

This measurement and verification (M&V) procedure is appropriate for projects that involve the replacement of existing fixtures, lamps, and/or ballasts with a similar number of new energy efficient fixtures, lamps, and/or ballasts. This procedure can also be used for projects involving delamping with or without the use of reflectors. This stipulated hours method requires the use of the appropriate values listed in Table 2.1. If these tables do not accurately characterize the building type, then the Project Sponsor should refer to the applicable individual utility-approved full M&V procedures. Any alternate M&V methods must be approved by the sponsoring utility and adhere to the 1997 *International Performance Verification and Measurement Protocol* (IPMVP) available at the organization's Web site (www.ipmvp.org).

Pre-Installation M&V Activities

Prior to installing lighting retrofit, the Project Sponsor conducts a pre-installation equipment survey. This survey should provide the following information about all the fixtures involved in the lighting retrofit: room location, fixture, lamp, and ballast types; lighting controls; area designations; counts of operating and non-operating fixtures; and type of control device. If Interactive factors are claimed the survey must also indicated if the space is air-conditioned with electricity consuming equipment, and if the space is electrically heated.

Fixture wattages in both the pre and post case should be based on the *Standardized Lighting Fixture Wattage Table*. For example, the baseline for a standard 4-foot

fluorescent fixture is a combination of 34-watt Energy Saver lamps with an energy efficient ballast.

Post-Installation M&V Activities

After the lighting retrofit has been completed, the Project Sponsor conducts a post-installation equipment survey. The proposed equipment provided in the pre-installation equipment survey information should be updated to reflect the equipment installed or modified.

Calculation of Demand and Energy Savings

The peak demand savings and energy savings are calculated according to Equations (a) through (f). Demand savings are only allowed for lighting fixtures that will be in operation on weekdays between the hours of 1 p.m. and 7 p.m. during the months of May through September. Interactive HVAC demand and energy savings may be calculated *only* for lighting retrofits taking place in air-conditioned spaces. Lighting retrofits in unconditioned spaces, such as parking garages, are not eligible for interactive HVAC savings payments. Total demand savings are calculated using a coincidence factor to account for the average number of lights on during the hour of maximum demand reduction.

Peak demand savings

Equation (a)

Lighting Demand Savings [kW] = Pre Lighting Demand [kW] – Post Lighting Demand [kW]

Equation (b)

Interactive HVAC Demand Savings [kW] = Lighting Demand Savings [kW]*Stipulated Interactive HVAC Demand Savings [%]

Equation (c)

Total Demand Savings [kW] = (Lighting Demand Savings [kW] + Interactive HVAC Demand Savings [kW]) * Coincidence Factor

Energy savings

Equation (d)

Lighting Energy Savings [kWh] = Lighting Demand Savings [kW]*Stipulated Annual Hours of Operation [hrs]

Equation (e)

Interactive HVAC Energy Savings [kWh] = Lighting Energy Savings [kWh]*Stipulated Interactive HVAC Energy Savings [%]

Equation (f)

Total Energy Savings [kWh] = Lighting Energy Savings [kWh] + Interactive HVAC Energy Savings [kWh]

Example[1]

A lighting efficiency project is proposed for a typical small office building in Longview, Texas. The Sponsor submits the lighting survey forms as part of the Final Application detailing the existing and proposed equipment. The table below summarizes the existing and proposed connected lighting Load for each usage group in the project.

Area Description	Survey Lines	Connected Lighting Load (kW)			Stipulated Operating Hours	Annual kWh Savings
		Existing	Proposed	Saved		
Hallways and Stairs	5	0.9	0.5	0.4	3,760	1,504
Common Offices	18	16.5	3.6	12.9	3,760	48,504
Conference Rooms	5	3.9	2.4	1.5	3,760	5,640
Misc Facilities	6	1.5	1.2	0.3	3,760	1,128
Private Offices	11	14.8	10.3	4.5	3,760	16,920
Restrooms	5	1.0	0.7	0.3	3,760	1,128
Total	**50**	**38.6**	**18.7**	**19.9**		**74,824**

Based on the collected data, the demand and energy savings are calculated:

(a) Lighting Demand Savings	= 38.6 [kW] – 18.7 [kW]
	= 19.9 kW.
(b) Interactive HVAC Demand Savings	= 19.9 [kW]*0.10
	= 2.0 kW.
(c) Total Demand Savings	= (19.9 [kW] + 2.0 [kW])*.80
	= 17.5 kW.
(d) Lighting Energy Savings	= 19.9 [kW] * 3,760 [hrs]
	= 74,824 kWh.
(e) Interactive HVAC Energy Savings	= 74,824 [kWh]*0.05
	= 3,741 kWh.
(f) Total Energy Savings	= 74,824 [kWh] + 3,741 [kWh]
	= 78,565 kWh.

3 Simplified M&V Guidelines for Lighting Efficiency with Controls Measures

Overview

This Measurement and Verification (M&V) procedure is appropriate for lighting efficiency measures in combination with lighting controls retrofit measures. Lighting efficiency measures may include the replacement of existing fixtures, lamps, and/or ballasts with new energy efficient fixtures, lamps, and/or ballasts, as well as delamping with or without the use of reflectors. Controls measures may be occupancy sensors or daylighting controls.

This method requires the use of the appropriate stipulated hours from Table 3.1 and a Power Adjustment Factor (PAF) from Table 3.2. If values from these tables do not accurately characterize the building type and operation, then the Project Sponsor should refer to the applicable individual utility-approved full M&V procedures. Any alternate M&V methods must be approved by the sponsoring utility and adhere to the 1997 *International Performance Verification and Measurement Protocol* (IPMVP) available at the organization's Web site (www.ipmvp.org).

Table 3.1. Stipulated Annual Operating Hours and Interactive Savings

Building Type	Stipulated Annual Operating Hours	Coincidence Factor During Hour of Maximum Demand Savings	Interactive HVAC Demand Savings	Interactive HVAC Energy Savings
Office	3,760	80%	10%	5%
Non-24-Hour Supermarket/Retail/ Restaurant	4,250	95%	10%	5%
Education (K-12; no summer session)	2,150	85%	10%	5%
24-Hour Supermarket/ Retail	6,900	95%	10%	5%
In-Patient Health Care	3,750	60%	10%	5%
Higher education (college/university)	**2,085**	**67%**	**10%**	**5%**
Parking structure	**7,884**	**100%**	**0%**	**0%**
Multi-family housing common areas	**4,772**	**85%**	**10%**	**5%**

Table 3.2. Power Adjustment Factors (PAFs)*

Control Type	Power Adjustment Factor
Daylight controls (DC) – continuous dimming	0.70
DC – multiple-step dimming	0.80
DC – ON/OFF	0.90
Occupancy sensor (OS)	0.70
OS w/ DC – continuous dimming	0.60
OS w/ DC – multiple-step dimming	0.65
OS w/ DC – ON/OFF	0.65

*PAFs are adapted from ASHRAE Standard 90.1-1989, Table 6-3.

Pre-Installation M&V Activities

Prior to installing lighting retrofit, the Project Sponsor conducts a pre-installation equipment survey. This survey should provide the following information about all the fixtures involved in the lighting retrofit: room location, fixture, lamp, and ballast types; lighting controls; area designations; counts of operating and non-operating fixtures; and type of control device.

If Interactive factors are claimed the survey must also indicated if the space is air-conditioned with electricity consuming equipment, and if the space is electrically heated. Fixture wattages in both the pre and post case should be based on the *Standardized Lighting Fixture Wattage Table.* For example, the baseline for a standard 4-foot fluorescent fixture is a combination of 34 watt Energy Saver lamps with an energy-efficient ballast.

Post-Installation M&V Activities

After the lighting retrofit has been completed, the Project Sponsor conducts a post-installation equipment survey. The proposed equipment provided in the pre-installation equipment survey information should be updated to reflect the equipment installed or modified.

Calculation of Demand and Energy Savings

The peak demand savings and energy savings are calculated according to Equations (a) through (f). Demand savings are only allowed for lighting fixtures that will be in operation on weekdays between the hours of 1 p.m. and 7 p.m. during the months of May through September. Interactive HVAC demand and energy savings may be calculated *only* for lighting retrofits taking place in conditioned spaces. Lighting retrofits in non air conditioned spaces, such as parking garages, are not eligible for interactive HVAC savings payments. Total demand savings are calculated using a Coincidence factor to account for the average number of lights on during the hour of maximum demand reduction. No demand savings are credited to the controls.

Peak demand savings

Equation (a)

Lighting Demand Savings [kW] = Pre Lighting Demand [kW] – Post Lighting Demand [kW]

Equation (b)

Interactive HVAC Demand Savings [kW] = Lighting Demand Savings [kW]*Stipulated Interactive HVAC Demand Savings [%]

Equation (c)

Total Demand Savings [kW] = (Lighting Demand Savings [kW] + Interactive HVAC Demand Savings [kW]) * Coincidence Factor

Energy savings

Equation (d)

Lighting Energy Savings [kWh] = {Pre Lighting Demand [kW] – Post Lighting Demand [kW] *Power Adjustment Factor [%]}*Stipulated Annual Hours of Operation [hrs]

Equation (e)

Interactive HVAC Energy Savings [kWh] = Lighting Energy Savings [kWh]*Stipulated Interactive HVAC Energy Savings [%]

Equation (f)

Total Energy Savings [kWh] = Lighting Energy Savings [kWh] + Interactive HVAC Energy Savings [kWh]

Example[2]

A lighting efficiency and controls projects is proposed for a typical small office building in Longview, TX. Controls are to be installed in some common offices, private offices and restrooms. The Project Sponsor submits the lighitng survey detailing the existing and proposed equipment inventory (example Form LE1 is attached). The following table summarizes the existing and proposed connected lighting load and operating hours for each usage group in the project.

Area Description	Connected Load (kW)		New control type	PAF	Pre-retrofit hours
	Existing	Proposed		Table 2.2	Table 2.1
Common Offices w/ controls	9.0	4.3	Daylight control—multi-step dimming	0.8	3,760
Common Offices	10.1	4.1			3,760
Private Offices	5.2	2.1			3,760
Private Offices w/controls	4.3	2.0	Occupancy sensor	0.7	3,760
Conference Rooms	3.9	1.5			3,760
Restrooms	0.3	0.1			3,760

Pre-retrofit operating hours are determined using the Stipulated Hours Method. The stipulated annual operating hours for office buildings is 3,760 hours/year. Usage groups that are being retrofitted with controls are divided into control and non-control usage groups. The post-retrofit hours for the control usage groups are multiplied by the PAF corresponding to the type of control being utilized. The post-retrofit hours for the non-control usage groups remain unchanged from the pre-retrofit hours. Using equations (a) through (f), the energy savings for the *Common Offices With Controls* will be

(a) Lightng Demand Savings [kW] = 9.0 [kW] -- 4.3 [kW]

= 4.7 [kW]

(b) Interactive HVAC Demand Savings [kW] = 4.7 [kW] * 0.10

= 0.5 [kW]

(c) Total Demand Savings [kW] = (4.7 [kW] + 0.5 [kW]) * 0.80

= 4.2 [kW]

(d) Lighting Energy Savings [kWh] = {9.0 [kW] – 4.3 [kW]*0.8} * 3760 [hrs]

= 20,906 [kWh]

(e) Interactive HVAC Energy Savings [kWh] = 20,906 [kWh] * 0.05

= 1,045 [kWh]

(f) Total Energy Savings [kWh] = 20,906 [kWh] + 1,045 [kWh]

= 21,951 [kWh]

The energy savings is then calculated for each usage group.

				Results		
Area Description	(a)	(b)	(c)	(d)	(e)	(f)
Common Offices w/ Controls	4.7	0.5	4.2	20,906	1,045	21,951
Common Offices	6	0.6	5.3	22,560	1,128	23,688
Private Offices	3.1	0.3	2.7	11,656	583	12,239
Private Offices w/ Controls	2.3	0.2	2.0	10,904	545	11,449
Conference Rooms	2.4	0.2	2.1	9,024	451	9,475
Restrooms	0.3	0	0.2	1,128	56	1,184
Total			**16.5**			**79,986**

Stipulated Value Updates (Project Number 31946)

The PUCT ruling on Project 31946 added stipulated Operating Hours and Coincidence factors for a number of new building types and updated those values for previously existing building types (Table 8). It also established some new interactive effects to be used in refrigerated spaces/building that are operating at low (-10 to +10 deg Fahrenheit) and medium (+33 to +41 deg Fahrenheit) temperatures (Table 12).

Table 8. Building Operating Hours and Coincidence Factors for Lighting Measures

Building Type	Operating Hours	Operating Hour Sources	Coincidence Factor	Coincidence Factor Sources
Education:K-12, w/o Summer Session	2,777	Navigant (2002) Weighted-average Calculation	0.47	RLW (2007)
Education: College, University, Vocational, Day Care, and K-12 w/ summer session	3,577	SCE (2007), weighted average calculation	0.69	RLW (2007)
Food Sales - Non-24-Hour Supermarket/Retail	4,706	CBECS (2003)/Navigant (2002), weighted ave calculation	0.95	RLW (2007)
Food Sales - 24 Hour Supermarket/Retail	6,900	Weighted Ave of Existing PUCT-Approved Value and Navigant (2002)	0.95	Existing PUCT-Approved Value
Food Service – fast food	6, 188	SCE (2007)	0.81	RLW (2007), weighted-average calculation
Food Service – Sit-down Restaurant	4,368	SCE (2007)	0.81	RLW (2007), weighted-average calculation
Health Care (Out-patient)	3,386	Navigant (2002) Weighted-average Calculation	0.77	RLW (2007)
Health Care (In-patient)	5,730	Navigant (2002) Weighted-average Calculation	0.78	See Explanation below
Lodging (Hotel/Motel/Dorm), Common Areas	6,630	Navigant (2002)Weighted-average Calculation	0.82	RLW (2007)
Lodging (Hotel/Motel/Dorm), Rooms	3,055	Navigant (2002)Weighted-average Calculation	0.25	See Explanation below
Manufacturing	5,740	Frontier Estimate	0.73	RLW (2007))
Multi-family Housing, Common Areas	4,772	Existing PUCT-Approved Value	0.87	RLW (2007)

20

Building Type	Operating Hours	Operating Hour Sources	Coincidence Factor	Coincidence Factor Sources
Nursing and Resident Care	4,271	Navigant (2002) Weighted-average Calculation	0.78	RLW (2007)
Office	3,737	Navigant (2002) Weighted-average Calculation	0.77	RLW (2007)
Outdoor (street & parking)	3996	Oncor Street Lighting Tariff Filing	0.00	Oncor Street Lighting Tariff Filing
Parking Structure	7,884	Existing PUCT-approved value	1.00	Existing PUCT-approved value
Public Assembly	2,638	Navigant (2002) Weighted-average Calculation	0.56	Conn (2007); Weighted by XENCAP Study
Public Order and Safety	3,472	Navigant (2002) Weighted-average Calculation	0.75	Conn (2007); Weighted by XENCAP Study
Religious	1,824	Navigant (2002) Weighted-average Calculation	0.53	Conn (2007); Weighted by XENCAP Study
Retail (Excluding Malls and Strip Centers)	3,668	Navigant (2002) Weighted-average Calculation	0.90	RLW (2007)
Retail (Enclosed Mall)	4,813	Navigant (2002)Weighted-average Calculation	0.93	RLW (2007)
Retail (Strip shopping and non-enclosed mall)	3,965	Navigant (2002) Weighted-average Calculation	0.90	RLW (2007)
Service (Excluding Food)	3,406	Navigant (2002) Weighted-average Calculation	0.90	RLW (2007) – assumed similar operations as Retail
Warehouse (Non-refrigerated)	3,501	Navigant (2002) Weighted-average Calculation	0.77	RLW (2007)
Warehouse (Refrigerated)	3,798	Navigant (2002) Weighted-average Calculation	0.84	RLW (2007)

Source: Connecticut Energy Conservation Management Board. Final Report, 2005 Coincidence Factor Study. (2007); U.S. Lighting Market Characterization. Prepared by Navigant Consulting for the U.S. Department of Energy.

21

Proposed Changes to Interactive Effects

Changes are proposed to the interactive effects of lighting retrofits in refrigerated spaces as detailed in Table 12.

Table 12. Proposed Changes to Interactive Effects

	Interactive Demand Savings Factor	Interactive Energy Savings Factor	
Low-temperature Refrigerated AC	1.30	1.30	Refrigerated space between -10 and 10 degrees Fahrenheit
Medium-temperature Refrigerated AC	1.25	1.25	Refrigerated space between 33 and 41 degrees Fahrenheit

APPENDIX G – WORKPAPER SHOWING ENERGY GAUGE MODELING APPROACH

Sample Approach to Calculating Deemed Savings from AR Comprehensive Deemed Savings

The approach to be used for NO will of course include just one weather zone (using TMY3 weather files) and will exclude gas savings estimates.

3.14. Floor Insulation

Measure Description

Add floor insulation with an R-value of 19 or higher to floor space under conditioned space that previously had no insulation. A floor with a (R-0) insulation value has no insulation, but does have a nominal floor R value made up of interior and exterior wall materials, air film and wood studs.

Baseline

The baseline is considered to be a house with pier and beam construction and no floor insulation under the floor of the conditioned space.

Efficiency Standards

In order to qualify for deemed savings, the floors must be insulated to a minimum of R-19.

Batt insulation is recommended in most cases and must have the vapor barrier installed facing up and against the floor or conditioned area. Insulation should be affixed with a permanent retention system to ensure the insulation remains in place for the full measure life. All insulations must comply with all current Occupational Safety and Health Administration (OSHA) standards.

Calculation of Deemed Savings

Deemed savings values have been calculated for each of the four climate zones. The deemed savings are dependent R-value of the floor pre and post retrofit. Deemed savings values are calculated based on an un-insulated floor space being retrofitted with insulation that has and R-value of 19.

Building load simulation software that calculates hourly load data was used to create savings for a series of models. The software used was EnergyGauge USA. Floor insulation savings are sensitive to weather; therefore, available TMY2 weather data specific to each of the four Arkansas weather regions was used for the analysis. The table below displays the home characteristics used in the EnergyGauge building models.

Table 64: Prototype Home Characteristics: Floor Insulation

Shell Characteristic	Value	Source
Conditioned Area	2,000 square feet	
Foundation	Pier and beam – crawlspace	
Base Floor Insulation	R-0	Existing insulation level
Change Floor Insulation	R-19	
Ceiling Insulation	R-19	
Wall Insulation	R-11	
Window Area	16.5 % of floor area (~21% of wall area)	
Air Infiltration	0.7 ACH	Average air changes per hour of air infiltration for

Shell Characteristic	Value	Source
		existing homes used during calibration of model
Window U-value	1.27	
Thermostat Settings	71.25° winter; 77.5° summer	Average thermostat settings used during calibration of model
Orientation	50 feet by 45 feet with longer sides facing North and South	Pre-designed building model available in the EnergyGauge database; more window area is concentrated on the North and South facing sides of the building (120 sq ft N &S, 45 sq ft E& W)
Duct Losses	15% overall loss	Default value set by EnergyGauge during calibration of model
Air Conditioning	10.0 SEER	Federal Standard in effect from 1990-2006
Gas Heating	78% AFUE	Annual Fuel Utilization Efficiency - base gas furnace efficiency
Electric Resistance Heat	COP 1.0	Coefficient of Performance for central electric resistance heating systems
Electric Heat Pump	HSPF = 7.7	Federal Minimum

Deemed Savings Values

The deemed savings values listed below are per square foot of floor area below a conditioned space that is to be insulated.

For homes with gas heat and electric air conditioning, the deemed savings include the heating season therm savings, plus the cooling season kWh savings in the last column.

For homes with gas heat and no AC, the deemed savings include the therm savings in the second column, plus the furnace fan kWh savings in the last column.

Table 65: Code Zone 9: Northwest

Code Zone 9: Northwest	kWh savings per sq. ft	kW* savings per sq. ft	Therms savings per sq. ft	Peak Therm Savings per sq. ft
Electric AC with Gas Heat	0.220	Negligible	0.243	0.00312
Gas Heat Only (no AC)	0.169	n/a	0.243	0.00312
Electric AC with Electric Resistance Heat	4.87	Negligible	n/a	n/a
Electric AC with Heat Pump	2.96	Negligible	n/a	n/a

*This is the reduction in electricity used by the furnace's air handler during the heating season.

Table 66: Code Zone 8: Northeast/North Central Region

Code Zone 8: Northeast/North Central Region	kWh savings per sq. ft	kW* savings per sq. ft	Therms savings per sq. ft	Peak Therm Savings per sq. ft
Electric AC with Gas Heat	0.1835	Negligible	0.168	0.00242♦
Gas Heat Only (no AC)	0.118	n/a	0.167	0.00242♦
Electric AC with Electric Resistance Heat	3.41	Negligible	n/a	n/a
Electric AC with Heat Pump	1.98	Negligible	n/a	n/a

*This is the reduction in electricity used by the furnace's air handler during the heating season.

Table 67: Code Zone 7: Central Region

Code Zone 7: Central Region	kWh savings per sq. ft	kW* savings per sq. ft	Therms savings per sq. ft	Peak Therm Savings per sq. ft
Electric AC with Gas Heat	0.202	Negligible	0.160	0.00207
Gas Heat Only (no AC)	0.113	n/a	0.159	0.00207
Electric AC with Electric Resistance Heat	3.31	Negligible	n/a	n/a
Electric AC with Heat Pump	1.94	Negligible	n/a	n/a

*This is the reduction in electricity used by the furnace's air handler during the heating season.

Table 68: Code Zone 6: South Region

Code Zone 6: South Region	kWh savings per sq. ft	kW* savings per sq. ft	Therms savings per sq. ft	Peak Therm Savings per sq. ft
Electric AC with Gas Heat	0.179	Negligible	0.116	0.00219
Gas Heat Only (no AC)	0.082	n/a	0.115	0.00219
Electric AC with Electric Resistance Heat	2.42	Negligible	n/a	n/a
Electric AC with Heat Pump	1.3	Negligible	n/a	n/a

*This is the reduction in electricity used by the furnace's air handler during the heating season.

Note: Peak demand savings for this measure are negligible.

Estimated Useful Life (EUL)

The average lifetime of this measure is 20 years according to DEER 2008.

♦ Data in table is for Blytheville peak. Other Zone 8 peaks can be calculated by multiplying Blytheville peak by the appropriate factor, m. For Jonesboro, m = 0.990. For Fort Smith, m = 0.965.

[1] *2004-2005 Database for Energy Efficient Resources (DEER) Version 2.01.* October 2005. Run ID RRes00AVPOOL2. Measure ID D03-967. Accessed January 2008. <eega.cpuc.ca.gov/DEER/>

[2] *Work Paper PGECOPUM102 Variable Speed Pool Pump Revision #1, by Pacific Gas & Electric Company, April 2009.*

[3] *Evaluation of Year 2001 Summer Initiatives Pool Pump Program*, Performed by ADM Associates for Pacific Gas and Electric Company, April 2002.

[4] "Proposed Amendments to Appliance Efficiency Regulations, 15 Day Language." 2008 Appliance Efficiency Rulemaking, Phase 1, Part B, Docket Number 08-AAER-1B, *California Energy Commission*. November 2008. p. 2, p.164. <www.energy.ca.gov/2008publications/CEC-400-2008-021/CEC-400-2008-021-15DAY.PDF>

[5] "CEC Appliances Database – Pool Pumps." *California Energy Commission*. Updated Feb 2008. Accessed March 2008. <www.energy.ca.gov/appliances/appliance/excel_based_files/Pool_Products/>