

ANNUAL REPORT



ENTERGY NEW ORLEANS
Program Year 3
April 2013-March 2014

ENTERGY LOUISIANA
October 2012-March 2014



**PREPARED
FOR**

Entergy New Orleans
1600 Perdido St.,
New Orleans, LA 70112

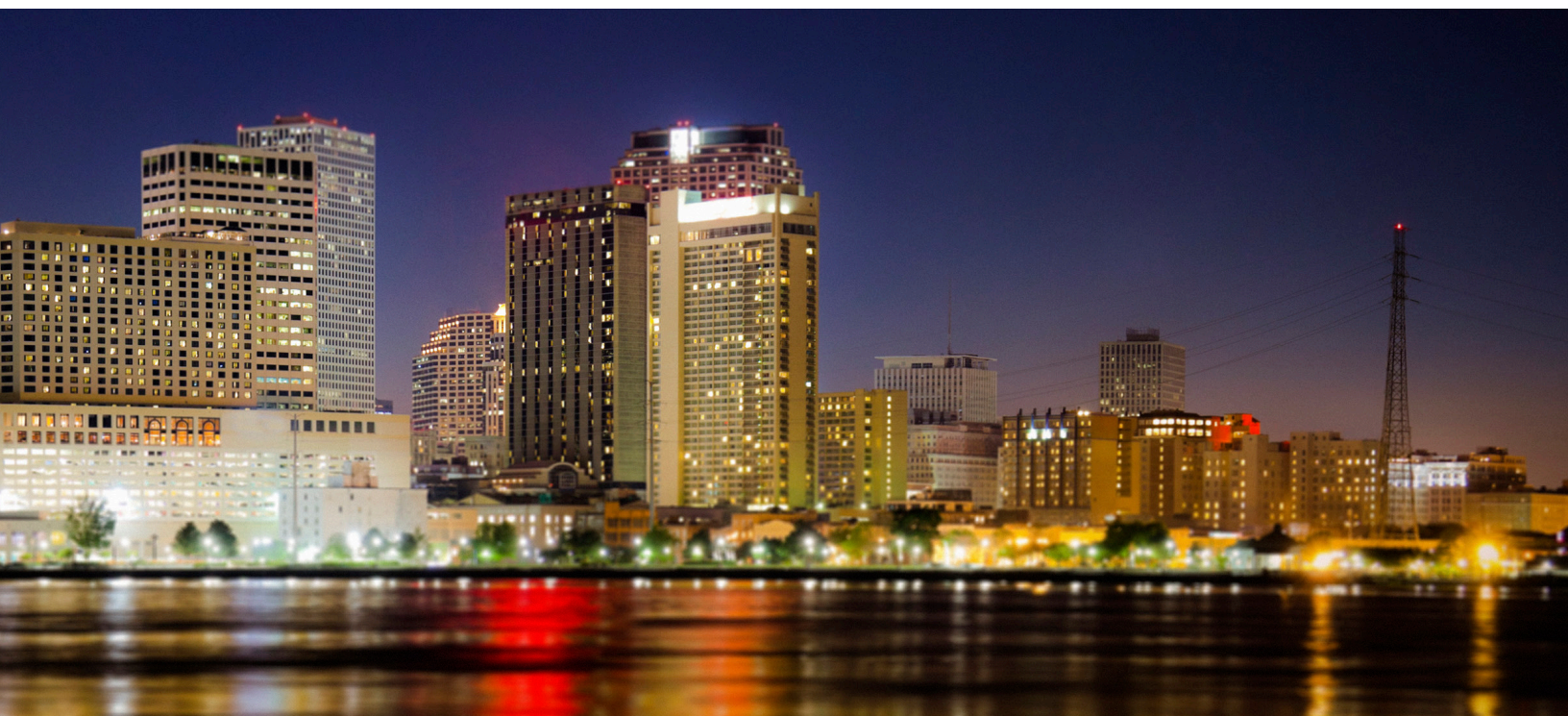
June, 2014





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EXECUTIVE SUMMARY



The third program year for the Energy Smart New Orleans Program has seen the continued success of the Orleans Parish energy-efficiency program, administered by Energy New Orleans and implemented by CLEAResult. Since the program's inception in 2011, Energy Smart has helped more than 25,000 residents make their homes and businesses more efficient, saving energy and money while increasing comfort and property values. In the past twelve months alone, the program has resulted in nearly 20 million kWh of electricity savings, the equivalent of eliminating more than 100 million pounds of greenhouse gases.

Over the last twelve months, Energy Smart has focused on helping low-income New Orleans residents make their homes and apartments more energy efficient. The successful transition of the Hard to Reach Program to an "Assisted" Home Performance with ENERGY STAR Program brought a dramatic increase in the number of low-income single-family homes weatherized in Orleans Parish. In addition, energy-saving compact fluorescent light bulbs, showerheads and faucet aerators were installed in over 3,400 apartments in New Orleans and Algiers.

The Small Commercial Solutions Program and Large Commercial Solutions Program continue to perform exceedingly well, indicating a pent-up demand for energy efficiency services in the commercial sector.

Energy Smart launched two pilot programs - the Solar Photovoltaic Pilot and the In-Home Display Pilot program. Results of

these pilot programs are contained in separate reports to be filed at the City Council.

By now a trusted name in the community, Energy Smart has continued to grow and expand, responding to the needs of homeowners and improving upon its program offerings. The NOLA Wise Program was folded into Energy Smart in September 2013, helping widen its grassroots outreach. During this period, NOLA Wise also laid the groundwork for launching a School Kits Program, utilizing a program design which CLEAResult had implemented successfully in other parts of the country. Further sustained and diverse marketing efforts, as detailed in this report, have disseminated the Energy Smart message through various media and helped reach audiences throughout New Orleans.

In the spring of 2014, the Environmental Protection Agency's ENERGY STAR program recognized Energy Smart as a National Partner of the Year for its achievements in the Home Performance with Energy STAR Program this year. Energy New Orleans and CLEAResult were recognized by the EPA in a ceremony in Washington, D.C., on April 29, 2014, during which the program participants' 3.6 million kWh savings were cited.

The result is a core of committed small-business owners who are working with the program to deliver high-quality service and energy savings to homeowners.



It was a pleasure working with them and I would definitely recommend the service to others. -Satisfied Customer



**PROGRAM
YEAR 3 SAVINGS
AND BUDGET
SNAPSHOT**

ENERGY NEW ORLEANS	TARGET	ACTUAL	% OF GOAL
ELECTRIC SAVINGS (KWH)	16,581,090	16,007,993	96.5%
INCENTIVE BUDGET	\$2,052,249	\$1,948,367	94.9%

ENERGY LOUISIANA	TARGET	ACTUAL	% OF GOAL
ELECTRIC SAVINGS (KWH)	3,113,278	3,207,488	103%
INCENTIVE BUDGET	\$365,000	\$270,904	74.2%



ANNUAL REPORT OVERVIEW

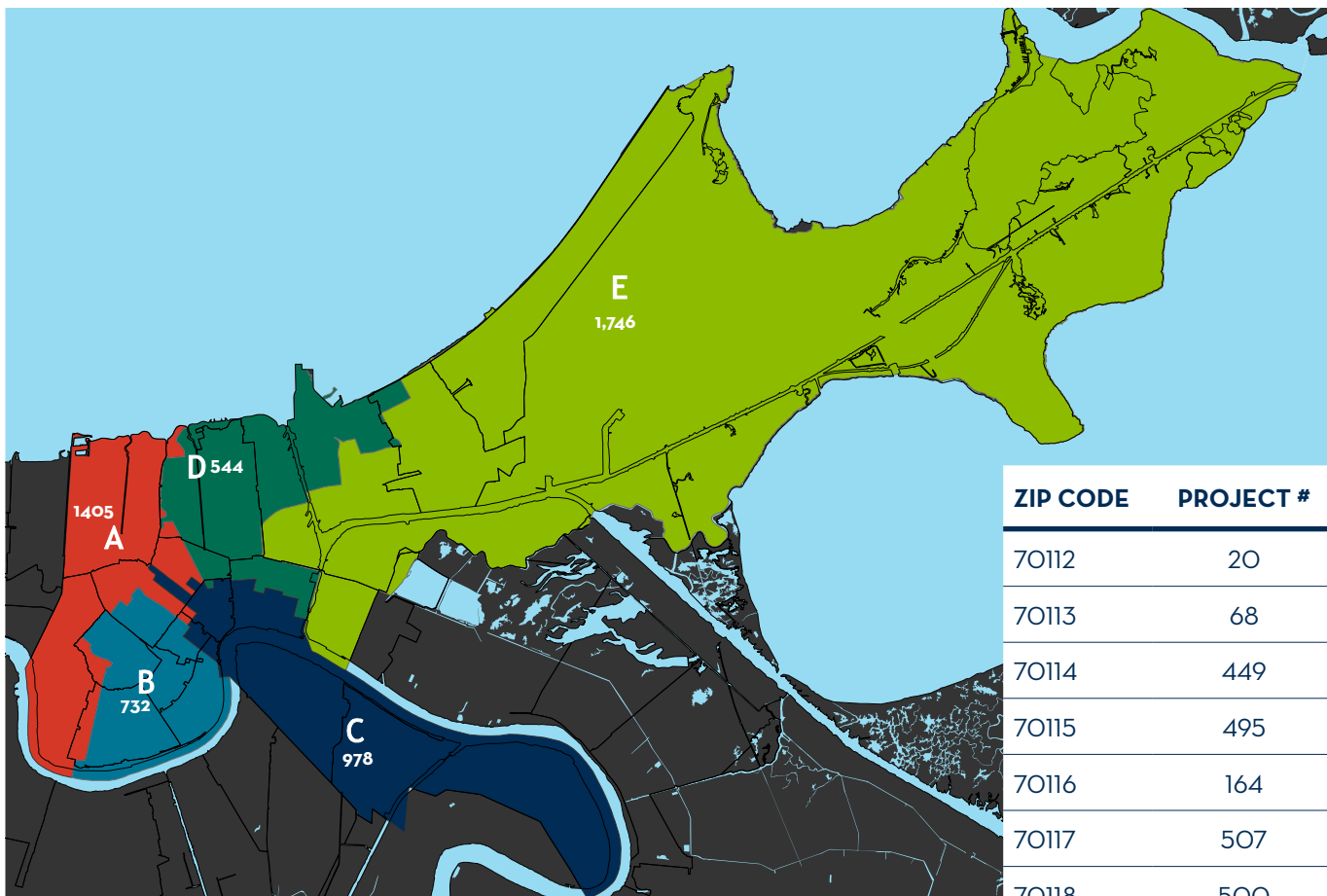
This report provides details on the activities of the Energy Smart Program in its third year of program delivery, from April 1, 2013-March 31, 2014 for the Eastbank. The report also provides details for Algiers/Westbank activity from, October 1, 2012 to March 31, 2014. Descriptions of kWh and incentive delivery amounts, in raw numbers and as compared to goal numbers, and program highlights are listed for the following programs:

- Home Performance with ENERGY STAR.
- ENERGY STAR Central Air Conditioner.
- High Performance Air Conditioning Tune-Up.
- ENERGY STAR Window Air Conditioner.
- Energy Efficient New Homes.
- Compact Fluorescent Lighting Direct Install.
- Assisted Home Performance with ENERGY STAR.
- Solar Hot Water Heater.
- Small Commercial Solutions.
- Large Commercial & Industrial Solutions.

In addition, the report highlights special events and ongoing partnerships that propelled Energy Smart's penetration and accomplishments in the community. Also provided are overviews of:

- Marketing campaign and collateral materials.
- Grassroots outreach campaigns with local partners Bright Moments and NOLA Wise.
- Customer satisfaction surveys.
- A look forward to Program Year Four.

MAP OF PROGRAM ACTIVITIES TO DATE



- A - 70124, 70119, 70118
- B - 70125, 70115, 70130
- C - 70117, 70114, 70131
- D - 70122
- E - 70128, 70129, 70126, 70127

ZIP CODE	PROJECT #
70112	20
70113	68
70114	449
70115	495
70116	164
70117	507
70118	500
70119	758
70122	544
70124	147
70125	143
70126	507
70127	476
70128	423
70129	340
70130	94
70131	223
TOTAL	5858



PROGRAMS OF ENERGY SMART

PROGRAMS OVERVIEW

The Energy Smart Program offerings are designed to reach a wide variety of Entergy New Orleans and Entergy Louisiana ratepayers in the City of New Orleans. The programs are available to homeowners, renters, business owners and contractors and include mail-in rebates, retail partner instant rebates, direct install activities and many other ways for local residents to participate, regardless of income or level of energy efficiency desired. This combination of a wide range of programs produces the greatest opportunity for energy savings.

By connecting contractors to customers and training resources, the program also serves to transform the market of energy-efficiency upgrades, and create meaningful economic activity in Orleans Parish.

“ “ I am happy that Entergy is encouraging homeowners residents to use energy efficient appliances and is giving these financial incentives.



ENTERGY NEW ORLEANS SAVINGS AND PARTICIPATION

Program Year 3*

PROGRAM NAME	MARKET FOCUS	YEAR 2 SAVINGS GOALS*		YEAR 3 SAVINGS TOTAL					% COMPLETED PROGRAM YTD	
		KW	KWH	KW	KWH	CO ² REDUCTION (LBS)	# OF PARTICIPANTS	# OF MEASURES	KW	KWH
HOME PERFORMANCE WITH ENERGY STAR	RESIDENTIAL	293	868,874	901.32	3,184,213	17,831,591	2,469	18,780	307.6%	366.5%
ENERGY STAR AIR CONDITIONER	RESIDENTIAL	347	1,178,169	7995	227,754	1,275,425	349	416	23%	19.3%
AIR CONDITIONER TUNE-UP	RESIDENTIAL	648	1,176,985	611.80	617,946	3,460,500	1,038	1,199	94.4%	52.5%
NEW HOMES	RESIDENTIAL	492	2,308,671	15.45	71,925	402,781	32	36	3.1%	3.1%
CFL DIRECT INSTALL	RESIDENTIAL	660	4,565,349	108.93	2,448,124	13,709,493	897	19,068	16.5%	53.6%
ASSISTED HOME PERFORMANCE WITH ENERGY STAR	RESIDENTIAL	30	122,250	352.77	2,743,541	15,363,830	2,842	34,164	1175.9%	2,244.2%
SOLAR HOT WATER HEATER	RESIDENTIAL	NA	NA	0.84	4,630	25,928	2	2		
SMALL COMMERCIAL	COMMERCIAL	322	2,230,328	356.30	2,108,012	11,804,865	89	89	110.7%	94.5%
LARGE COMMERCIAL	COMMERCIAL	636	4,130,464	695.85	4,601,848	25,770,349	18	19	109.4%	111.4%
TOTALS		3,428	16,581,090	3,123.20	16,007,993	89,644,761	7,736	73,773	91.1%	96.5%

*Goals are Year 2 as Program Year 3 goals have not been formally approved.



ENTERGY LOUISIANA SAVINGS AND PARTICIPATION

October 2012 to March 2014

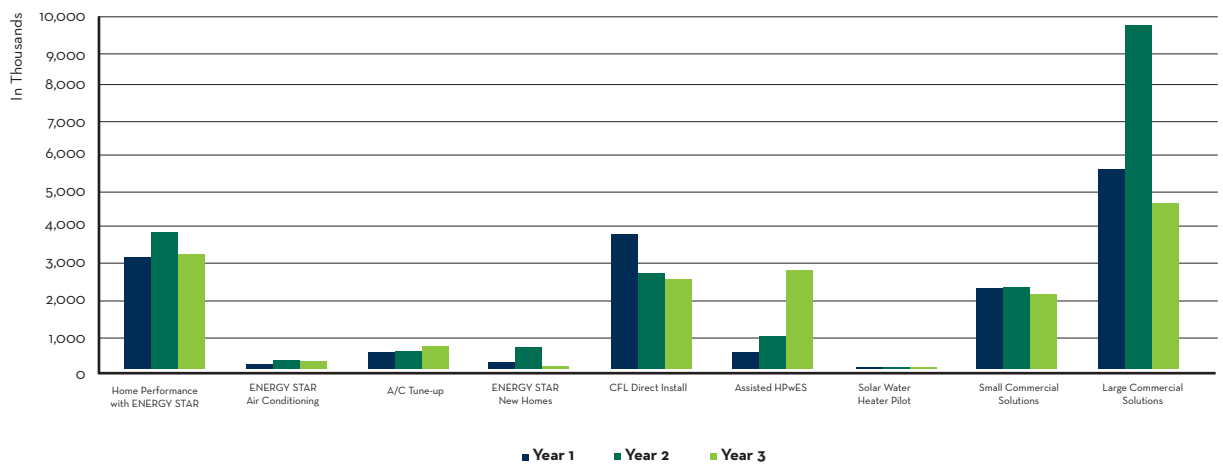
PROGRAM NAME	MARKET FOCUS	PROGRAM SAVINGS GOALS		PROGRAM TOTALS			% COMPLETED PROGRAM YTD
		KWH	KWH	CO ² REDUCTION (LBS)	# OF PARTICIPANTS	# OF MEASURES	KWH
HOME PERFORMANCE WITH ENERGY STAR	RESIDENTIAL	593,539	570,497	3,194,784	484	5,653	96.1%
ENERGY STAR AIR CONDITIONER	RESIDENTIAL	105,302	33,018	184,901	30	37	31.4%
AIR CONDITIONER TUNE-UP	RESIDENTIAL	120,441	131,854	738,382	102	350	109.5%
NEW HOMES	RESIDENTIAL	26,653	0	0	-	-	0%
CFL DIRECT INSTALL	RESIDENTIAL	1,102,303	821,238	4,598,933	-	-	74.5%
ASSISTED HOME PERFORMANCE WITH ENERGY STAR	RESIDENTIAL	94,273	928,933	5,202,026	775	12,315	985.4%
SOLAR HOT WATER HEATER	RESIDENTIAL	14,712	0	0	-	-	-
SMALL COMMERCIAL	COMMERCIAL	409,158	512,925	2,872,380	15	15	125.4%
LARGE COMMERCIAL	COMMERCIAL	646,897	209,023	1,170,529	1	1	32.3%
TOTALS		3,113,278	3,207,488	17,961,935	1,407	18,371	103%

“ Glad they added Algiers as this is often an overlooked part of the city.

CHANGES OVER PROGRAM YEARS 1-3

Variations in kWh savings from program years one through three for Entergy New Orleans are shown below, broken down by program. Programs that perform well one year tend to reap similarly high savings the following year, with the exception of the Assisted Home Performance Program, which has improved kWh savings each year, most dramatically in year three.

kWh Totals by Program - ENO



CARBON EMISSIONS

Energy Smart Programs reduced carbon emissions in the atmosphere by close to 90 million pounds this year in the Entergy New Orleans suite of programs alone.

This is the equivalent of:

- 283,000 trees planted.
- 2300 cars taken off the road; or
- 1000 homes powered for one year.

ENERGY NEW ORLEANS	CO ² REDUCTION (LBS)
HOME PERFORMANCE WITH ENERGY STAR	17,831,591
ENERGY STAR AIR CONDITIONING	1,275,425
A/C TUNE-UP	3,460,500
ENERGY SMART NEW HOMES	402,781
CFL DIRECT INSTALL	13,709,493
ASSISTED HOME PERFORMANCE WITH ENERGY STAR	15,363,830
SOLAR WATER HEATER PILOT	25,928
SMALL COMMERCIAL SOLUTIONS	11,804,865
LARGE COMMERCIAL SOLUTIONS	25,770,349
TOTAL	89,644,761

ENERGY LOUISIANA	CO ² REDUCTION (LBS)
HOME PERFORMANCE WITH ENERGY STAR	3,194,784
ENERGY STAR AIR CONDITIONING	184,901
A/C TUNE-UP	738,382
ENERGY SMART NEW HOMES	-
CFL DIRECT INSTALL	4,598,933
ASSISTED HOME PERFORMANCE WITH ENERGY STAR	5,202,026
SOLAR WATER HEATER PILOT	-
SMALL COMMERCIAL SOLUTIONS	2,872,380
LARGE COMMERCIAL SOLUTIONS	1,170,529
TOTAL	17,961,935

HOME PERFORMANCE WITH ENERGY STAR

The Home Performance with ENERGY STAR Program is a national program administered by the Department of Energy in conjunction with the EPA. Homeowners who participate in the Home Performance with ENERGY STAR Program live in cooler homes in the summer and warmer homes in the winter, and pay less for their utility bills.

Rather than focusing on a single problem, like an old heating or cooling system, not enough insulation in the attic or draftiness, Home Performance with ENERGY STAR helps homeowners understand how improvements throughout the home work together so they can prioritize investment to achieve energy savings and comfort goals. Any residential Entergy customer in Orleans Parish who lives in an existing single-family home, up to a fourplex structure, is eligible to receive rebates for installing energy-efficiency improvements.

In contrast with years one and two of the program, which were characterized by spikes and dips in activity throughout the calendar year, year three of the program saw a leveling-out of services, with fairly steady delivery of kWh savings regardless of the month. This reflects the maturity of the program, encompassing such factors as the effective training of program contractors and the refining of marketing tools. The one exception was December 2013, which saw a huge increase in participation in Algiers.

The Home Performance with ENERGY STAR Program will undergo some changes in 2014 that will result in a slight decline in activity.

ENTERGY NEW ORLEANS

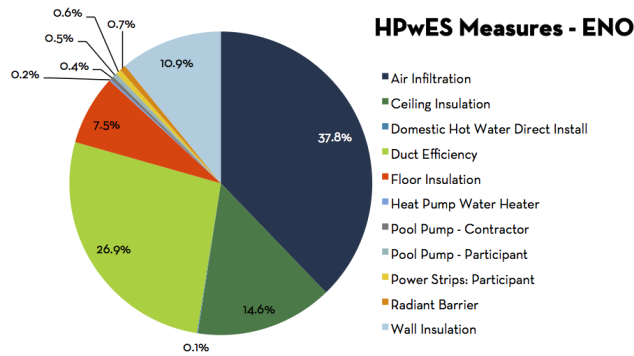
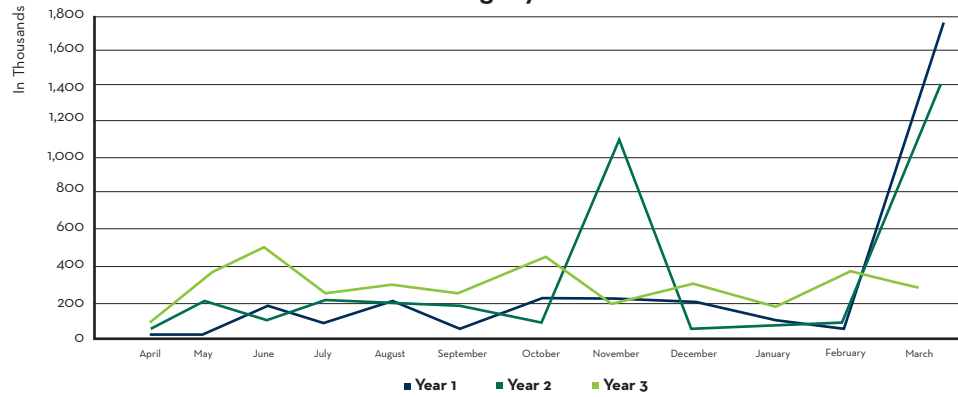
	TARGET	ACTUAL	% OF GOAL
ELECTRIC SAVINGS (KWH)	868,874	3,184,213	366.5%
INCENTIVE BUDGET	\$587,496	\$ 551,053	93.8%

ENTERGY LOUISIANA

	TARGET	ACTUAL	% OF GOAL
ELECTRIC SAVINGS (KWH)	593, 539	570,497	96.1%
INCENTIVE BUDGET	\$112,000	\$78,121	69.8%

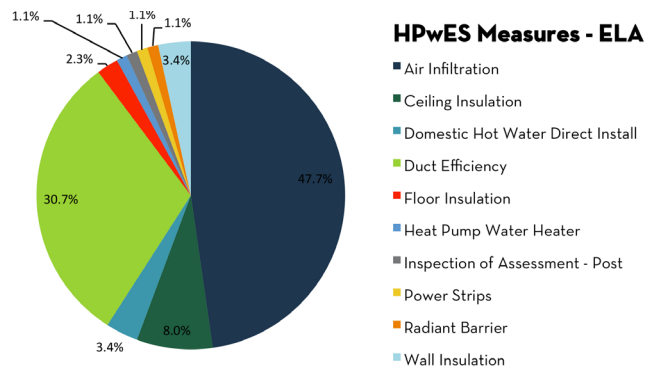
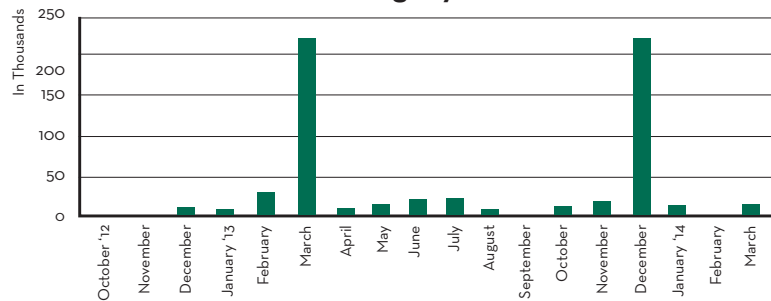
**ENTERGY
NEW ORLEANS**

kWh Savings by Month - ENO



**ENTERGY
LOUISIANA**

kWh Savings by Month - ELA



ENERGY STAR CENTRAL AIR CONDITIONING

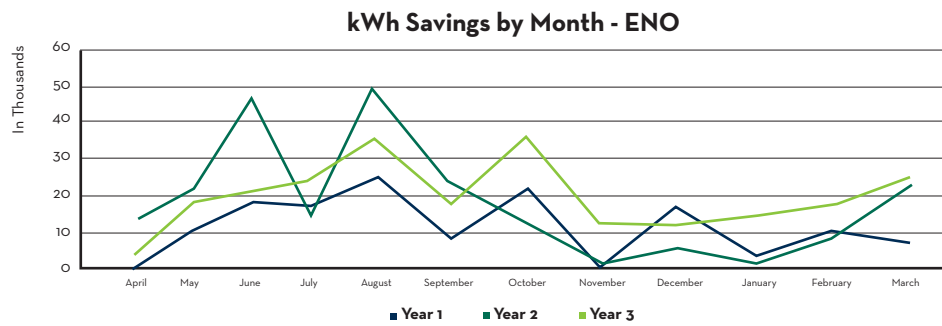
The Energy Smart Program provides rebates for the purchase and installation of energy-efficient ENERGY STAR central air conditioners and heat pumps. By installing a new, high-efficiency central air conditioning system, customers can increase a home's comfort and reduce energy bills. Any residential Entergy customer in Orleans Parish is eligible to receive rebates for ENERGY STAR rated units installed by Energy Smart participating local contractors or purchased. Energy Smart also provides mail-in rebates for the purchase and installation of energy-efficient window units in order to increase a home's comfort while reducing monthly energy bills. Any residential Entergy customer in Orleans Parish is eligible to receive rebates for ENERGY STAR qualified units purchased from an Energy Smart retailer. Each customer can receive rebates for up to four window units.

The ENERGY STAR Central Air Conditioning Program has seen some unprecedented activity in program year three as rebate submissions in the third and fourth quarter of the year were quite a bit higher than in the past two years. The higher level of activity in the off-peak parts of the year is a positive indication that air conditioner replacement is now being treated as a proactive way to reduce energy consumption, rather than a reactive need to replace an inoperable or poorly functioning unit in the heat of summer.



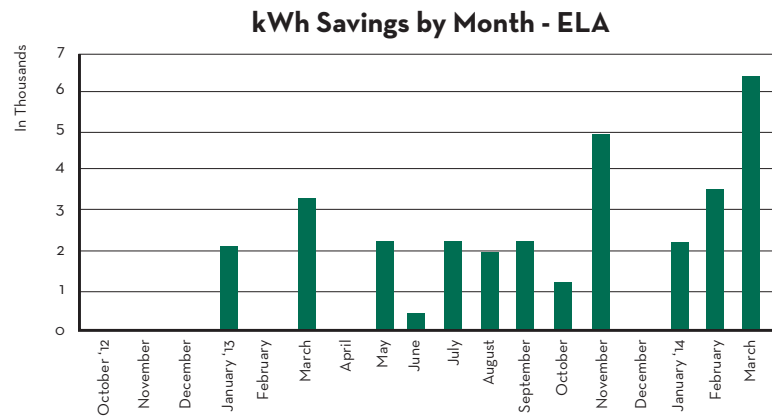
**ENTERGY
NEW ORLEANS**

	TARGET	ACTUAL	% OF GOAL
ELECTRIC SAVINGS (KWH)	1,178,169	227,754	19.3%
INCENTIVE BUDGET	\$35,000	\$50,860	145.3%



**ENTERGY
LOUISIANA**

	TARGET	ACTUAL	% OF GOAL
ELECTRIC SAVINGS (KWH)	105,302	33,018	31.4%
INCENTIVE BUDGET	\$20,500	\$8,305	40.5%





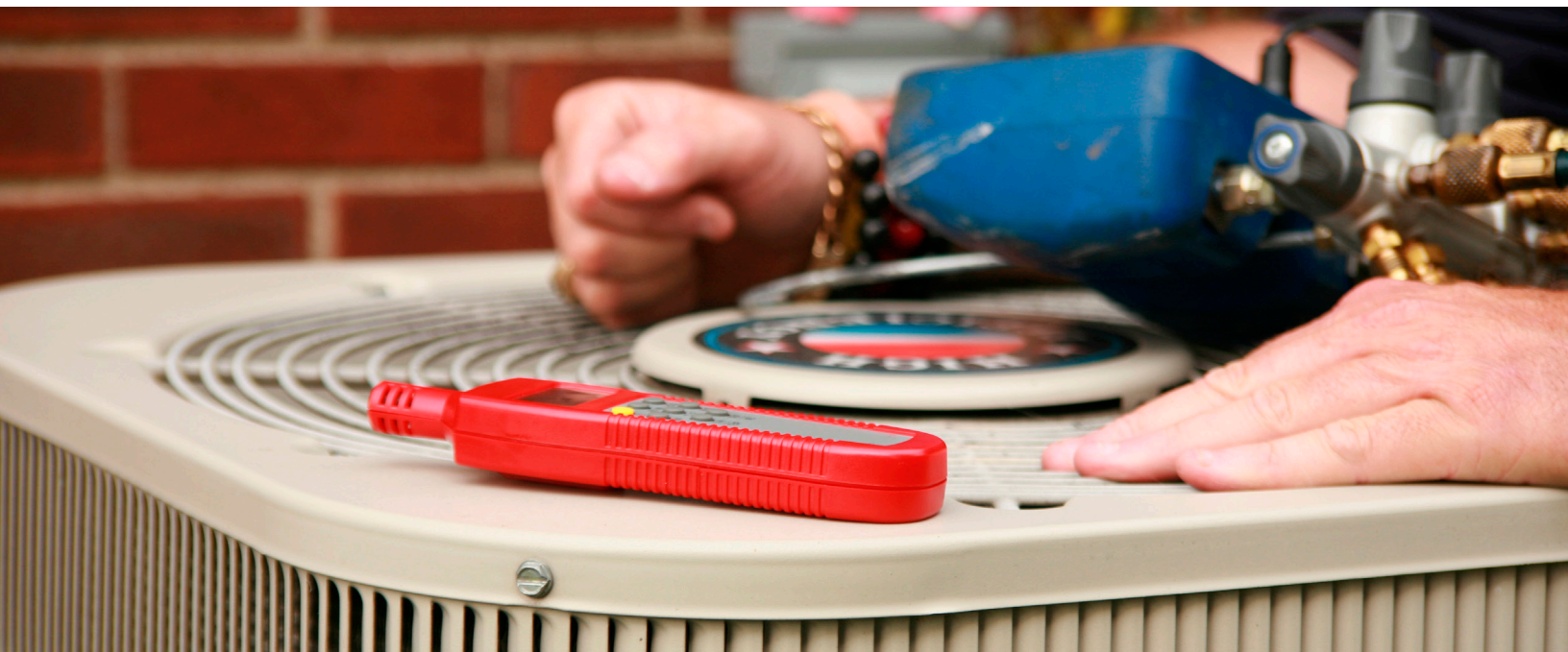
HIGH PERFORMANCE AIR CONDITIONING TUNE-UP

Energy Smart provides a \$75 discount for high-performance air conditioning tune-ups to increase a home's comfort while reducing monthly energy bills. Any residential Energy Smart customer in Orleans Parish is eligible to receive a discount for an A/C tune-up performed by an Energy Smart participating contractor.

A participating contractor performs a thorough assessment to assure that the A/C system is operating at peak efficiency. The contractor will do the following:

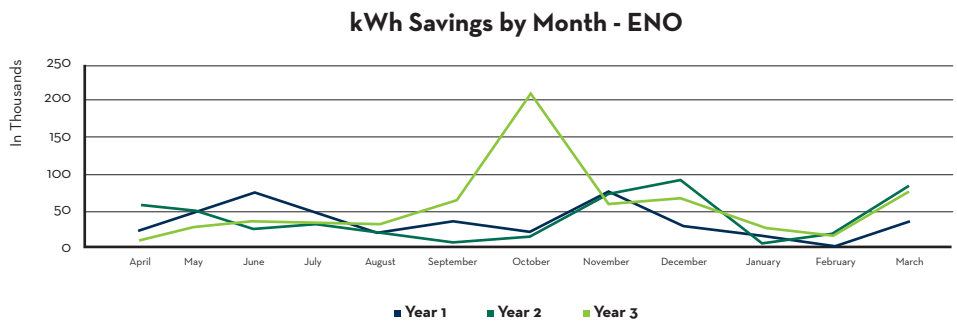
- Examine central system for functionality and possible problems.
- Check compressor contacts and capacitors.
- Clean outdoor condenser coil.
- Inspect indoor evaporator coil and blower.
- Precisely adjust the refrigerant charge by calculating superheat and subcooling temperatures.
- Report to you and recommend any necessary adjustments, repairs or upgrades.
- Provide quality control services.

The program saw participation surges in fall 2013 in New Orleans and in spring 2014 in Algiers. Year three of the program also represented a dramatic increase in kWh savings over year two, representing an increased quality of the contractors.



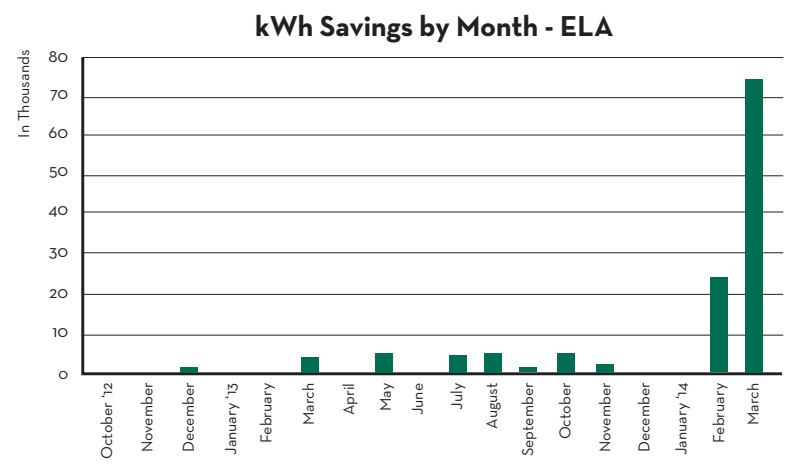
**ENTERGY
NEW ORLEANS**

	TARGET	ACTUAL	% OF GOAL
ELECTRIC SAVINGS (KWH)	1,176,985	617,946	52.5%
INCENTIVE BUDGET	\$70,000	\$74,292	106.1%



**ENTERGY
LOUISIANA**

	TARGET	ACTUAL	% OF GOAL
ELECTRIC SAVINGS (KWH)	120,441	131,854	109.5%
INCENTIVE BUDGET	\$20,500	\$19,533	95.3%



ENERGY EFFICIENT NEW HOMES

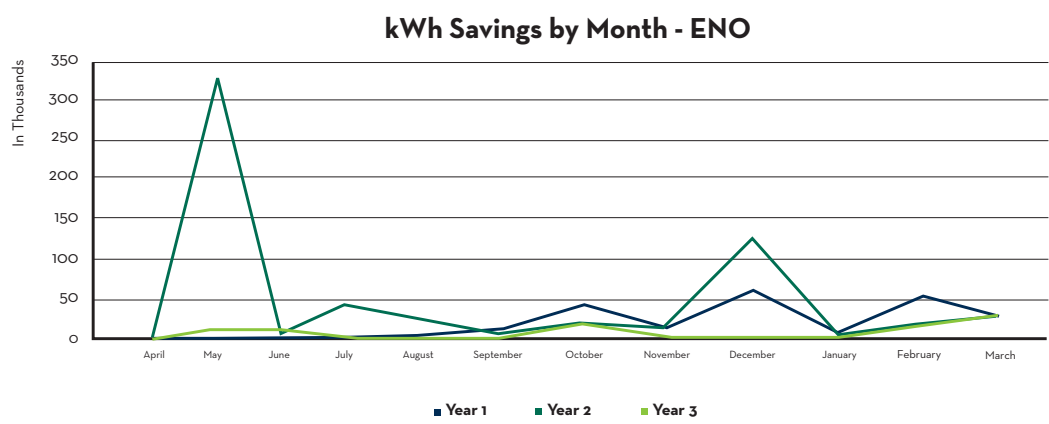
Local residents have made great strides since Hurricane Katrina to rebuild in a greener, more sustainable way. Energy Smart serves as a catalyst towards further growth in the energy-efficient home market. This program offers incentives for homes that are built at higher energy efficiency levels than required by the building code.

All builders and developers building new homes or qualifying rebuilds in Orleans Parish are eligible to participate. If homeowners are interested in living in an energy-efficient home, they must contact one of the participating builders to construct, rebuild or purchase their energy-efficient home.

The Energy Efficient New Homes Program has struggled with activity since program inception. The building of a public housing project brought the most activity in May of program year two, but otherwise the lack of available space in Orleans Parish has limited participation. A small allocation was given to the New Homes Program for the extension, but a similar low participation rate will likely occur.

ENERGY NEW ORLEANS

	TARGET	ACTUAL	% OF GOAL
ELECTRIC SAVINGS (KWH)	2,308,671	71,925	3.1%
INCENTIVE BUDGET	\$168,000	\$6,915	4.1%





“ Thank you for the assistance. I am saving money already.”

COMPACT FLUORESCENT LIGHTING

Energy STAR qualified compact fluorescent light bulbs use about 75 percent less energy than an incandescent light bulb, last about 10 times longer and can cut additional energy costs associated with home cooling. CFLs provide the same amount of lumens as standard incandescent bulbs, but have lower wattage ratings. This means they use less energy and cause less pollution.

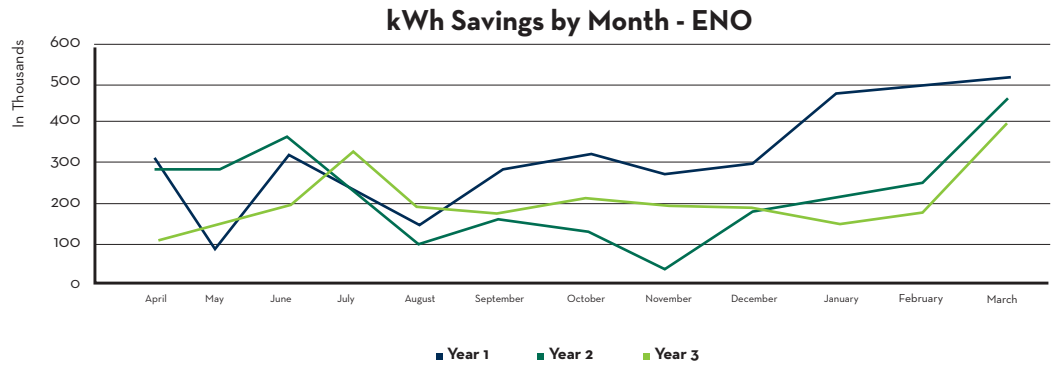
Energy Smart partners with Green Light New Orleans, a local nonprofit, to provide customers with energy-efficient compact fluorescent light bulbs. Any residential Energy customer in Orleans Parish is eligible to have energy-efficient CFLs installed in their home. Community members can call Green Light New Orleans directly or apply online to receive free CFLs.

The Compact Fluorescent Lighting Program has been very consistently performing for Energy Smart. However, the 2014 program year will see reduced participation rates, reduced savings rates and higher costs. As the New Orleans market saturates with those that have taken part in the program, participation will decline. 2014 lighting changes and the phaseout of incandescent bulbs have reduced the savings rates for the program. Finally, though the inclusion of small based bulbs boosted savings numbers in year 3, it also decreased cost-effectiveness due to the higher costs of these bulbs.



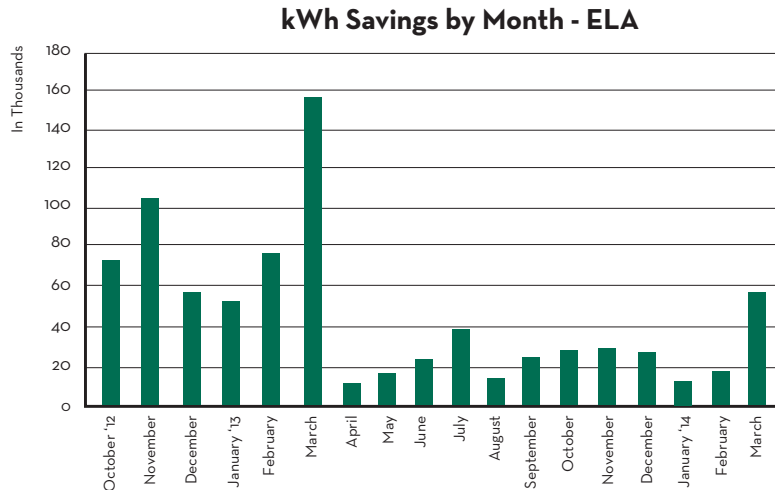
**ENERGY
NEW ORLEANS**

	TARGET	ACTUAL	% OF GOAL
ELECTRIC SAVINGS (KWH)	4,565,349	2,448,124	53.6%
INCENTIVE BUDGET	\$175,000	\$227,736	130.1%



**ENERGY
LOUISIANA**

	TARGET	ACTUAL	% OF GOAL
ELECTRIC SAVINGS (KWH)	1,102,303	821,238	74.5%
INCENTIVE BUDGET	\$50,000	\$53,422	106.8%



ASSISTED HOME PERFORMANCE WITH ENERGY STAR

Several Energy Smart programs include energy-efficiency offerings targeted to low-income residential customers. The options available to qualified Entergy New Orleans customers include:

- Weatherization Assistance
- Room Air Conditioner Replacement

Assisted Home Performance with ENERGY STAR – also known as the Residential Low-Income Program – makes available a number of different products and services that help qualifying customers improve the energy efficiency of their homes. Each is intended to assist the City of New Orleans and its residents in accomplishing the following objectives:

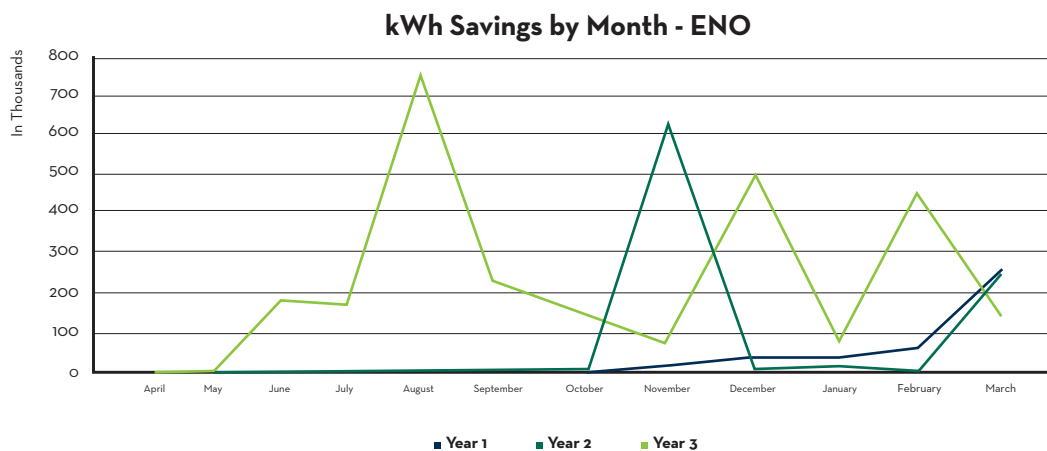
- Improve the energy efficiency, comfort and affordability of homes for New Orleans residents who qualify as low-income under federal guidelines.
- Develop a base of well-trained contractors who are able and motivated to provide cost-effective energy efficiency services across the city.

Year three of the program yielded exceedingly high participation rates, largely due to effectively-honed outreach measures that were performed on behalf of team members, and engagement with key partners in the community. Compared to years one and two of the program, during which participation rates were slow to take off, this year saw success rates that will ensure consistency and growth in the future.



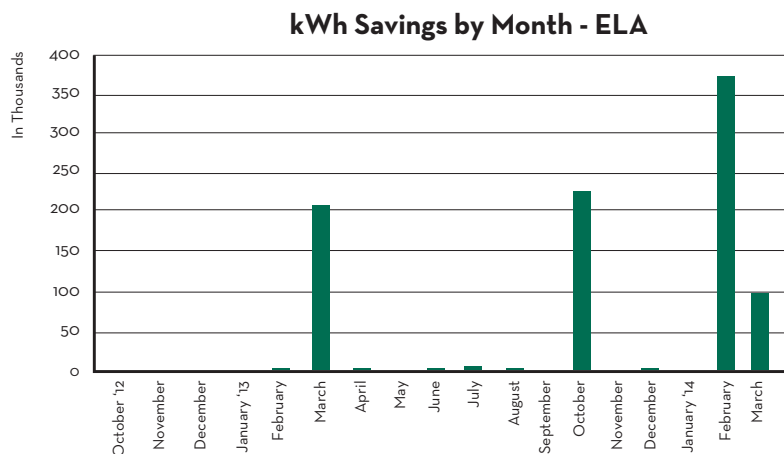
**ENERGY
NEW ORLEANS**

	TARGET	ACTUAL	% OF GOAL
ELECTRIC SAVINGS (KWH)	122,250	2,743,541	2,244.2%
INCENTIVE BUDGET	\$281,883	\$186,390	66.1%



**ENERGY
LOUISIANA**

	TARGET	ACTUAL	% OF GOAL
ELECTRIC SAVINGS (KWH)	94,273	928,933	985.4%
INCENTIVE BUDGET	\$38,800	\$24,355	62.8%





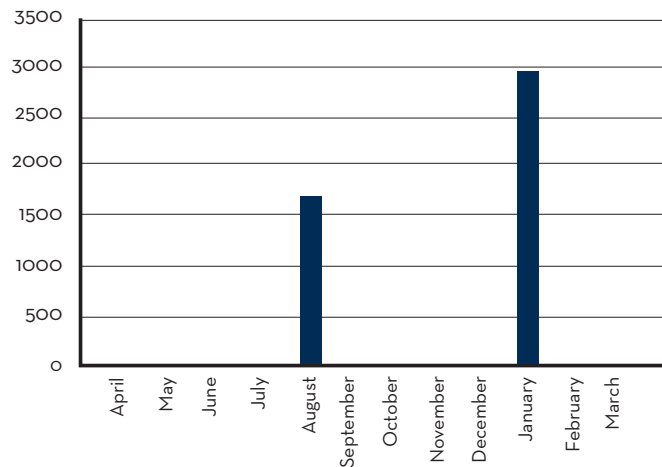
SOLAR WATER HEATER PILOT

Energy Smart provides an instant rebate for qualifying solar water-heating systems. These systems let the sun heat a home’s hot water to reduce monthly energy bills. Any residential Entergy customer in Orleans Parish who has an existing electric water heater is eligible to receive an instant rebate for the installation of a solar water heating system installed by an Energy Smart participating contractor.

This program saw low participation for the third year in a row, with rebates being issued to only two homeowners. Despite continued engagement with the solar installing contractor network, this program has continued to have extremely low participation, partially due to the initial structure of the Louisiana solar tax credit and unclear solar-assisted water heater installation guidelines from state and local agencies.

ENERGY NEW ORLEANS

kWh Savings by Month - ENO





“ The equipment is a valuable addition to my home improvement.”

SMALL COMMERCIAL SOLUTIONS

The Small Commercial Solutions Program is an energy-efficiency program designed to provide assistance and financial incentives for the installation of certain energy-efficiency measures that reduce energy consumption in small commercial facilities. All commercial customers who have an average peak demand less than 100 kW can participate in the Small Commercial Solutions Program.

The trend of seeing mostly lighting projects completed continued in program year three, a clear indication from business owners that a return on investment in fewer than twelve months was a motivating factor in performing energy efficiency upgrades. Limited success in convincing some businesses to upgrade their air-conditioning units to a better energy efficiency standard was realized over the last twelve months. Over the next few years, lighting baseline savings will adjust due to changing federal regulations and the market transformation which has occurred in New Orleans over the first three years of the Energy Smart Program. As this happens, energy savings from non-lighting measures will continue to become a larger and larger part of the Small Commercial Solutions Program.

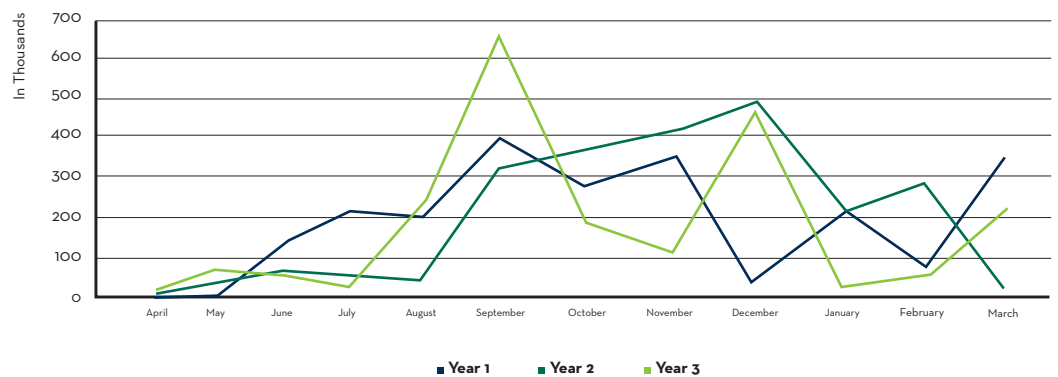
The highest months for program participation were September and December in New Orleans, and May in Algiers.



**ENERGY
NEW ORLEANS**

	TARGET	ACTUAL	% OF GOAL
ELECTRIC SAVINGS (KWH)	2,230,328	2,108,012	94.5%
INCENTIVE BUDGET	\$269,782	\$264,063	97.9%

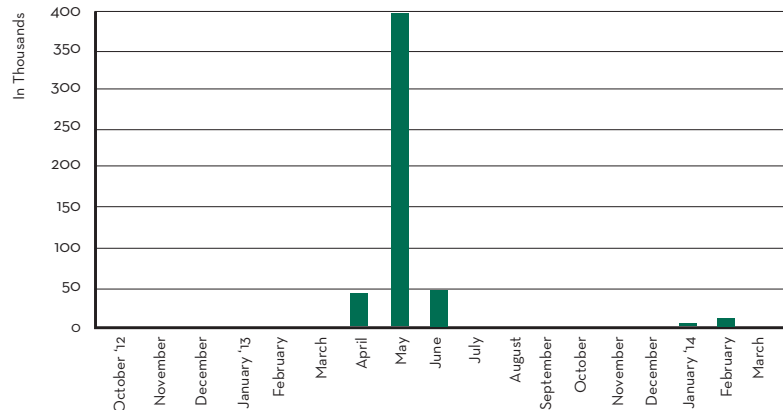
kWh Savings by Month - ENO



**ENERGY
LOUISIANA**

	TARGET	ACTUAL	% OF GOAL
ELECTRIC SAVINGS (KWH)	409,158	512,925	125.4%
INCENTIVE BUDGET	\$72,200	\$65,274	128%

kWh Savings by Month - ELA



LARGE COMMERCIAL & INDUSTRIAL SOLUTIONS

The Large Commercial & Industrial Solutions Program is an energy-efficiency program designed to provide assistance and financial incentives for the installation of certain energy-efficiency measures that reduce energy consumption in large commercial and industrial facilities. All commercial customers who receive electrical service from Entergy New Orleans, Inc. and have an average peak demand of 100 kW or more can participate in the Large Commercial & Industrial Solutions Program.

The Large Commercial & Industrial Solutions Program was fully subscribed just three weeks into the start of program year three. All nineteen of these projects were lighting projects, due to the simple payback time period for lighting projects being so low, often under twelve months. As noted in the Small Commercial Solutions section, this trend will likely continue as businesses focus on the investment that makes the most sense for them.

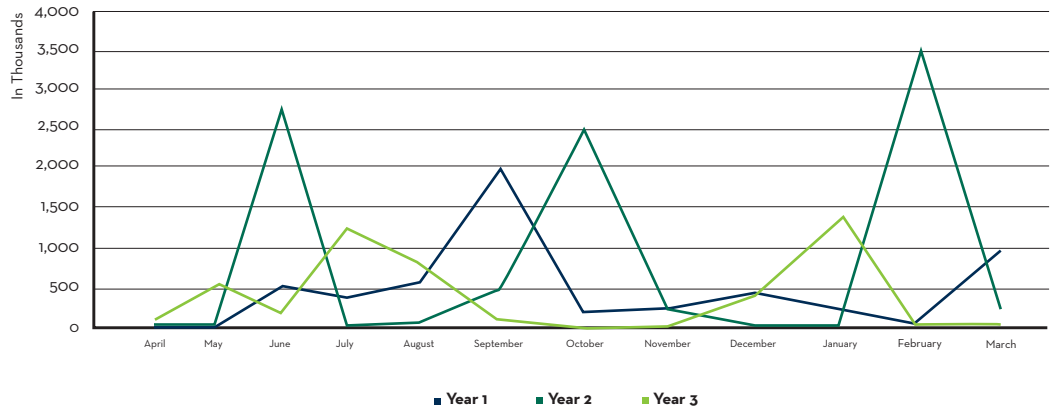
The timeline for implementing individual Large Commercial projects is unpredictable due to the variables at play in a building upgrade. Therefore, it is difficult to predict which months will result in a surge of incentives or participation.



**ENTERGY
NEW ORLEANS**

	TARGET	ACTUAL	% OF GOAL
ELECTRIC SAVINGS (KWH)	4,130,464	4,601,848	111.4%
INCENTIVE BUDGET	\$465,088	\$459,250	98.7%

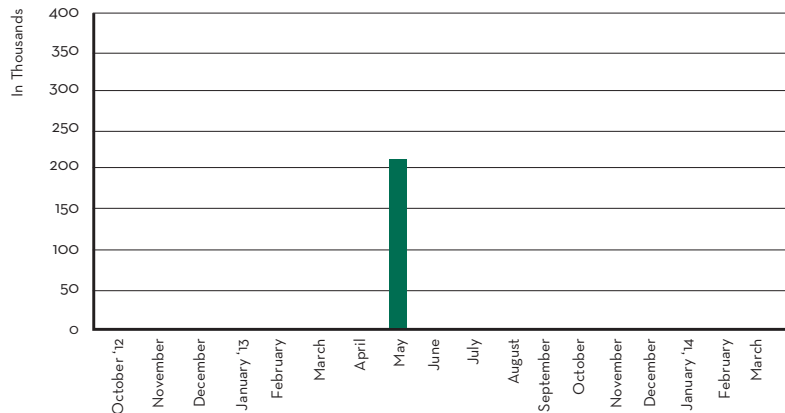
kWh Savings by Month - ENO



**ENTERGY
LOUISIANA**

	TARGET	ACTUAL	% OF GOAL
ELECTRIC SAVINGS (KWH)	646,897	209,023	32.3%
INCENTIVE BUDGET	\$72,200	\$21,895	30.3%

kWh Savings by Month - ELA



A man wearing a green hard hat, safety glasses, and a green work shirt is focused on a rugged tablet computer. He is holding a pen over the screen. The background shows an industrial facility with pipes and machinery.

PARTICIPATING CONTRACTORS

& Energy Consultants

The energy consultants and construction contractors listed below have been approved for program participation, through a rigorous process of application, documentation submission, certification, training, oversight and partnership. They are all versed in how to speak to customers about Energy Smart offerings, and have invested part of their business model in the delivery of energy-efficiency services to Orleans Parish residents.

PARTICIPATING CONTRACTOR	PHONE	EMAIL/WEBSITE	CENTRAL HVAC	A/C TUNE-UPS	INSULATION	SOLAR WATER HEATER
A & H SERVICE CO.	504-469-2217	WWW.AHSERVICE.COM	X	X		
ADVANCED MECHANICAL	504-245-8791	AMICONTRACTING@YAHOO.COM	X		X	
AIR CONDITIONING AMBULANCE	504-467-1400	WWW.ACAMBULANCE.COM			X	
AIR ONE HEATING & COOLING	504-888-6702	AIRONE1996@HOTMAIL.COM	X	X		
ANDERSON REAL ESTATE DEVELOPMENT	504-251-7407	PATRICKANDERSON29@YAHOO.COM			X	
ATI ANDERSON TECHNICIANS	504-831-9500	WWW.ATIANDERSON.COM	X	X		
AUTHENTIC AIR	504-421-2647	WWW.AUTHENTICAIRLLC.COM	X	X		
BLUM THERMAL SERVICE	504-279-0073	BLUMTHERMSVCS@BELLSOUTH.NET	X			
BRYAN'S UNITED	504-368-3297	WWW.BRYANSUNITED.COM	X	X		
BUILDING PERFORMANCE CENTER	504-481-3946	KLYNNJACKSON504@AOL.COM			X	
BURKHARDT AIR CONDITIONING	504-277-7520	WWW.BURKHARDTSAIR.COM	X	X		
BYWATER SHEET METAL WORKS AND ROOFING	504-466-2916	BYWATERSHTMTL@BELLSOUTH.NET			X	
CALMAR CORPORATION	504-464-6242	WWW.CALMARINC.COM			X	
COLD AIR NOW!	504-444-2233	THOMAS@COLDAIRNOW247.COM	X	X		
COLMEX CONSTRUCTION	504-383-8092	COLMEXCONSTRUCTION@GMAIL.COM			X	
COMFORT ENGINEERED SYSTEMS	504-602-6648	WWW.COM4T.COM	X	X		X
CONSTRUCTION SPECIALISTS GROUP	504-684-5393	CONSTRUCTIONSSPECIALISTGROUP@GMAIL.COM			X	
COOL AIR	504-733-1569	WWW.COOLAIRNOLA.COM	X			
CORE USA	504-298-9556	INFO@COREUSA.ORG			X	
DELTON ELECTRIC AND AC	504-525-9199	MARK@DELTON.COM	X	X		
DYER'S A/C AND HEATING	504-352-3130	DYERSACHTG@YAHOO.COM	X	X		
ENVIROGREEN	504-273-1077	WWW.ENVIROGREENINSULATION.COM			X	
EXPRESS HEATING AND AC SERVICES	504-263-0442	TERRY@EXPRESSHEATANDAC.COM	X	X		
FLETRICH SERVICES	04-482-7811	FLETRICHSERVICES@CHARTER.NET	X			
FONTENOT INSULATION	504-834-4222	FONTENOT-INSULATION@COX.NET			X	
GBOB ENTERPRISES	504-393-9062	GBOBENT@EARTHLINK.NET	X	X		
GENERAL HEATING AND AIR CONDITIONING	504-488-0826	WWW.GENERALHEATING-AC.COM	X	X		
GLOBAL ENERGY TECHNOLOGIES	985-857-9552	GLOBALENERGY@TRIPARISH.NET			X	
GREEN APPLE FOAM INSULATION	504-258-2464	WWW.GREENAPPLEFOAM.COM			X	



PARTICIPATING CONTRACTOR	PHONE	EMAIL/WEBSITE	CENTRAL HVAC	A/C TUNE-UPS	INSULATION	SOLAR WATER HEATER
GREEN ENERGY SOLUTIONS	225-329-8299	GREENENERGYSOLUTIONSOFLA@GMAIL.COM			X	
GREEN GRANTS	504-835-2510	WWW.GREENGRANTS.COM	X			
HELP HEATING AND AIR CONDITIONING	504-733-5888	WWW.HELPSERVICECO.COM	X	X		
HINTON A/C	504-522-0326	-	X			
IN-TECH INSULATION	504-482-8850	WWW.INTECHINSULATION.COM			X	
LOUISIANA HOME SPECIALISTS	504-278-8811	WWW.LAHSLLC.COM			X	
MARC JONES CONSTRUCTION	985-215-6624	MARC@MARC.JONESCONSTRUCT.COM			X	X
METRO A/C AND HEATING	504-341-9186	PHIL@METROACANDHEAT.COM	X	X		
MR. GREEN JEANS INSULATION	504-861-4544	WWW.MRGREENJ.COM			X	
NATIONAL AIR	504-341-2822	NATIONALAIR@COX.NET	X	X		
NO LIMIT ENERGY SOLUTIONS	504-322-1536	WWW.NOLIMITENERGYSOLUTIONS.COM			X	
OWL TECHNOLOGIES	504-289-8766	WW.OWLTECHNOLOGIES.COM			X	
OZONE GREEN SPRAY FOAM	504-756-9663	WW.OZONEGREENFOAM.COM			X	
PONTCHARTRAIN MECHANICAL	504-738-3061	WWW.PROJECTHOMECOMING.NET				X
PROJECT HOMECOMING	504-942-0444	WWW.PROJECTHOMECOMING.NET			X	
PULLEN AIR CONDITIONING	504-833-1106	WWW.PULLENAC.COM	X	X		
REBIRTH ENERGY SOLUTIONS	504-684-4580	WW.REBIRTHENERGYSOLUTIONS.COM			X	
RETRO-FITZ	504-250-9487	WWW.RETRO-FITZ.COM			X	
RIVERVIEW CONSTRUCTION	504-324-1810	WWW.RIVERVIEWCCS.COM	X	X	X	X
SOLAR ALTERNATIVES	504-267-1660	WWW.SOLALT.COM				X
SOUTHERN SERVICES A/C & HEATING	504-443-3515	BETTYCEFALU@BELLSOUTH.NET	X	X		
SOUTHLAND A/C	504-469-3132	WWW.SOUTHLANDAIR.COM/	X			
SUNERGY SOLAR SOLUTIONS	504-534-8255	SUNERGYNOLA@GMAIL.COM				X
SURGI'S HEATING AND AIR CONDITIONING	504-469-4232	WWW.SURGISAC.COM	X			
SUNLIGHT CONTRACTORS LLC	504-222-2082	SUNLIGHTCONTRACTORS.COM	X	X	X	X
SUPERIOR AIRE	504-465-0688	WWW.SUPERIORAIREINC.COM	X	X		
TAYLOR AND TYLER	504-364-1411	WWW.TAYLORTYLERAC.COM	X	X	X	
VANDERBROOK AC & HEATING	504-361-1701	WWW.VANDERBROOKAC.COM	X	X		
THE WEATHERIZATION COMPANY	504-919-4598	MSBOWEN@THEWEATHERIZATIONCOMPANY.COM	X	X	X	
U&M AC HEATING MECHANICAL SERVICES	504-638-2210	UMAC8789@ATT.NET	X	X		
WILSERV	985-809-7962	WWW.WILSERV.INFO			X	

ENERGY CONSULTANTS	PHONE	EMAIL/WEBSITE	CEN- TRAL HVAC	A/C TUNE- UPS	INSULATION
AVAK CONSULTING SERVICES	504-617-0844	WWW.AVAKCONSULTING.COM	X	X	X
COLMEX CONSTRUCTION	504-383-8092	COLMEXCONSTRUCTION@GMAIL.COM	X	X	X
CONSTRUCTION SPECIALISTS GROUP	504-684-5393	CONSTRUCTIONSSPECIALISTGROUP@GMAIL.COM	X	X	
CORE USA	504-298-9556	INFO@COREUSA.ORG	X	X	X
DIGITAL LIVING	504-390-9687	THANH.TRANG@DIGITALLIVINGLLC.COM	X	X	X
DIVERSIFIED ENERGY	504-258-5687	WWW.DIVERSIFIEDE.COM	X	X	X
E & I	504-231-3424	ROGER@MAXVALUEINS.COM	X	X	X
GREEN APPLE FOAM INSULATION	504-258-2464	WWW.GREENAPPLEFOAM.COM	X	X	X
GREEN GRANTS	504-835-2510	WWW.GREENGRANTS.COM	X	X	X
GREENWOOD HOME ENERGY	504-800-0351	MYRONWARDEN@GMAIL.COM	X	X	X
IN-TECH INSULATION AND CONSULTING	504-482-8850	WWW.INTECHINSULATION.COM	X	X	X
MR. GREEN JEANS	504-861-4544	WWW.MRGREENJ.COM	X	X	
NO LIMIT ENERGY SOLUTIONS, LLC	504-322-1536	WWW.NOLIMITENERGYSOLUTIONS.COM	X	X	X
OWL TECHNOLOGIES, LLC	504-289-8766	WWW.OWLTECHNOLOGIES.COM	X		
PROJECT HOMECOMING	504-942-0444	WWW.PROJECTHOMECOMING.NET	X	X	X
REBIRTH ENERGY SOLUTIONS, LLC	504-684-4580	WWW.REBIRTHENERGYSOLUTIONS.COM	X	X	X
RETROFITZ INSULATION AND WEATHERIZATION	504-250-9487	WWW.RETRO-FITZ.COM	X	X	X
RIVERVIEW CONSTRUCTION	504-324-1810	WWW.RIVERVIEWCCS.COM	X	X	X
SMART ENERGY SOLUTIONS	225-364-4767	WWW.MYSMARTENERGYSOLUTIONS.COM	X	X	X
SUNLIGHT CONTRACTORS LLC	504-222-2082	WWW.SUNLIGHTCONTRACTORS.COM	X	X	X
THE BUILDING PERFORMANCE CENTER, LLC	504-481-3946	KLYNNJACKSON504@AOL.COM	X	X	X
WILSERV, INC. (BLOWER DOOR TEST ONLY)	985-809-7962	WWW.WILSERV.INFO	X	X	



QUALITY
ASSURANCE

QUALITY ASSURANCE

Energy Smart conducts quality assurance checks of a percentage of the energy-efficiency upgrades performed on homes and businesses in order to ensure consistent and high-quality services to customers. This creates a level of trust between the program and community members, and also provides a basis for ongoing contractor training. The menu of QA services provided includes onsite visits, review of incentive documentation, customer education and initial assessments.

Below is a table showing the number of QA inspections performed in the field per program.

ENTERGY NEW ORLEANS

PROGRAM	QA INSPECTIONS
HOME PERFORMANCE WITH ENERGY STAR	605
ENERGY STAR AIR CONDITIONER	326
AIR CONDITIONER TUNE-UP	448
CFL DIRECT INSTALL	-
NEW HOMES	-
ASSISTED HOME PERFORMANCE WITH ENERGY STAR	738
SOLAR HOT WATER HEATER	2
SMALL COMMERCIAL	84
LARGE COMMERCIAL	19
TOTAL	2,222

ENTERGY LOUISIANA

PROGRAM	QA INSPECTIONS
HOME PERFORMANCE WITH ENERGY STAR	127
ENERGY STAR AIR CONDITIONER	17
AIR CONDITIONER TUNE-UP	48
CFL DIRECT INSTALL	-
NEW HOMES	-
ASSISTED HOME PERFORMANCE WITH ENERGY STAR	356
SOLAR HOT WATER HEATER	-
SMALL COMMERCIAL	15
LARGE COMMERCIAL	1
TOTAL	564



MARKETING

OVERVIEW

Energy Smart marketing continued to increase customer awareness and brand recognition in Program Year 3. CLEAResult has strengthened the Energy Smart brand and its credibility with the creation of new marketing material and the addition of the Entergy logo on all collateral including the Energy Smart website and ongoing Energy Smart articles in the monthly Entergy newsletters. By working closely with the New Orleans PR firm Bright Moments, Energy Smart reached thousands of renters, homeowners, business owners and corporate executives in New Orleans.

The Energy Smart website address was prominently featured on all marketing materials in 2013. In total, 9,081 users visited the website, 62.1 percent of whom were first-time users. Referral traffic represented 32.59% percent of total traffic with the largest number of referral links coming from **entergy-neworleans.com** and **dsireusa.org**.^{*} Direct users (those who typed in the website address) accounted for 32.6% percent of traffic, while 33.8% percent searched for the site. The top keyword term search was “energy smart new orleans” representing increased brand recognition among utility customers. Innovative marketing campaigns were formulated based on both seasonal relevance and with the intention of driving participation in programs that were shy of reaching their target goals. Energy efficiency is a topic that requires a large amount of information to enable customers to understand available options; therefore, extensive program material was made available through the Energy Smart website and call center. These sources each played a crucial role in conveying energy efficiency information to the public. These information gateways served as an intermediary step between advising New Orleans residents regarding Energy Smart offerings and getting them connected with Energy Smart products and services.

Energy Smart marketing designed and coordinated placement of 16 newspaper advertisements in The New Orleans Tribune, Gambit Weekly and Times Picayune publications and four online banner ads to promote our various programs including the ENERGY STAR A/C Tune-up, ENERGY STAR Window A/C, Heat Pump Water Heater Program and the HPwES programs. In addition, Energy Smart created and released 70 radio spots throughout the year with NPR, WBOK, and WYLD that resulted in interviews with local stations. To increase brand recognition and promote our rebate programs such as window A/C, heat pump water heater and APS, Energy Smart marketing created in-store point-of-purchase collateral materials including shelf-talkers, posters, flyers and rebate forms. These materials promoted in-store savings for customers purchasing select items, promoting both energy savings and the Energy Smart program. In addition, Energy Smart executed a Window A/C Rebate and Recycling Event at two participating Lowe’s locations and promoted the event with radio spots, a live remote, print and web

^{*}Google no longer tracks referral traffic and searches as they used to, so, unfortunately, the information below can't really be compared to last year's information to get an accurate picture of how your traffic has changed. The issue is that Google moved to Secure Search, which doesn't report as much information. So, the following information is fairly reliable, but measured a bit differently than it has been in the past, and therefore not really good for comparison. Also, for the most popular search term, this does not give a whole picture...this is the most popular search term we have, but 65% of searches that led to the site are not reported due to Google's Secure Search, so this is the most popular search term among the 35% of searches that were not done through secure search.

OVERVIEW CONTINUED

banner ads, in-store signage, door hangers, flyers and email newsletters. Energy Smart also partnered with Sears and GE to launch the Pilot Heat Pump Water Heater Program. Energy Smart provided \$350 instant rebates in participating Sears locations. This program was promoted through in-store signage, flyers, bill insert, email newsletter and outreach.

Energy Smart also executed a CFL and APS giveaway event in March 2013 to promote the energy efficiency of these products and increase adoption of use. Each participant received eight CFLs at the following locations:

- Entergy Corporation March 20: Total of 1056 given away
- City Hall March 21: Total of 4152 bulbs given away
- Home & Garden Show weekend of March 23-25: Total of 1440 bulbs given away
- Tulane University Uptown campus March 27: Total of 3360 given away
- Tulane University Downtown campus March 28: Total of 3360 given away

Energy Smart also executed various outreach activities throughout the year to help raise awareness regarding the various programs offer and foster direct interactions and connect with the community. Furthermore, in Program Year 3, Energy Smart partnered with LifeCity and NOLA Wise to develop sustainable change through the implementation of environmentally responsible practices. Together, Energy Smart, LifeCity and Nola WISE conducted a vast outreach of initiatives targeting neighborhood associations, nonprofit organizations, community centers, fairs, festivals and tradeshow that resulted in 61 presentations and over 90 tabling events.

The Energy Smart team distributed a total of 95,000 flyers and door hangers to various neighborhoods promoting Energy Smart’s suite of programs. Information on the programs was also available at the Energy Smart information Center located at the Algiers Regional Library and the New Orleans City Hall.

NOLA WISE OUTREACH AND EDUCATION

In September 2013, the NOLA Wise program was incorporated into Energy Smart after the federal grant which was funding the NOLA Wise program expired. NOLA Wise is a residential energy efficiency program developed by the City of New Orleans and administered by Global Green. NOLA Wise was funded by the New Orleans City Council and was tasked with supporting outreach for the Energy Smart program. The outreach and education has three main parts:

1. “Ask the Expert”: Outreach and education to Orleans residents and businesses via presentations, tabling, office visits and social media.
 - Outreach: 21 Presentations and 10 tabling events completed. Many of these presentations took place at neighborhood meetings including:
 - * Holy Cross Neighborhood Association
 - * Hollygrove Neighborhood Association
 - * Susan Guidry Town Hall meeting at Audubon Park
 - * Audubon Riverside Neighborhood Association

- * Historic Faubourg Tremé Association
 - * Faubourg St. John
 - * Gentilly Terrace and Gardens Improvement Association
 - * New St. Claude Association of Neighbors
 - * Bywater Neighborhood Association
 - * 7th Ward Neighborhood Association
 - * Oak Park Neighborhood Association
 - * Filmore Gardens Neighborhood Association
 - * Desaix Area Neighborhood Association
 - * Mid City Neighborhood Organization
 - * Lake Oaks Civic Improvement Association
 - * Claibourne Communities Broadmoor Improvement Association
 - * Central City Renaissance Alliance
- NOLA Wise staff assisted Energy Smart at the New Orleans Home & Garden Show.
 - The LA Mobile house, a trailer outfitted with energy efficiency products and displays and run by the LSU Agricultural Extension, was showcased by NOLA Wise at NOLA For Life.
 - NOLA Wise continued its phone hotline (504-523-WISE) with staff answering questions about energy efficiency while making referrals to Energy Smart programs and contractors.
2. Schools education program: NOLA Wise piloted a program with Energy Smart to educate Orleans Parish students on energy efficiency. Each student is provided with an “Energy Kit” (4 CFL light bulbs, 1 LED night light, and a low flow showerhead, kitchen and bathroom faucet aerator) from Energy Smart to also provide actual energy savings at the students’ homes. The school package is referred to as “Be Energy Smart”.
 - Pilot phase: NOLA Wise presented and distributed kits to 136 students. Participating schools include:
 - * Hynes Charter School, 6th grade science, 24 students
 - * Lusher Charter School, 5th grade girl scouts, 16 students
 - * John Dibert Community School, 6th grade science, 57 students
 - * SciTech Academy, 6th grade science, 40 students
 - Goal April - December 2014: Reaching 1000 6th grade students with “Be Energy Smart” education and energy kits.
 3. NOLA Wise loan: NOLA Wise has a low interest home energy efficiency loan that was developed in outreach and education with City of New Orleans and the Southeast Energy Efficiency Alliance.
 - Energy Smart and NOLA Wise promoted the loan via the Energy Smart website, to contractors, and at tabling events.

CUSTOMER SERVICE CENTER


The Energy Smart Informational Center, staffed by knowledgeable Energy Smart team members, is a public kiosk where Entergy customers can get all their questions answered about the program, available incentives, and energy efficiency in general.

CUSTOMER SERVICE CENTER CONTINUED

The Information Center moved from its old location at City Hall in the Fall of 2013 to its current location at the Entergy Customer Care Center at Jefferson Davis & Canal. It is staffed from 9am - 1pm on Wednesdays. Below are samples of collateral materials developed for the Energy Smart program, including door hangers, flyers, rebate forms, advertisements, and retail store cards.

MARKETING COLLATERAL SAMPLES

Below are samples of collateral materials developed for the Energy Smart program, including door hangers, flyers, rebate forms, advertisements, and retail store cards.





Energy Smart Programs
Save Energy to Annually Power
More Than 3,000 Homes

We thank the Participating Contractors that worked hard in Energy Smart's second program year to save energy, money and the environment. The program offers a variety of energy-saving services and has saved over **34 million** kilowatt-hours of electricity since its launch in 2011.

We're proud to congratulate the Participating Contractors below for taking New Orleans. We couldn't be more grateful for their dedication to energy

<p>A & H Service Co., Inc. Advanced Mechanical, Inc Air Conditioning Ambulance Air One Heating & Cooling Anderson Real Estate Development, LLC ATI Anderson Technicians, Inc. Authentic Air LLC Blum Thermal Service, LLC Brotherhood Way General Contractors LLC Bryan's United Burkhardt Air Conditioning Bywater Sheet Metal Works & Roofing, Inc. Calmar Corporation Celestin Mechanical Contractors, LLC Cold Air Now!, LLC Colmex Construction Comfort Engineered Systems Construction Specialists Group Cool Air, Inc Deltone Electric and A/C</p>	<p>Dyer's A/C and Heating Envirogreen Express Heating and A/C Services Flettrich Services, Inc. Fontenot Insulation, LLC GBOB Enterprises General Heating and Air Conditioning Global Energy Technologies Green Apple Foam Insulation Green Energy Solutions Help Heating and Air Conditioning Hinton A/C HLN Energy Services In-tech Insulation Louisiana Home Specialists, LLC Marc Jones Construction Metro A/C and Heating Mr. Green Jeans Insulation National Air No Limit Energy Solutions, LLC</p>
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Developed by the New Orleans City Council and administered by Entergy

STAY COOL & SAVE!

Entergy New Orleans' CoolSaver® Program gives you the power to **REDUCE ENERGY USE** and **COOLING COSTS**.

Give us a call today to learn how you could earn up to **\$175** off a CoolSaver air conditioner tune-up.

What are the benefits?

- Up to **\$175** off the cost of a CoolSaver A/C tune-up.
- Reduced cooling costs.
- Extended life of your equipment.
- Increase your air conditioner's ability to cool by an average of **30%** for a more comfortable summer.
- Better humidity control.

Ready to get started?
 Call 866-721-0249 to schedule your CoolSaver tune-up today.



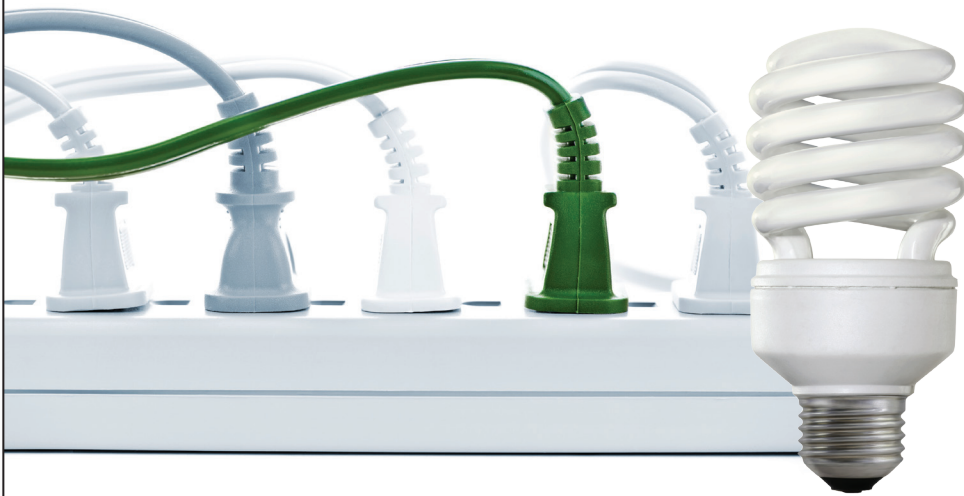
EnergySmartNOLA.com

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



Energy Smart

Entergy Customers in Orleans Parish: Receive 8 FREE CFLs and an Advanced Power Strip Today!



*Energy*Smart 

 *Entergy*
ENERGY SERVICES CORPORATION

Get up to a \$50 Rebate

Energy Smart Window Air Conditioner Rebate

Fill out the reverse side of this form and mail to the address listed on the back with a copy of your dated sales receipt or fax to (866) 908-1504. Limit 4 rebates per customer. See reverse side for complete terms and conditions. Note: Your window air conditioner must be ENERGY STAR® Qualified to receive your rebate.

Small Air Conditioner Units
under 14,000 BTUs

\$35



Large Air Conditioner Units
14,000 BTUs and higher

\$50

For more information about this and other Energy Smart programs, visit www.energysmartnola.com or call (866) 721-0249.

*Energy*Smart 
A New Orleans Program

 *Entergy*
THE POWER OF PEOPLE®

Available for Entergy Customers in Orleans Parish

Energy Smart ENERGY STAR® Central Air Conditioning Rebate

Available for Entergy Customers in Orleans Parish

Customer Name: _____

Service/ Installation Address: _____

City: _____ State: _____ ZIP: _____

Mailing Address (if different): _____

City: _____ State: _____ ZIP: _____

Phone: _____ Email: _____

Energy Smart Participating Contractor _____

Contractor Phone _____

Building Information:

Style (circle one): _____ Single / Double / Multi

Required Document Checklist:

- AHRI Certificate
- Copy of Customer's Invoice
- Signed and COMPLETED Energy Smart Rebate Form

Equipment Information:

Old HVAC Information

Estimated SEER: _____ Size (in BTU or tons): _____ Heating Type (circle one): Heat Pump / Gas / Electric Resistance

New HVAC Information

Condenser Brand: _____ Heat Pump (only) HSPF: _____

Condenser Model: _____ *Size (in BTUs): _____

Coil Model: _____ SEER: _____

Air Handler / Furnace Model: _____ EER: _____

Was a new coil also installed? Yes / No Heating Type (circle one): Heat Pump / Gas / Electric Resistance

*Must be 65,000 BTU or less

Installation Date: _____ HVAC Rebate Amount \$: _____

Customer Completion: I acknowledge the above is true and correct. By signing below, I agree to allow Energy Smart or CLEAResult to perform an on-site verification of installed equipment. I also understand that failure to allow an inspection within 60 days may result in forfeiture of the rebate amount.

Customer Signature: _____ Date: _____

Please send this application along with required documents to: **Energy Smart Central A/C Program**

All rebate forms must be received with
Please allow 2 - 3 weeks for processing

For more information about this and other
visit www.energysmartnola.info, email
or call (866) 721-0249.

Energy Smart is a

Get \$15 Back

Energy Smart Advanced Power Strip Rebate

An advanced power strip can save an average of 85 kilowatt-hours due to phantom loads per year - this is energy that your appliances use when they are turned off!

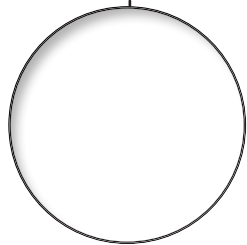
Must be one of the following eligible advanced power strip products to receive your rebate. Fill out the reverse side of this form and mail to the address listed on the back with a copy of your dated sales receipt or fax to (866) 908-1504. Limit 4 rebates per customer. See reverse side for complete terms and conditions.

Manufacturer	Eligible Product Name	Model #
Belkin	8 Outlet Conserve Smart AV	F7C007
BITS Limited	10 Outlet Energy Saving Smart Strip	LCG-5
BITS Limited	10 Outlet Energy Saving Smart Strip with USB	LUG-5
BITS Limited	7 Outlet Energy Savings Smart Strip	SCG-5
Coleman Cable	7 Outlet Energy Saving Smart Strip	04939-88-12
TrickleStar	7 Outlet Advanced PowerStrip	1805S-US-7xx
TrickleStar	12 Outlet Advanced PowerStrip	1805S-US-12CT
TrickleStar	4 Outlet Advanced PowerTap	1755S-US-4CD

For more information about this and other Energy Smart programs,
visit www.energysmartnola.info or call (866) 721-0249.



Available for Entergy Customers in Orleans Parish

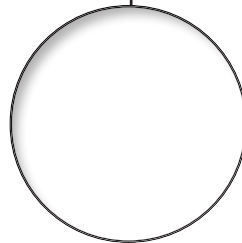


EnergySmart 
A New Orleans Program



\$75 off
A/C Tune-up from
Energy Smart




For more information,
visit www.EnergySmartNOLA.info
or call toll free at (866) 721-0249.



EnergySmart 
A New Orleans Program

**Did you know that you need to
tune-up your A/C every year?**

**Energy Smart can give you \$75
off an A/C tune-up that will:**

-  Make your A/C Run Better and Use Less Energy
-  Help Extend the Life of Your Unit
-  Keep Money in Your Pocket

**Contact us at:
www.EnergySmartNOLA.info
or call toll free at (866) 721-0249.**

Energy Smart is developed by the New Orleans City Council
and administered by Entergy.

Energy Smart Commercial Solutions Program FOR HOTELS



The Energy Smart Commercial Solutions Program provides financial incentives to help hotel owners reduce energy costs.

REBATES

Technology
Variable Frequency Drives
Air Conditioning
Guest Room Energy Management
Vending Machine Controllers

Schedule

To learn more about the Commercial Solutions Program, call toll-free (866) 721-0249, or visit www.EnergySmartNOLA.info

Developed by the New Orleans City Council and administered by Entergy New Orleans, Inc.

Energy Smart Commercial Solutions Program FOR RESTAURANTS



The Energy Smart Commercial Solutions Program provides New Orleans restaurant owners the opportunity to install energy efficient technologies that help you save energy and money. Rebates are available for technologies that help improve the efficiency of your entire restaurant facility.

REBATES ARE AVAILABLE FOR THE FOLLOWING TECHNOLOGIES:

Technology	Description	Potential Rebate
Lighting	T-8 Fluorescent Lighting Retrofits	Up to \$53 per Fixture
	Incandescent to CFLs	Up to \$8 per Bulb
	Incandescent to LEDs	Up to \$13 per Bulb
Air Conditioning	DX Units	Based on New Equipment Efficiency Call for Details
	Package Units	Based on New Equipment Efficiency Call for Details
Food Service Equipment	ENERGY STAR Electric Steam Cooker	Up to \$1,250 per Unit
Refrigeration	ECM Evaporate Motors	\$80 per Unit
Dishwashing	Pre-Rinse Spray Valve (Electric Water Heater Customer Only)	\$90 per Spray Valve
Vending Machine Controllers	Cold Drink Machines	\$190 per Unit
	Refrigerated Reach-In Coolers	\$130 per Unit
	Snack Machines	\$46 per Unit

Get started today by having a walk-through energy assessment performed on your facility!

To learn more about the Commercial Solutions Program, call toll-free (866) 721-0249, or visit www.EnergySmartNOLA.info



Developed by the New Orleans City Council and administered by Entergy New Orleans, Inc.

SAVE MONEY. SAVE ENERGY.

Get up to a \$50 rebate on
ENERGY STAR® qualified
window air conditioners.

Available for Entergy Customers in Orleans Parish

Small A/C units
under 14,000 BTUs

\$35
rebate

Large A/C 14,000
BTUs and higher

\$50
rebate



Developed by the New Orleans City Council and
administered by Entergy New Orleans, Inc.

For more information about the Energy Smart
Program, please visit www.EnergySmartNOLA.info
or call (866) 721-0249.

Window A/C Instant Rebate and Recycling Event!

Save up to \$100 instantly when
you purchase an ENERGY STAR®
qualified window air conditioner!

Same day discounts of \$50 (more than
14,000 BTUs) or \$35 (less than 14,000 BTUs).
DOUBLE your discount if you bring in an old
window A/C to recycle!



- ✿ Sat., June 1 at Lowe's on Elysian Fields, noon - 4 PM
- ✿ Sat., June 8 at Lowe's on Jefferson Highway, noon - 4 PM



Developed by the New Orleans City Council and administered by Entergy New Orleans, Inc. This offer is for Entergy customers in Orleans Parish only. New window A/C unit must be ENERGY STAR qualified. Offer valid on the above dates, while supplies last. Mail-in rebates available year-round at www.EnergySmartNOLA.com. Eligible customers must present photo ID to receive instant coupon. Energy Smart staff will verify all customer eligibility on site. Lowe's cannot verify customer eligibility. Limit of 4 window A/C units per household. ©2013 Lowe's Companies, Inc. All rights reserved. Lowe's, the gable design, and Never Stop Improving are trademarks of LF, LLC. All are used with permission.

¡Evento de reciclaje y reembolso instantáneo en aires acondicionados de ventana!

Ahorre hasta \$100 de
forma instantánea en aires
acondicionados de ventana
ENERGY STAR® que califican.

Descuentos el mismo día de \$50 (más de
14.000 BTU) o de \$35 (menos de 14.000 BTU).
¡DUPLIQUE su descuento si trae un aire
acondicionado antiguo para reciclarlo!



- ✿ Sábado 1 de junio en Lowe's de Elysian Fields, de 12 PM a 4 PM
- ✿ Sábado 8 de junio en Lowe's de Jefferson Highway, de 12 PM a 4 PM



Evento organizado por la alcaldía de la ciudad de New Orleans y es administrado por Entergy New Orleans, Inc. Oferta válida sólo para clientes Entergy del condado Orleans. La nueva unidad de aire acondicionado de ventana debe contar con calificación ENERGY STAR®. Oferta válida en las fechas antes mencionadas, hasta agotar existencias. Reembolsos por correo disponibles todo el año en www.EnergySmartNOLA.com. Límite de 4 unidades de aire acondicionado de ventana por domicilio. ©2013 Lowe's Companies, Inc. Todos los derechos reservados. Lowe's, el diseño del gablete y Siempre Mejorando son marcas de LF, LLC. Todas se utilizan con autorización.



BUDGET
TRANSFERS



NEW ORLEANS

Transfer A: This transfer was made to ensure that the Home Performance with ENERGY STAR Program and Compact Fluorescent Lighting Program would have enough funding to operate through the end of the year. The high-dollar transfers were made at this time due to the influx of participation that each program was receiving, as well as historic trends of high participation late in the program year.

Transfer B: This transfer was made to continue facilitation of direct CFL installations. With higher program costs this year due the purchase of small-base light bulbs, this transfer was necessary.

Transfer C: This was the final transfer of the year, where dollars were moved to pay year-end program wrap-up of projects. An unprecedented influx of A/C replacements late in the year accounted for the need for a large transfer there. Green Light New Orleans made a large material purchase in mid-February to cover their highest activity months of the year, which have historically been March and April. As noted below in the chart, some of the purchased material will be installed in the extension period, but the exact dollar amount of that material was captured and properly accounted for.

PROGRAM	ORIGINAL BUDGET	ROLLOVER FROM YR.2	TRANSFERS			DEPOSITS + YR. 2 ROLLOVER	EXPENDED	BALANCE
			A	B	C			
HOME PERFORMANCE WITH ENERGY STAR	\$246,000	\$2,495.91	\$339,000	-	(\$29,283.02)	\$558,212.89	\$551,052.98	\$71,599.1
ENERGY STAR AIR CONDITIONER	\$154,000	\$520	(\$119,000)	-	\$15,340	\$50,860	\$50,860	\$0
AIR CONDITIONER TUNE-UP	\$154,000	-	(\$84,000)	-	\$4,292	\$74,292	\$74,292	\$0
CFL DIRECT INSTALL	\$123,000	-	\$52,000	\$24,000	\$28,736.10	\$227,736.10	\$227,736.10	\$0
ENERGY EFFICIENCY NEW HOMES	\$168,000	-	(\$138,000)	(\$4,000)	(\$19,085.08)	\$6,914.92	\$6,914.92	\$0
ASSISTED HOME PERFORMANCE WITH ENERGY STAR	\$253,000	\$28883.43	-	-	-	\$281,883.43	\$281,883.43	\$0
SOLAR HOT WATER HEATER	\$70,000	\$12,152	(\$50,000)	(\$20,000)	-	\$12,152	\$1,593.06	\$10,558.94
SMALL COMMERCIAL	\$274,000	(\$4,217.10)	-	-	-	\$269,782.90	\$264,082.50	\$5,700.40
LARGE COMMERCIAL	\$464,000	\$1,087.73	-	-	-	\$465,087.73	\$459,249.53	\$5,838.20
TOTALS	\$1,906,000	\$40,921.97	-	-	-	\$1,946,921.97	\$1,917,664.52	\$29,257.45

**Actual Program spending for CFL Direct Install was \$203,944.26, \$23,791.84 is for material purchased for the extension period

ALGIERS

The Algiers transfers reflected the Eastbank activity, with highest program expenditures in the Home Performance with ENERGY STAR Program and the Compact Fluorescent Lighting Program. In addition, low demand in the Large Commercial & Industrial Solutions Program allowed for some of those funds to be used in the Small Commercial Solutions Program, where there was a higher demand for incentives.

PROGRAM	ORIGINAL BUDGET	TRANSFER	TRANSFER TO ENO FOR DI MATERIAL PURCHASE	DEPOSITS +TRANSFER	EXPENDED	BALANCE	\$\$ NOT DEPOSITED
HOME PERFORMANCE WITH ENERGY STAR	\$112,000	\$5,830.05	\$31,653.83	\$95,330.05	\$95,330.05	\$0	\$22,500
ENERGY STAR AIR CONDITIONER	\$20,500	(\$9,252.25)	-	\$11,247.75	\$8,305	\$2,942.75	\$0
AIR CONDITIONER TUNE-UP	\$20,500	-	-	\$20,500	\$19,532.50	\$967.50	\$0
CFL DIRECT INSTALL	\$50,000	\$3,422.20	-	\$53,422.20	\$53,422.20	\$0	\$0
ENERGY EFFICIENCY NEW HOMES	\$4,800	-	-	\$1,125	\$0	\$1,125	\$3,675
ASSISTED HOME PERFORMANCE WITH ENERGY STAR	\$38,800	-	-	\$38,800	\$38,800	\$0	\$0
SOLAR HOT WATER HEATER	\$5,000	-	-	\$1,400	\$0	\$1,400	\$3,600
SMALL COMMERCIAL	\$51,000	\$14,273.90	-	\$65,273.90	\$65,273.90	\$0	\$0
LARGE COMMERCIAL	\$72,000	(\$14,273.90)	-	\$57,926.10	\$21,894.50	\$36,031.60	\$0
TOTALS	\$374,800	-	-	\$345,025	\$302,558.15	\$42,466.85	\$29,775



Program is helpful financially and installed extra energy efficient items.

A photograph showing a man in a white cap and shirt writing on a clipboard. A woman in a white shirt is looking at the clipboard. The scene is brightly lit, suggesting an indoor setting like a service center or office.

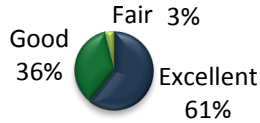
**CUSTOMER
SATISFACTION**



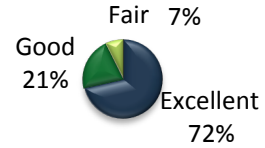
Residential Energy Solutions Program - Customer Satisfaction Surveys

Total of 33 surveys received through Mar 27, 2014

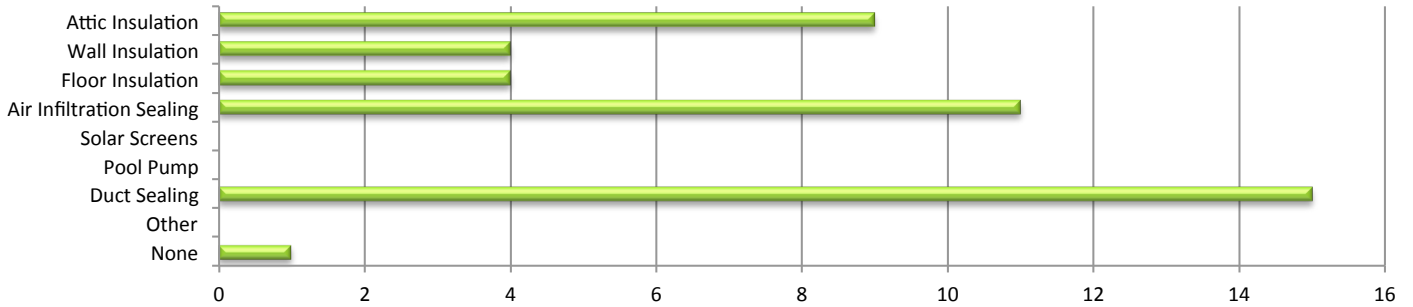
Q1b: How do you rate your experience with the energy consultant?



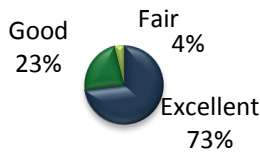
Q1c: How do you rate the value of the Energy Smart assessment?



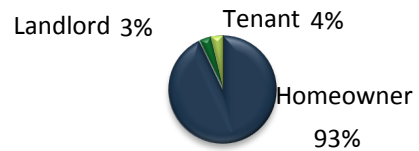
Q1d: What measure(s) did you or do you plan to implement within 60 days for the assessment?



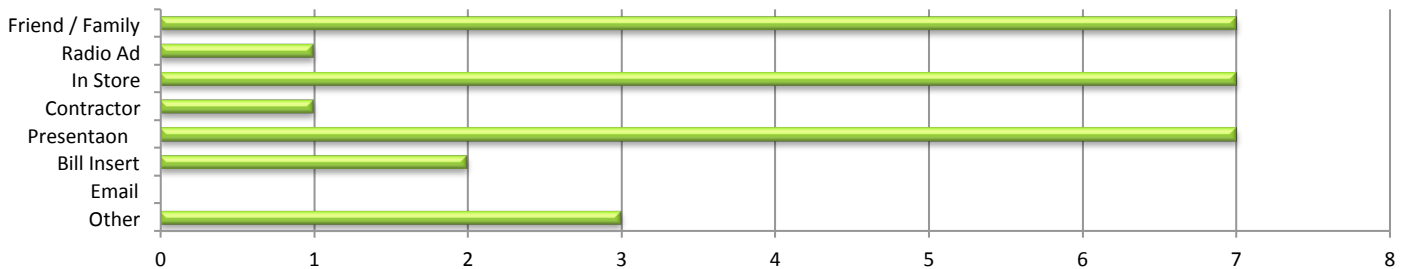
Q2b: What was the contractor's overall level of professionalism?



Q3: Are you the homeowner, landlord, or tenant?



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



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

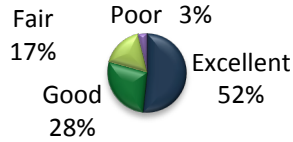
Q6: Have you taken advantage of other Energy Smart programs?



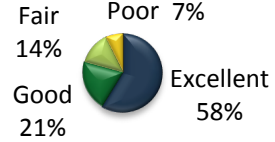
High Performance AC Tune-Up Program - Customer Satisfaction Surveys

Total of 35 surveys received through Mar 27, 2013

Q1b: How do you rate your experience with the contractor?



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

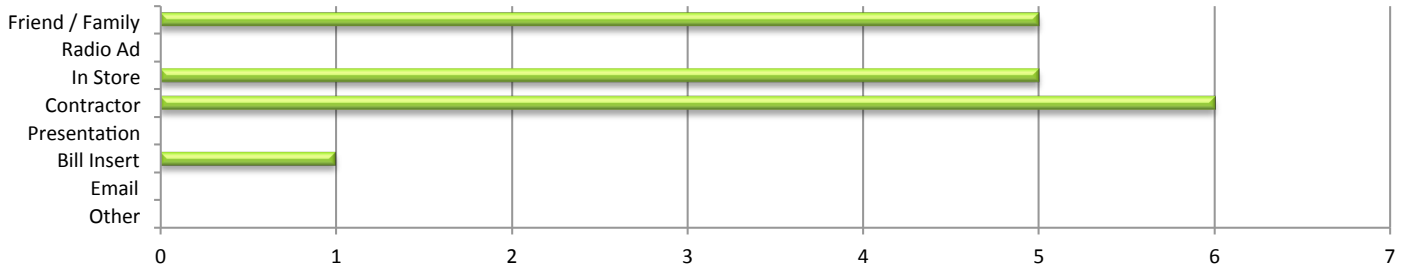


Q3: Are you the homeowner, landlord, or tenant?

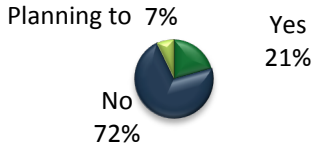


Q4: Would you recommend the Energy Smart program to others?

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



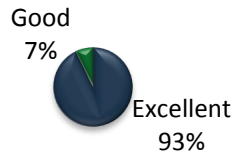
Q6: Have you taken advantage of other Energy Smart programs?



Small Commercial Solutions Program - Customer Satisfaction Surveys

Total of 14 surveys received through Mar 25, 2014

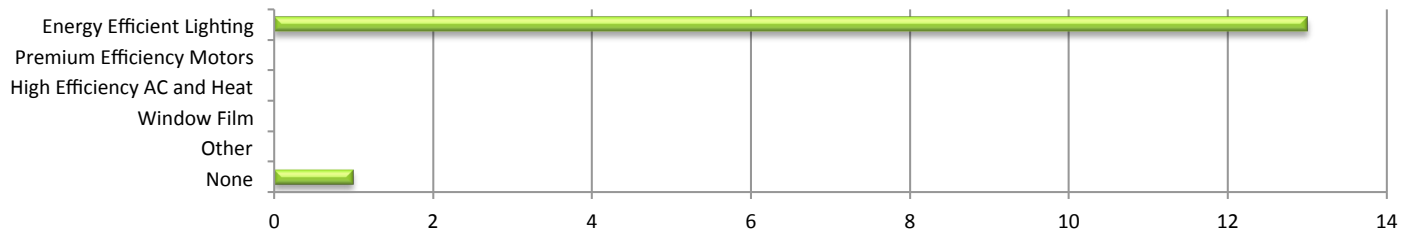
Q1a: How do you rate your experience with the Energy Smart representative?



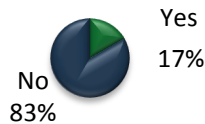
Q1c: How would you rate the overall value of the Energy Smart program?



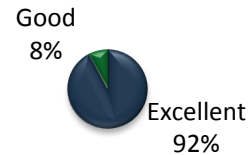
Q1d: What upgrade(s) did you implement as part of the program?



Q1e: Are you planning to implement any other energy efficiency measures?



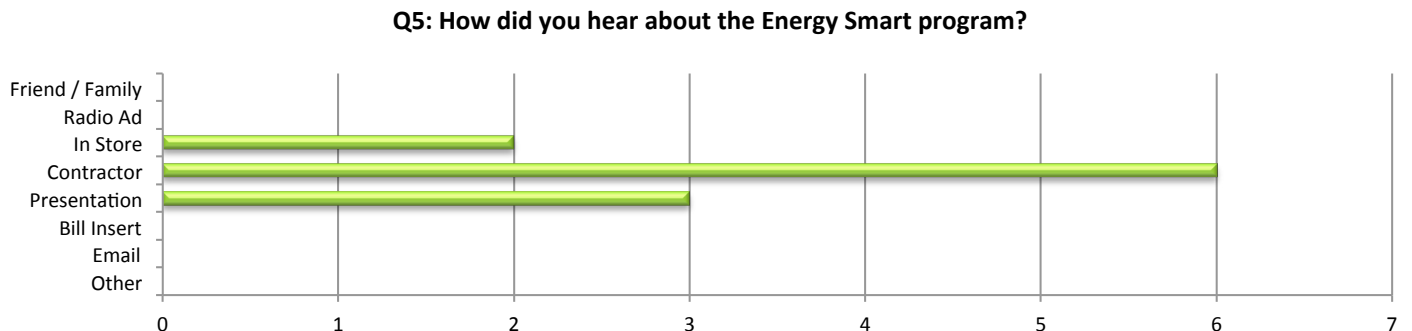
Q2b: How do you rate your experience with the contractor?



Q3: Are you the tenant or the owner of the property that qualified for this program?



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

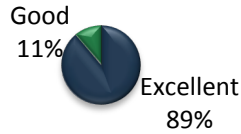




Energy Star Central A/C Program - Customer Satisfaction Surveys

Total of 9 surveys received through Mar 27, 2014

Q1b: How do you rate your experience with the contractor?



Q2: How do you rate the value of the Energy Star Central A/C Program?

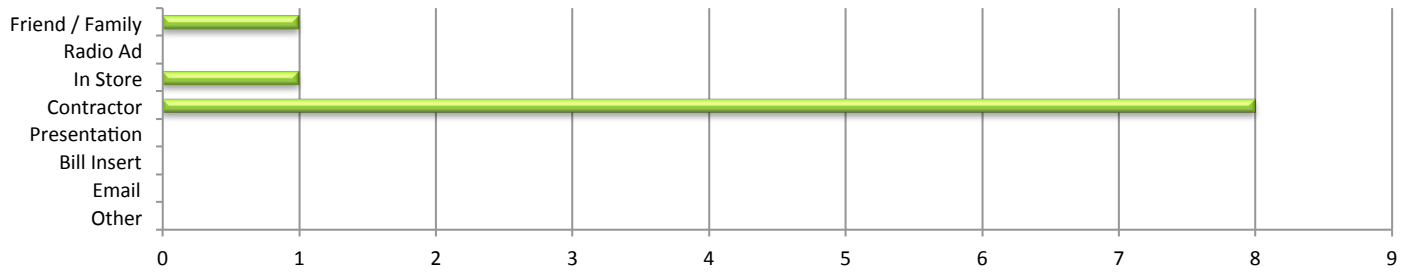


Q3: Are you the homeowner, landlord, or tenant?

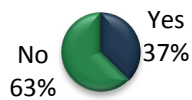


Q4: Would you recommend the Energy Smart program to others?

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



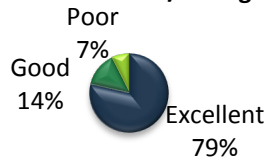
Q6: Have you taken advantage of other Energy Smart programs?



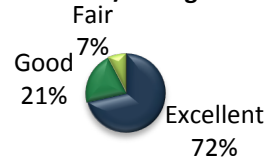
Energy Star Window A/C Program - Customer Satisfaction Surveys

Total of 14 surveys received through Mar 27, 2014

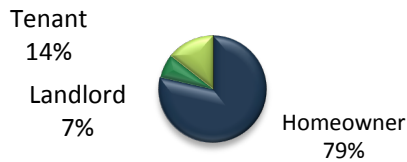
Q1: How do you rate your overall experience with the Window A/C Program?



Q2: How do you rate the value of the Energy Star Window A/C Program?

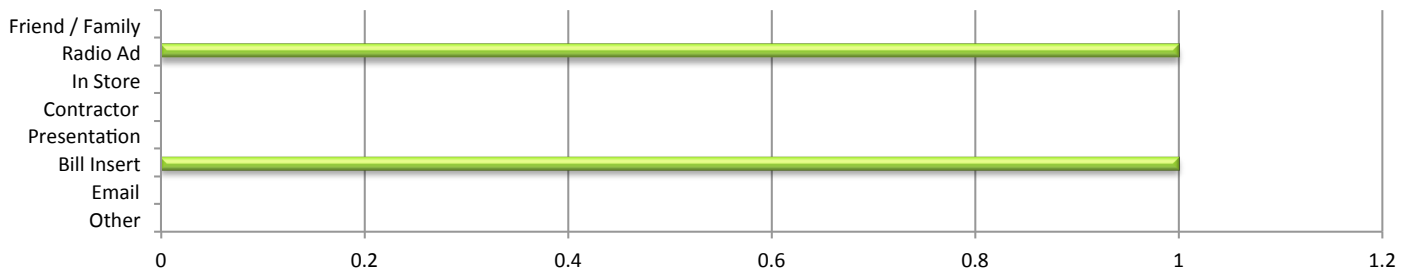


Q3: Are you the homeowner, landlord, or tenant?

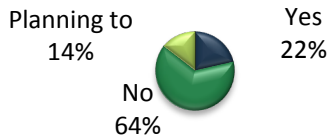


Q4: Would you recommend the Energy Smart program to others?

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



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





Room A/C Unit Replacement Program - Customer Satisfaction Surveys

Total of 10 surveys received through Mar 20, 2014

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



Q2b: How do you rate your experience with the installer?



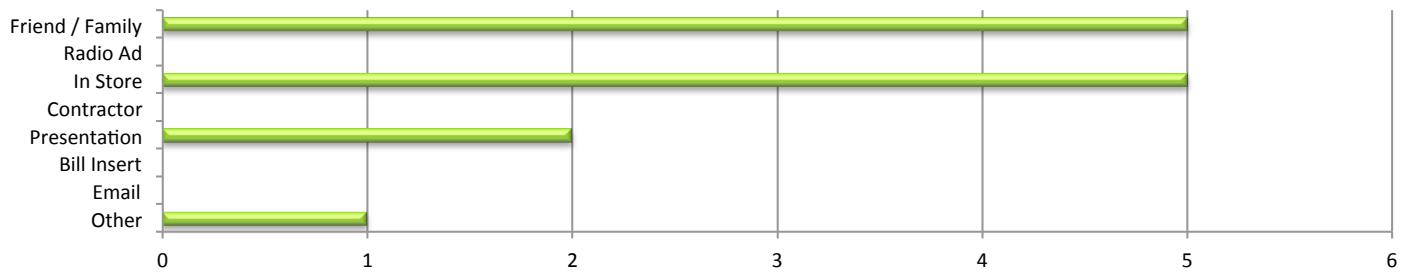
Q3: How do you rate the value of the Energy Smart Room A/C Replacement?



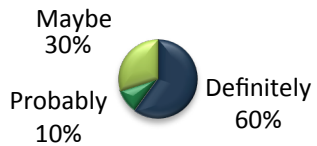
Q4: Are you the homeowner, landlord, or tenant?



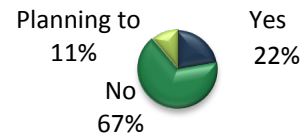
Q6: How did you hear about the Energy Smart program?



Q5: Would you recommend the Energy Smart program to others?



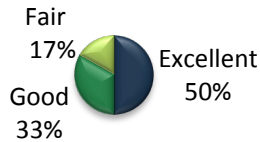
Q7: Have you taken advantage of other Energy Smart programs?



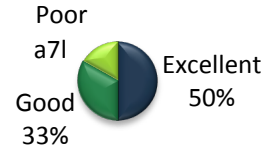
Weatherization Ready Program - Customer Satisfaction Surveys

Total of 6 surveys received through Apr 22, 2014

Q1b: How do you rate your experience with the contractor?



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



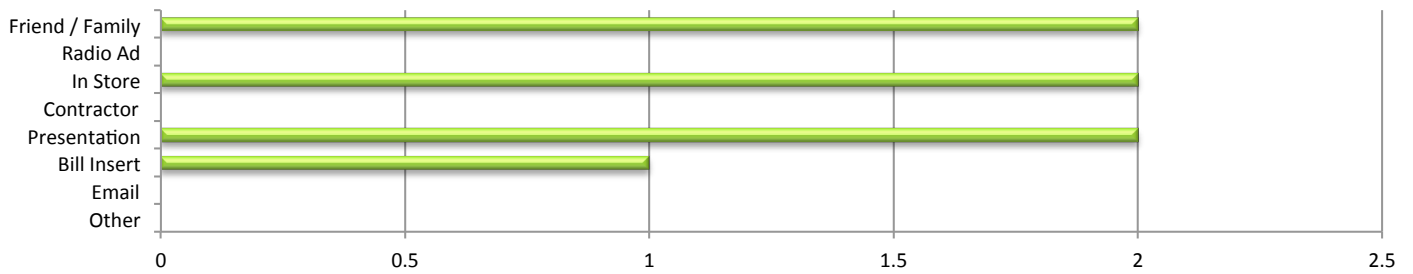
Q3: Are you the homeowner, landlord, or tenant?



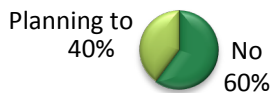
Q4: Would you recommend the Energy Smart program to others?



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



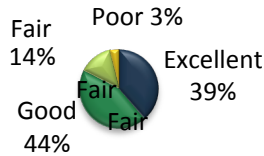
Q6: Have you taken advantage of other Energy Smart programs?



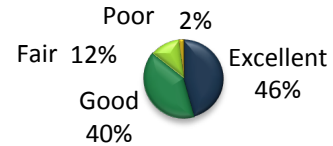
Residential Energy Solutions Program - Customer Satisfaction Surveys

Total of 59 surveys received through Mar 6, 2014

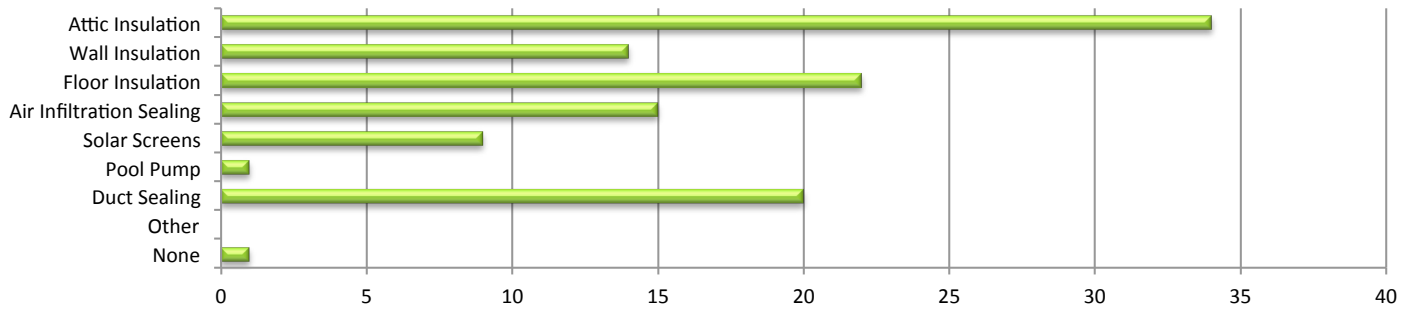
Q1b: How do you rate your experience with the energy consultant?



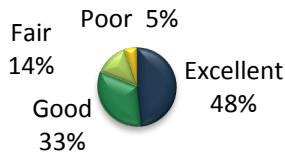
Q1c: How do you rate the value of the Energy Smart assessment?



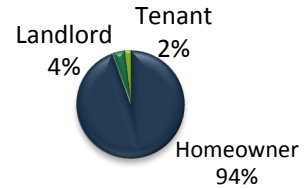
Q1d: What measure(s) did you or do you plan to implement within 60 days for the assessment?



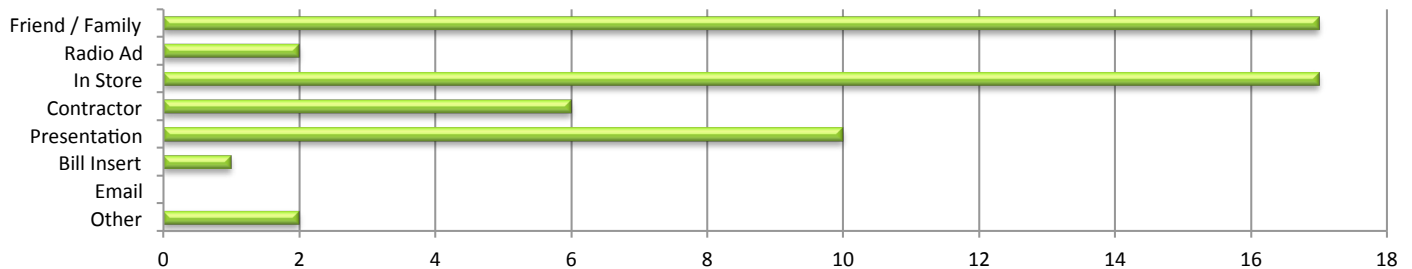
Q2b: What was the contractor's overall level of professionalism?



Q3: Are you the homeowner, landlord, or tenant?

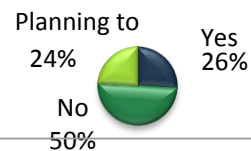


Q5: How did you hear about the Energy Smart program?



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

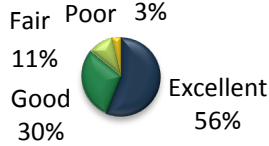
Q6: Have you taken advantage of other Energy Smart programs?



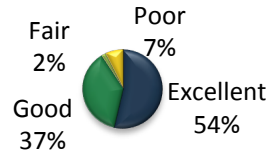
High Performance AC Tune-Up Program - Customer Satisfaction Surveys

Total of 61 surveys received through Mar 6, 2014

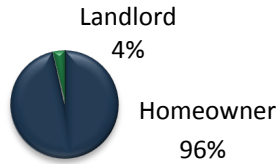
Q1b: How do you rate your experience with the contractor?



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



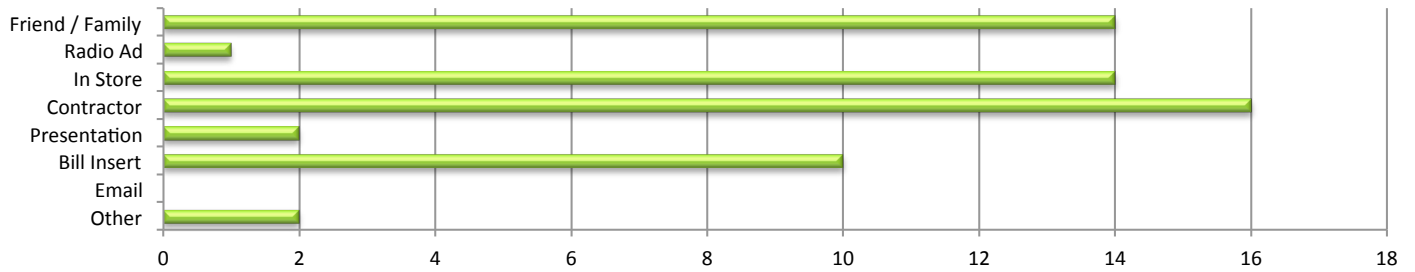
Q3: Are you the homeowner, landlord, or tenant?



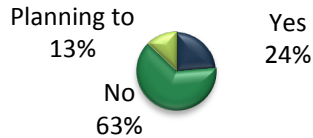
Q4: Would you recommend the Energy Smart program to others?



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



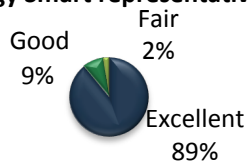
Q6: Have you taken advantage of other Energy Smart programs?



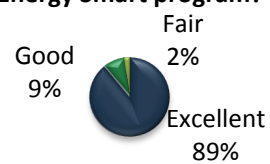
Small Commercial Solutions Program - Customer Satisfaction Surveys

Total of 43 surveys received through Feb 14, 2014

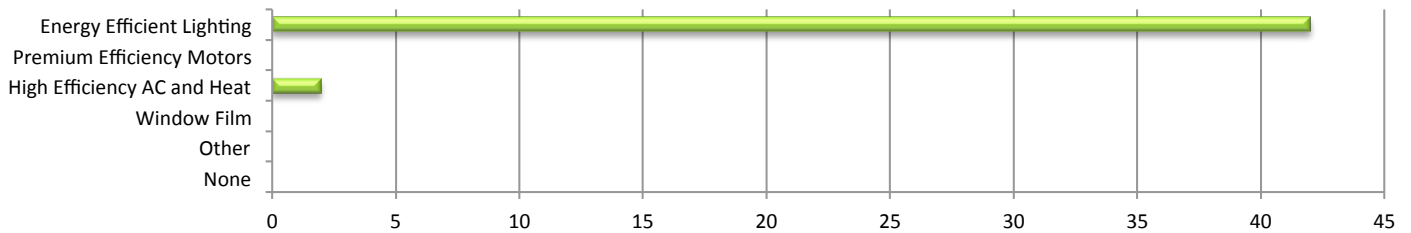
Q1a: How do you rate your experience with the Energy Smart representative?



Q1c: How would you rate the overall value of the Energy Smart program?



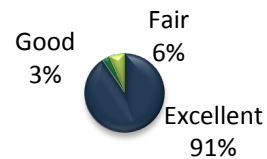
Q1d: What upgrade(s) did you implement as part of the program?



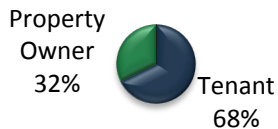
Q1e: Are you planning to implement any other energy efficiency measures?



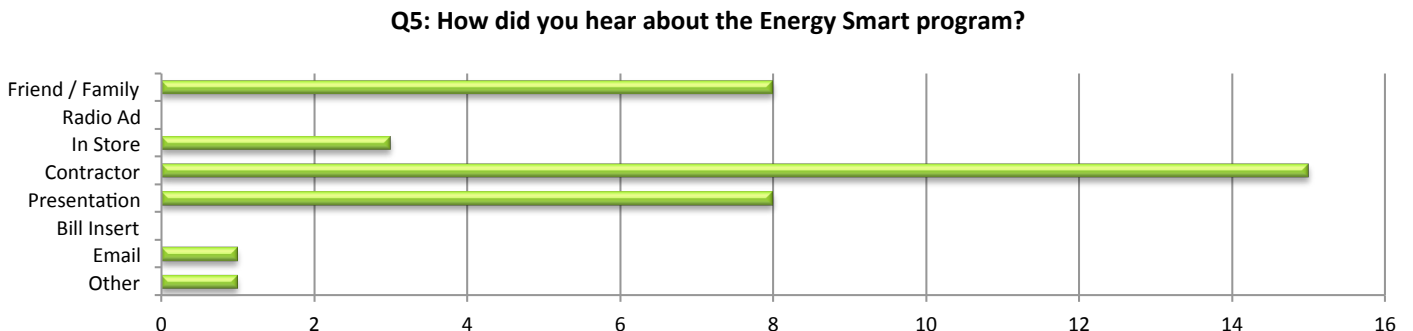
Q2b: How do you rate your experience with the contractor?



Q3: Are you the tenant or the owner of the property that qualified for this program?



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





Large Commercial Solutions Program - Customer Satisfaction Surveys

Total of 12 surveys received through Nov 30, 2013

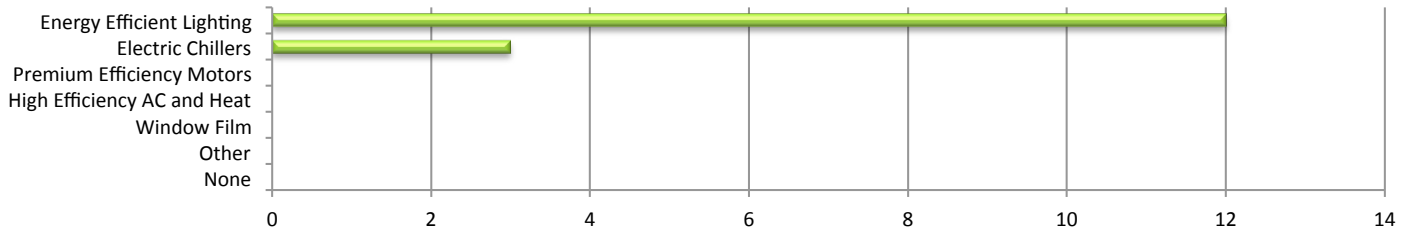
Q1a: How do you rate your experience with the Energy Smart representative?



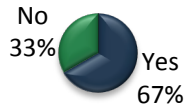
Q1c: How would you rate the overall value of the Energy Smart program?



Q1d: What upgrade(s) did you implement as part of the program?

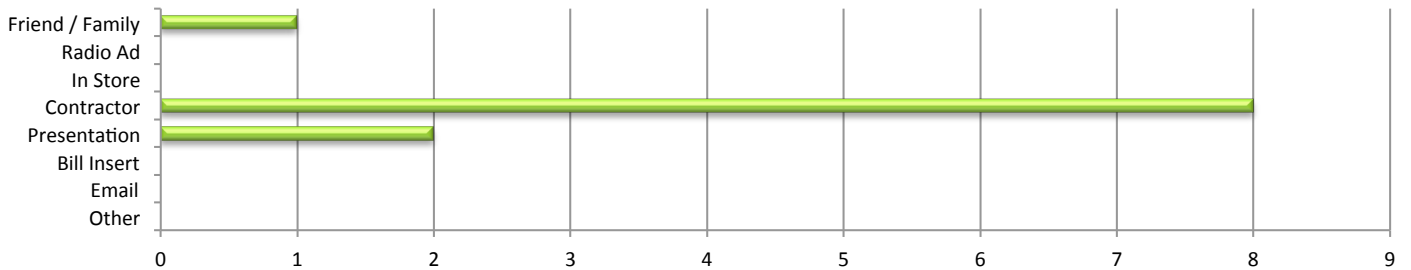


Q1e: Are you planning to implement any other energy efficiency measures?

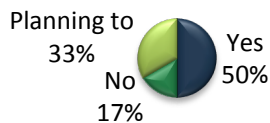


Q2: Would you recommend the Energy Smart program to others?

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



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



Energy Star Central A/C Program - Customer Satisfaction Surveys

Total of 20 surveys received through Mar 6, 2014

Q1b: How do you rate your experience with the contractor?

Q2: How do you rate the value of the Energy Star Central A/C Program?

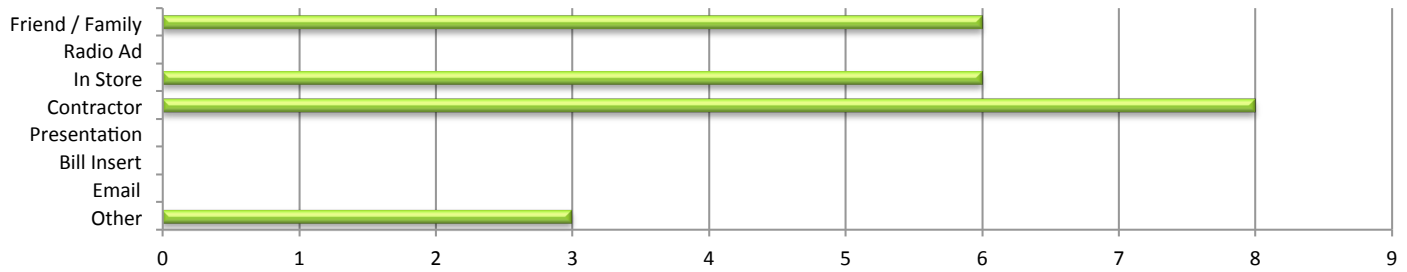
Q3: Are you the homeowner, landlord, or tenant?

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

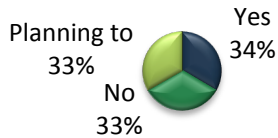


Homeowner
100%

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



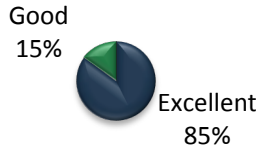
Q6: Have you taken advantage of other Energy Smart programs?



Energy Star Window A/C Program - Customer Satisfaction Surveys

Total of 47 surveys received through Mar 20, 2014

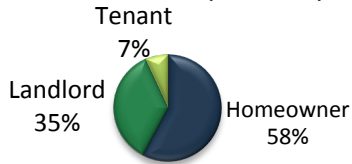
Q1: How do you rate your overall experience with the Window A/C Program?



Q2: How do you rate the value of the Energy Star Window A/C Program?

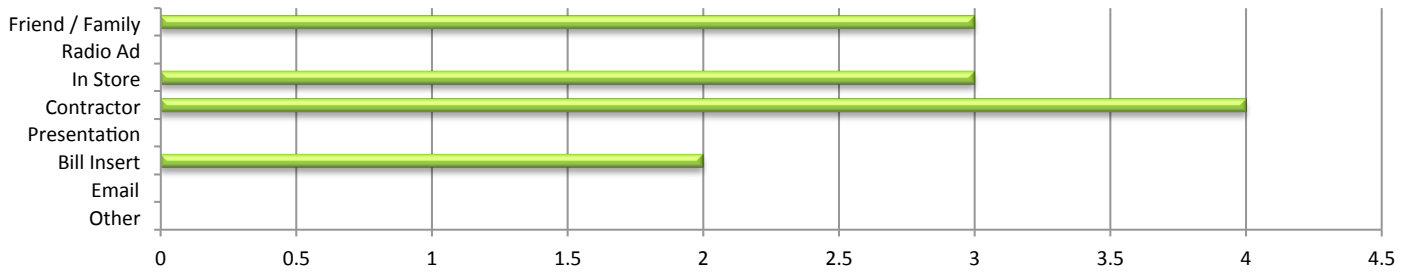


Q3: Are you the homeowner, landlord, or tenant?

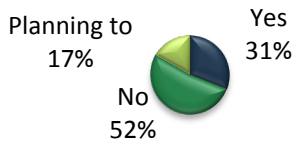


Q4: Would you recommend the Energy Smart program to others?

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



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





Room A/C Unit Replacement Program - Customer Satisfaction Surveys

Total of 3 surveys received through Jan 17, 2014

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



Q2b: How do you rate your experience with the installer?



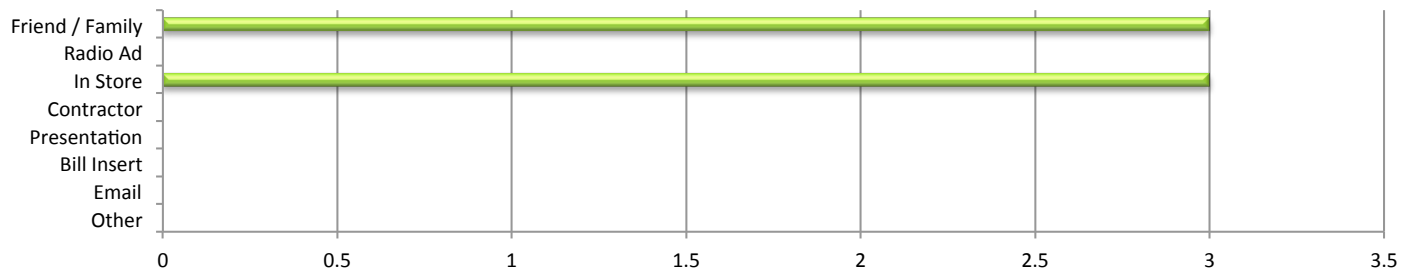
Q3: How do you rate the value of the Energy Smart Room A/C Replacement?



Q4: Are you the homeowner, landlord, or tenant?



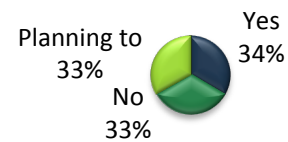
Q6: How did you hear about the Energy Smart program?



Q5: Would you recommend the Energy Smart program to others?



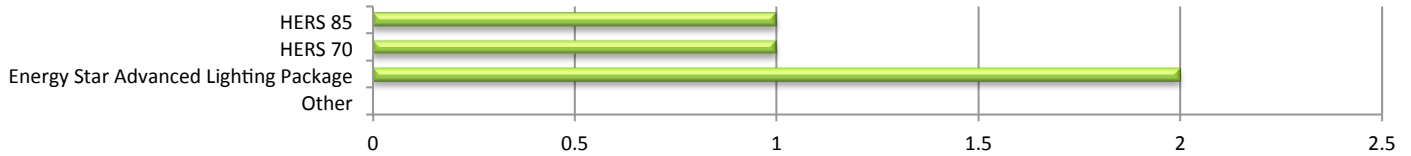
Q7: Have you taken advantage of other Energy Smart programs?



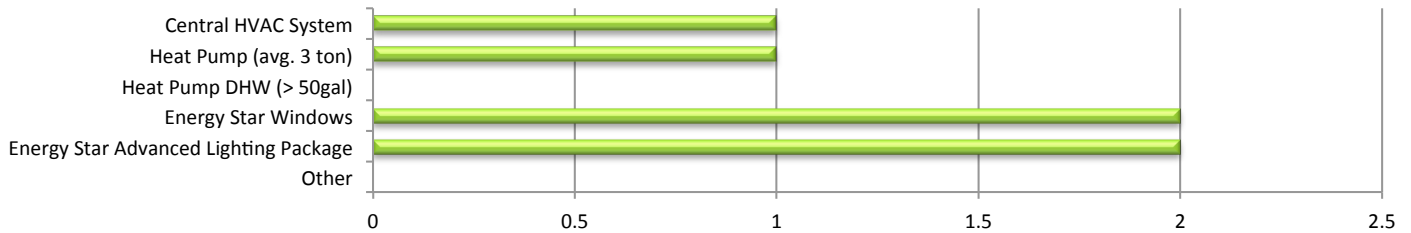
Energy Efficient New Homes Program - Customer Satisfaction Surveys

Total of 4 surveys received through Mar 31, 2014

Q1a: Which performance measures did you implement?



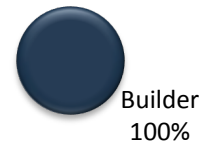
Q1b: Which prescriptive measures did you implement?



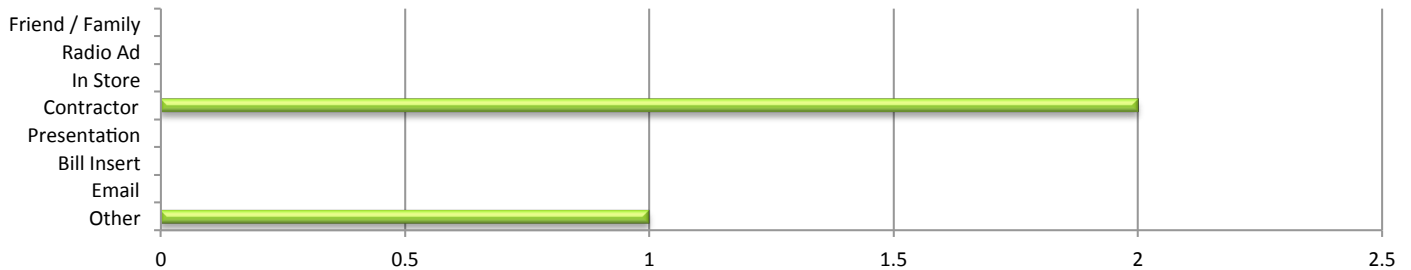
Q2: How do you rate the value of the Energy Efficient New Homes Program?



Q3: Are you the homeowner, landlord, or tenant?



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



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

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





Weatherization Ready Program - Customer Satisfaction Surveys

Total of 7 surveys received through Feb 18, 2014

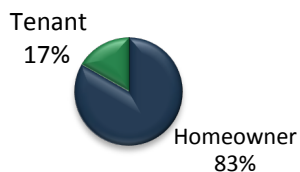
Q1b: How do you rate your experience with the contractor?



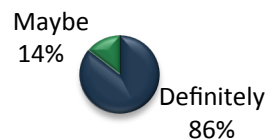
Q2: How do you rate the value of the Energy Smart Weatherization Ready Program?



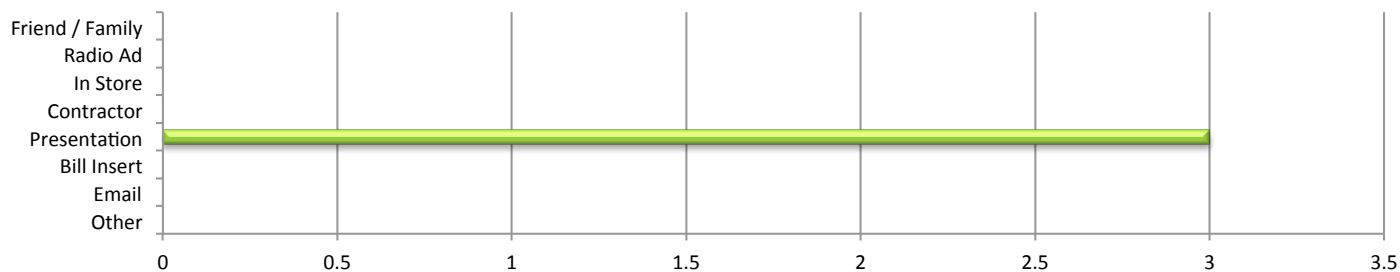
Q3: Are you the homeowner, landlord, or tenant?



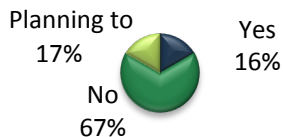
Q4: Would you recommend the Energy Smart program to others?



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



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





**I would not have had
the work done without
Energy Smart.**



**LOOKING AHEAD
TO PROGRAM YEAR 4**



LOOKING AHEAD TO THE PROGRAM EXTENSION

Building on the success of the first three years of the program, Energy Smart has plans to continue its growth and offer further energy-efficiency programs in New Orleans to continue helping local residents save energy and money.

One of the most innovative new programs already began in April 2014: the CoolSaverSM A/C Tune-up Program. A CoolSaver A/C Tune-up can improve the cooling output and efficiency of an air conditioning unit by up to 30 percent. With a CoolSaver A/C Tune-up, customers enjoy:

- A more dependable, longer-lasting unit .
- A lower monthly energy bill Cooler indoor environment.
- Better humidity control.
- Instant savings towards the cost of a CoolSaver A/C Tune-up.

The biggest advantage that a CoolSaver Tune-up has compared to a standard tune-up is the airflow adjustment. This adjustment requires that technicians spend more time in a home collecting data points (so it is more thorough) which results in higher energy savings for the homeowner. In addition, the CoolSaver A/C Tune-up Program requires that technicians utilize advanced diagnostic tools, resulting in more accurate field measurements.

In the next year, Energy Smart plans to expand its retail rebate offerings as a way to reach customers through a wider variety of venues and to increase energy savings. Pilot partnerships with Sears and existing national relationships with CLEARResult will allow for a quick ramp-up in this important arena.

In addition, the program plans to expand its restaurant marketing in order to reach this high-energy-consumption sector. This program enhancement will build upon the existing successes of the Large Commercial & Industrial Solutions Program and the Small Commercial Solutions Program.

A close-up photograph of a person in a dark suit and light blue shirt. They are holding a clipboard with a silver clip and a black pen, ready to write on a document. The document features a table with several columns and rows. A dark blue banner with white text is overlaid on the bottom left of the image. A green triangle points towards the banner from the right side.

PROGRAM CONTACTS

**CLEARRESULT
CONTACTS**

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CAMILLE LOPEZ POLLAN	SENIOR PROGRAM CONSULTANT	ALL PROGRAMS	(504) 872-3890	CAMILLE.LOPEZ@ CLEARRESULT.COM
LEANNE BOUDREAU	PROGRAM SPECIALIST	ALL PROGRAMS	(504) 523-9788	LBOUDREAU@ CLEARRESULT.COM
ANDY GOSTISHA	PROGRAM SPECIALIST	HPWES	(504) 872-3896	ANDY.GOSTISHA@ CLEARRESULT.COM
BRIDGET JOSEPH	PROGRAM CONSULTANT	HPWES AND SMALL COMMERCIAL SOLUTIONS	(504) 872-3893	BJOSEPH@CLEARRESULT.COM
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Attachment A: Modifications to the commercial and residential unitary equipment deemed savings

Commercial and Residential AC and HP equipment

Measure Description

This measure applies to Unitary Air Conditioners (AC) and Heat Pump (HP) equipment for both residential and commercial applications. The following are the major equipment categories covered in this measure:

1. Unitary Air Conditioning (AC) Equipment, air cooled
2. Unitary Heat Pump (HP) Equipment, air-cooled
3. Packaged Terminal Air Conditioners (PTAC)
4. Packaged Terminal Heat Pumps (PTHP)
5. Single-Package Vertical Air Conditioners (SPVAC)
6. Single-Package Vertical Heat Pumps (SPVHP)
7. Room Air Conditioners (RAC)
8. Water Chilling Packages (CH)

Equipment Useful Life (EUL)

Following are the effective equipment useful life (EUL) based on the expected median service life according to ASHRAE.¹

Equipment Category	EUL
Unitary Air Conditioning (AC) Equipment, air cooled	15 years
Unitary Heat Pump (HP) Equipment, air-cooled	15 years
Packaged Terminal Air Conditioners (PTAC)	15 years
Packaged Terminal Heat Pumps (PTHP)	15 years
Single-Package Vertical Air Conditioners (SPVAC)	15 years
Single-Package Vertical Heat Pumps (SPVHP)	15 years
Room Air Conditioners (RAC)	10 years
Water Chilling Packages (CH)	32 years

¹ 2011 ASHRAE Handbook HVAC Applications, Ch. 37 Owning and Operating Cost, Table 4 – Comparison of Service Life Estimates

Measure Baselines

The baseline efficiency is dependent upon three retrofit classifications early retirement (ER), replace on burnout (ROB) and new construction (NC).

Early Retirement Baseline

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 (for split-dx equipment manufactured year will be based on the outdoor condensing unit) 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.

Further information regarding the concept of early retirement can be found in a recent the section titled Early Retirement Texas PUCT petition².

The purpose for classifying projects as early retirement is it to account for the general practices of commercial HVAC contractors when it comes to repair/replace decisions. Baseline studies have demonstrated that retrofit projects include both replacement on burnout of non-functioning systems and the early retirement of systems that might have only required simple repairs. By demonstrating that contractors participating in rebate programs were more likely to replace systems rather than repair them, the baseline studies show that the existence of a rebate is sufficient incentive to encourage the early retirement of some systems. When this effect is quantifiable, it can be used to define a baseline for retrofit projects that is lower than the minimum efficiency of commercially-available equipment.

This measure proposes, for early retirement projects, the effective baselines will be based on whatever Federal or ASHRAE 90.1 equipment standard was in effect during same year the existing equipment was manufactured. This is a reasonable approach, since the equipment's efficiency would most likely be near such standard. Previously, all replace on burnout projects were treated the same: regardless of whether the system being replaced was still functioning, savings estimates and incentive payments were calculated as though the previously installed equipment no longer functioned. The early retirement methodology will allow utilities to calculate the savings for replacing an inefficient HVAC system that still has remaining useful life.

An early retirement project also requires a method for estimating the remaining useful life (RUL) of replaced systems. The method by which the RUL is estimated for an early retirement project is explained in more detail in a subsequent section titled "Remaining Useful Life".

Replace on Burnout Baseline

Replace on burnout (ROB) involves the replacement of existing equipment that is no longer functioning or does not have a remaining useful life. The effective baseline will be based on ASHRAE 90.1-2007.

² Texas PUCT Docket No. 40083, Petition to approve revisions to commercial hvac deemed savings for energy efficiency programs

New Construction Baseline

A new construction (NC) retrofit involves the installation of new high efficiency system that meets or exceeds the minimum efficiency standard. The baseline for new construction retrofits will be based on ASHRAE 90.1-2007.

Minimum Efficiency

For all retrofit projects the following are the minimum efficiency standards based on equipment and size category:

Equipment Category	Minimum Efficiency
Unitary Air Conditioning (AC) Equipment, air cooled	CEE Tier 1 or 2*
Unitary Heat Pump (HP) Equipment, air-cooled	CEE Tier 1 or 2*
Packaged Terminal Air Conditioners (PTAC)	ASHRAE 90.1-2010
Packaged Terminal Heat Pumps (PTHP)	ASHRAE 90.1-2010
Single-Package Vertical Air Conditioners (SPVAC)	ASHRAE 90.1-2010
Single-Package Vertical Heat Pumps (SPVHP)	ASHRAE 90.1-2010
Room Air Conditioners (RAC)	ASHRAE 90.1-2010
Water Chilling Packages (CH)	ASHRAE 90.1-2010
* Based on highest rating by category, effective CEE specification as of January 6, 2012	

Remaining Useful Life

An early retirement retrofit requires a method for estimating the remaining useful life (RUL) of replaced systems. The method used for estimating the RUL of a replaced system involves taking what is known about a system at the time it is being replaced – that it still works – and re-estimating the survival function for the system based on this information. The survival function used for the purpose was taken from the technical support document produced by the Department of Energy (DOE) in its evaluation of the energy efficiency standards.³ Commercial HVAC Systems have an EUL of 15 years¹, this is consistent with the age at which 50 percent of systems installed in a given year will no longer be in service, as described by the survival function in Figure 1.

³ Source: Life Cycle Cost Analysis Spreadsheet, “lcc_cuac_hourly.xls”.
http://www1.eere.energy.gov/buildings/appliance_standards/commercial/cuac_draft_analysis.html.

APPENDIX A-4

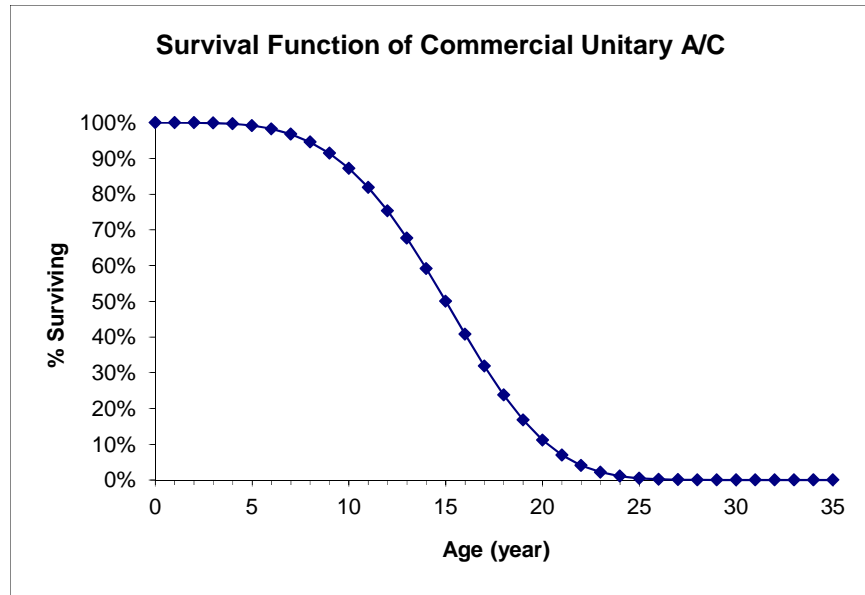


Figure 1 - Survival Function of Commercial Unitary Equipment³

For Room Air Conditioners a new survival curve was developed to account for the different EUL of 10 years. The survival function of Room Air Conditioners Figure 3 was developed by adjusting the survival curve of unitary equipment so that the 50 percent survival rate would correspond to a 10 EUL.

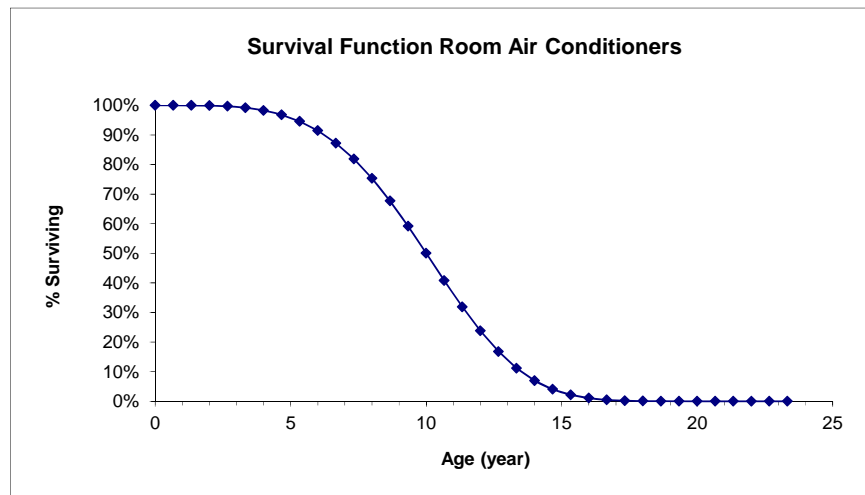


Figure 2 - Survival Function of Room Air Conditioners

Figure 3 - Survival Function of Packaged Chillers was based on data obtained from ASHRAE⁴. By review of the survival curve below at approximately 32 years 50 percent of the chiller population will still be in operation. Hence the EUL is set at 32 years.

APPENDIX A-5

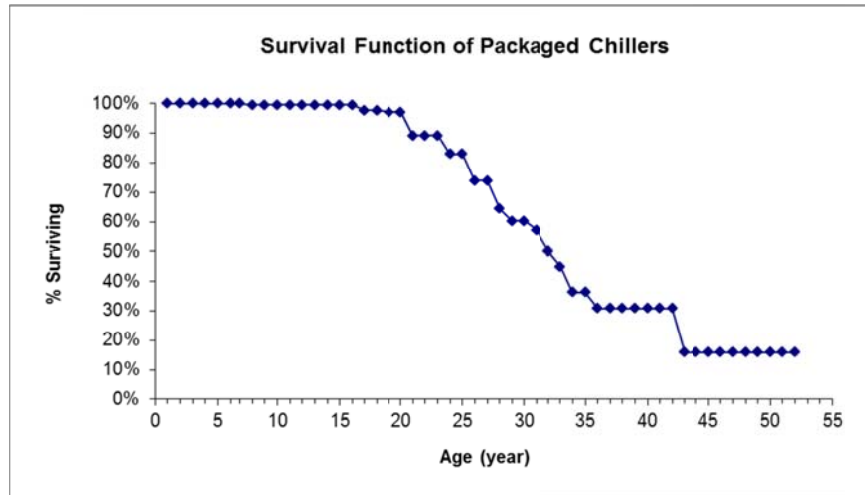


Figure 3 - Survival Function of Packaged Chillers⁴

⁴ 2011 ASHRAE Handbook, HVAC Applications, Ch. 37.3, Figure 1 Survival Curve of Centrifugal Chillers

APPENDIX A-6

The method used to estimate the RUL is based on Figure 1. For example, by the time the systems are 13 years old, the distribution in Figure 1 suggests that about 68 percent of systems remain in operation, meaning that 32 percent have failed. To estimate the point at which 50 percent of the remaining systems will have failed, the 32 percent that have already failed are removed from the distribution, and the percent surviving in each future year are compared against the baseline of 68 percent that continue to operate, rather than 100 percent (at year 0). In this way, as shown in Table 1, a 13 year-old system that is still in working condition is estimated to have 3.8 years of remaining useful life. Table 2 represented the RUL for Packaged Chillers which was developed by using Figure 3 - Survival Function of Packaged Chillers.

Table 1 - Room Air Conditioner and Unitary Equipment Remaining Useful Life (RUL)

Age of Replaced System (yrs)	Room Air Conditioners RUL (yrs)	Unitary Equipment RUL (yrs)
1	9.7	14.0
2	8.0	13.0
3	6.7	12.0
4	6.1	11.0
5	5.5	10.0
6	4.5	9.1
7	4.0	8.2
8	3.0	7.3
9	2.8	6.5
10	2.2	5.7
11	1.8	5.0
12	1.5	4.4
13	1.3	3.8
14	1.0	3.3
15	0.8	2.8
16	n/a	2.5
17	n/a	2.2
18	n/a	1.9
19	n/a	1.7
20	n/a	1.5
21	n/a	1.3
22	n/a	1.1
23	n/a	1.0

APPENDIX A-7

Table 2 - Packaged Chillers Remaining Useful Life (RUL)

Age of Replaced System (yrs)	Packaged Chillers RUL (yrs)	Age of Replaced System (yrs)	Packaged Chillers RUL (yrs)
1	31.0	21	12
2	30.0	22	11
3	29.0	23	10
4	28.0	24	9.4
5	27.0	25	8.4
6	26.0	26	7.9
7	25.0	27	6.9
8	24.1	28	7.8
9	23.1	29	11
10	22.1	30	10
11	21.1	31	9.1
12	20.1	32	8.3
13	19.1	33	7.5
14	18.1	34	6.8
15	17.1	35	5.8
16	16.1	36	5
17	15.3	37	4
18	14.3	38	3
19	13.3	39	2
20	12.3	40	1

Saving Adjusted for Early Retirement Projects

For early retirement (ER) projects the measure's demand and 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 ROB project that would have a standard EUL of 15 years for unitary equipment (10 years and 32 years for RAC and Packaged Chillers, respectively), with savings defined by the incremental efficiency between that of the installed systems and the ROB project baseline efficiency.

Demand and energy savings are most simply calculated according to a single equation that encompasses the efficiency gain from the efficiency of the replaced system to that of the installed system. 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 demand/energy savings from the efficiency improvement from the replaced system to the installed system and weighting the EUL of the ROB component with the demand/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. Equation A-5 expresses this measure life calculation mathematically:

Equation 1

$$\text{Weighted ER Measure Savings (kW)} = \frac{kW_{ER} \times RUL + kW_{ROB} \times (EUL - RUL)}{EUL}$$

Equation 2

$$\text{Weighted ER Measure Savings (kWh)} = \frac{kWh_{ER} \times RUL + kWh_{ROB} \times (EUL - RUL)}{EUL}$$

Where:

kW_{ER} = Early Retirement (ER) Demand Savings

kWh_{ER} = Early Retirement (ER) Energy Savings

kW_{ROB} = Replace on Burnout (ROB) Demand Savings

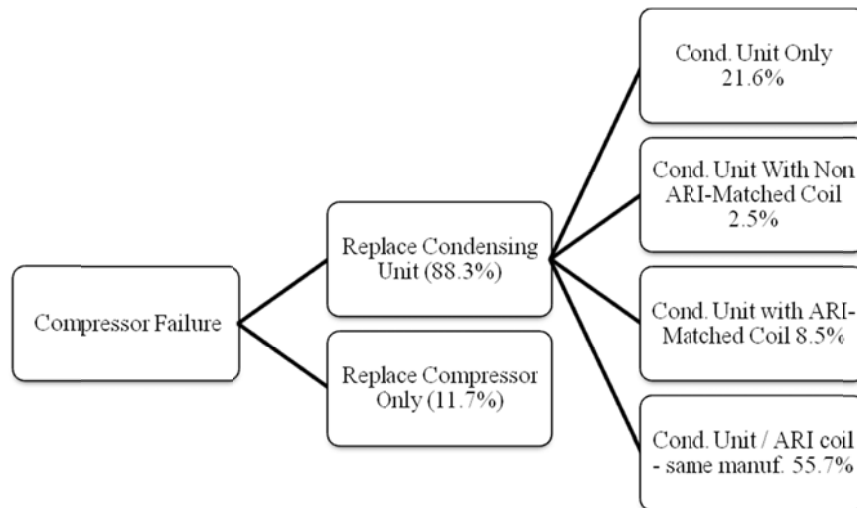
kWh_{ROB} = Replace on Burnout (ROB) Energy Savings

Remaining Useful Life (RUL)

EUL = Room Air Conditioners (10yrs), Unitary Equipment (15yrs), Packaged Chillers (32yrs)

Baseline Adjustment for Unitary Equipment under 65k BTUh

This baseline adjustment applies to unitary air conditioning equipment and unitary heat pumps under 65,000 Btu/h that are undergoing an ER or ROB retrofit. The purpose of this adjusted is to account for the likelihood, that without a utility incentive, there is a decision to partially replace or repair an existing system. For example, research performed by Texas A&M’s Energy System Laboratory (ES) indicated that in the event of a compressor failure out of warranty, dealers replaced the compressor 11.7% of the time, and replaced the condensing unit 88.3% of the time. Further, the condensing unit replacements consist of condensing unit-only replacements, replacements with mismatched evaporator coils, and replacements with matching evaporator coils. The percentages for these installations are as follows:



To calculate a weighted average SEER for these installations, ESL assumed that a compressor-only replacement resulted in no increase in SEER, and that the SEER of a condensing unit installed without a matching coil would be 85% of the SEER value for a matched system. The ESL estimate of the baseline SEER for replacement AC units is given by the following equation:

$$SEER_{Base} = (SEER_{CompressorRepl}) \times (Actual\%CompressorRepl) + (SEER_{CondenserRepl}) \times (Actual\%CondenserRepl) + (SEER_{SystemRepl}) \times (Actual\%SystemRepl)$$

Substituting ESL SEER estimates and survey data provides the following baseline SEER estimate:

$$SEER_{Base} = 9.5 \times 11.7\% + 11.05 \times 24.1\% + 13.5 \times 64.2\% = 12.44$$

In new construction, there is no possibility of a partial system (e.g. condensing unit-only) changeout, so the 12.44 baseline would not be appropriate. Therefore, the baseline for new construction installations is set at the federal government’s minimum efficiency standard (ASHRAE 90.1-2007) of 13 SEER.

SEER to EER Conversion for Unitary Equipment under 65k BTUh

Since the efficiency ratings for unitary equipment under 65,000 BTU/h are provided in SEER, the conversion of the efficiency rating to EER is provided in equation below:

$$EER = SEER * 0.697 + 2.0394$$

Part-load Efficiency for Unitary Equipment greater than 65k BTUH

This applies to unitary equipment greater than 65 kBTU/h. Since the partload efficiencies of this equipment category has throughout the various federal standards changed from IPLV to no rating then to IEER a method to account for the partload efficiency was developed as follows. For unitary equipment manufactured prior to 2010 the following adjusted partload efficiency IEERadj was developed as follows:

Unitary Air Conditioning Equipment

$$IEER_{adj} = EER + 0.2 \quad (\text{Cooling capacity} \geq 65k \text{ and } < 240k \text{ Btu/h})$$

$$IEER_{adj} = EER + 0.1 \quad (\text{Cooling capacity} \geq 240k \text{ Btu/h})$$

Unitary Heat Pump Equipment

$$IEER_{adj} = EER + 0.2 \quad (\text{Cooling capacity} \geq 65k \text{ and } < 135k \text{ Btu/h})$$

$$IEER_{adj} = EER + 0.1 \quad (\text{Cooling capacity} \geq 135k \text{ Btu/h})$$

Coincidence Factor

By review of several Texas utility energy program's coincidence factor, the range was between 0.80 to 0.92 for various building types and reference climate cities in Texas (Amarillo, Fort Worth, Houston, Corpus Christi/Brownsville). For all retrofit projects within this measure a demand coefficient of 0.86 will be used to estimate the demand savings.

Cooling and Heating Equivalent Full Load Hours (EFLHs)

Heating and cooling equivalent full load hours (EFLH) were generated for the New Orleans climate using CLEAResult's 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), Texas LoanSTAR Guidelines ELFHs, Nexant Texas and Arkansas ELFHs, and empirical data gathered from various CLEAResult utility programs.

Table 3 - Heating and Cooling EFLH

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
Small Office	2007	237
Warehouse	2137	59

Energy and Demand Savings Equations

Following are the main equations used to calculate savings for all major equipment types and retrofit scenarios described in this measure:

Unitary Air Conditioning (AC) and Heat Pump (HP) Equipment, air cooled

Cooling Capacity (< 65k Btu/h)

Equation 3

$$\text{Demand Savings}(kW) = \text{Tons} \times \left(\frac{12}{\text{Old EER}} - \frac{12}{\text{New EER}} \right) \times 0.86$$

Equation 4

$$\text{Energy Savings}(kWh) = \text{Tons} \times \left(\frac{12}{\text{Old SEER}_{adj}} - \frac{12}{\text{New SEER}_{adj}} \right) \times \text{Cooling EFLH}$$

Equation 5

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

Cooling Capacity ($\geq 65k$ Btu/h)

Equation 6

$$\text{Demand Savings}(kW) = \text{Tons} \times \left(\frac{12}{\text{Old EER}} - \frac{12}{\text{New EER}} \right) \times 0.86$$

Equation 7

$$\text{Energy Savings}(kWh) = \text{Tons} \times \left(\frac{12}{\text{Old IEER}_{adj}} - \frac{12}{\text{New IEER}_{adj}} \right) \times \text{Cooling EFLH}$$

Equation 8

$$\text{Heat Pump Heating } kWh_{savings} = kBTUh \times \left(\frac{1}{\text{Old COP}} - \frac{1}{\text{New COP}} \right) \times \frac{\text{Heating EFLH}}{3.413}$$

Where (reference Table 4 and Table 5 for efficiency values):

Old EER/SEER_{adj}/IEER_{adj}/HSPF/COP = For early retirement (ER) projects select efficiency in year which corresponds to equipment's manufactured year. For ROB select efficiency in row labeled ROB. For new construction select efficiency in row labeled new construction.

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New EER/SEER_{adj}/IEER_{adj}/HSPF/COP New equipment AHRI rated efficiency which must meet or exceed the minimum efficiency

Heating /Cooling EFLH See Table 3 - Heating and Cooling EFLH

The equations above apply to ROB and NC retrofit projects. To calculate early retirement projects savings see section titled "Saving Adjusted for Early Retirement Projects". Also please note for units less than 65,000 BTUh the conversion from SEER to EER is as follows $EER = SEER \times 0.697 + 2.0394$.

Packaged Terminal Air Conditioners (PTAC) and Heat Pumps (PTHP)

$$Demand\ Savings(kW) = Tons \times \left(\frac{12}{Old\ EER} - \frac{12}{New\ EER} \right) \times 0.86$$

$$Energy\ Savings(kWh) = Tons \times \left(\frac{12}{Old\ EER} - \frac{12}{New\ EER} \right) \times Cooling\ EFLH$$

$$Heat\ Pump\ Heating\ kWh_{savings} = kBTUh \times \left(\frac{1}{Old\ COP} - \frac{1}{New\ COP} \right) \times \frac{Heating\ EFLH}{3.413}$$

Where (reference Table 6 for efficiency values):

Old EER/COP = For early retirement (ER) projects select efficiency in year which corresponds to equipment's manufactured year. For ROB select efficiency in row labeled ROB. For new construction select efficiency in row labeled new construction.

New EER/COP New equipment AHRI rated efficiency which must meet or exceed the minimum efficiency

Heating /Cooling EFLH See Table 3 - Heating and Cooling EFLH

The equations above apply to ROB and NC retrofit projects. To calculate early retirement projects savings see section titled "Saving Adjusted for Early Retirement Projects".

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Single-Package Vertical Air Conditioners (SPVAC) and Heat Pumps (SPVHP)

$$\text{Demand Savings}(kW) = \text{Tons} \times \left(\frac{12}{\text{Old EER}} - \frac{12}{\text{New EER}} \right) \times 0.86$$

$$\text{Energy Savings}(kWh) = \text{Tons} \times \left(\frac{12}{\text{Old EER}} - \frac{12}{\text{New EER}} \right) \times \text{Cooling EFLH}$$

$$\text{Heat Pump Heating } kWh_{\text{savings}} = kBTUh \times \left(\frac{1}{\text{Old COP}} - \frac{1}{\text{New COP}} \right) \times \frac{\text{Heating EFLH}}{3.413}$$

Where (reference Table 7 for efficiency values):

Old EER/COP = For early retirement (ER) projects select efficiency in year which corresponds to equipment's manufactured year. For ROB select efficiency in row labeled ROB. For new construction select efficiency in row labeled new construction.

New EER/COP New equipment AHRI rated efficiency which must meet or exceed the minimum efficiency

Heating /Cooling EFLH See Table 3 - Heating and Cooling EFLH

The equations above apply to ROB and NC retrofit projects. To calculate early retirement projects savings see section titled "Saving Adjusted for Early Retirement Projects".

Room Air Conditioners (RAC)

$$Demand\ Savings(kW) = Tons \times \left(\frac{12}{Old\ EER} - \frac{12}{New\ EER} \right) \times 0.86$$

$$Energy\ Savings(kWh) = Tons \times \left(\frac{12}{Old\ EER} - \frac{12}{New\ EER} \right) \times Cooling\ EFLH$$

Where (reference Table 8 for efficiency values):

Old EER/COP = For early retirement (ER) projects select efficiency in year which corresponds to equipment’s manufactured year. For ROB select efficiency in row labeled ROB. For new construction select efficiency in row labeled new construction.

New EER/COP New equipment AHRI rated efficiency which must meet or exceed the minimum efficiency

Heating /Cooling EFLH See Table 3 - Heating and Cooling EFLH

The equations above apply to ROB and NC retrofit projects. To calculate early retirement projects savings see section titled “Saving Adjusted for Early Retirement Projects”.

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Air and Water Cooled Packaged Chillers

$$\text{Demand Savings}(kW) = \text{Tons} \times \left(\frac{1}{\text{Old Full Load COP}} - \frac{1}{\text{New Full Load COP}} \right) \times \frac{\text{Cooling EFLH}}{3.413}$$

$$\text{Energy Savings}(kWh) = \text{Tons} \times \left(\frac{1}{\text{Old Partload COP}} - \frac{1}{\text{New Partload COP}} \right) \times \frac{\text{Cooling EFLH}}{3.413}$$

Where (reference Table 9 for efficiency values):

Old COP = For early retirement (ER) projects select efficiency in year which corresponds to equipment's manufactured year. For ROB select efficiency in row labeled ROB. For new construction select efficiency in row labeled new construction.

New COP New equipment AHRI rated efficiency which must meet or exceed the minimum efficiency

Heating /Cooling EFLH See Table 3 - Heating and Cooling EFLH

The equations above apply to ROB and NC retrofit projects. To calculate early retirement projects savings see section titled "Saving Adjusted for Early Retirement Projects".

Calculation Example

Replace on Burnout (ROB) Scenario

Consider a 5-ton split system manufactured in 1990 installed at a School building type in New Orleans, which is being replaced upon the burnout of the unit. The system replacing the unit has the same capacity, but has an installed system efficiency of 15 SEER and 13 EER. Other important inputs are the current adjusted efficiency standards for a 5-ton split system (12.44 SEER and 10.7 EER) and the Equivalent Full Load Hours for School (1546 hours). The savings are calculated using

Equation 3 and Equation 4.

$$Demand\ Savings(kW_{ROB}) = 5ton \times \left(\frac{12}{10.7\ EER} - \frac{12}{13\ EER} \right) \times 0.86 = 0.85\ kW$$

$$Energy\ Savings(kWh_{ROB}) = 5ton \times \left(\frac{12}{12.44\ SEER} - \frac{12}{15\ SEER} \right) \times 1546\ hrs = 1273\ kWh$$

New Construction (NC) Scenario

Consider the same new unit installed as a new construction project. For this application, the NC inputs are used (11.1 EER and 13 SEER). These inputs are used in

Equation 3 and Equation 4.

$$Demand\ Savings(kW_{NC}) = 5ton \times \left(\frac{12}{11.1\ EER} - \frac{12}{13\ EER} \right) \times 0.86 = .68\ kW$$

$$Energy\ Savings(kWh_{NC}) = 5ton \times \left(\frac{12}{13\ SEER} - \frac{12}{15\ SEER} \right) \times 1546\ hrs = 951\ kWh$$

Early Retirement (ER) Scenario

Consider a 5-ton split system manufactured in 2005 installed at a School building type in New Orleans, which is being replaced despite being in reasonable operating condition. The system replacing the unit has the same capacity, but has an installed system efficiency of 15 SEER and 13 EER. Other important inputs are the current adjusted efficiency standards for a 5-ton split system (12.44 SEER and 10.7 EER) and the Equivalent Full Load Hours for School (1546 hours). The EUL for Unitary AC Equipment is 15 years, and the RUL for the 7 year old unit is 8.2 years.

Equation 3 and Equation 4 are used to compute the inputs which are utilized by Equation 1 and Equation 2 to calculate the savings.

$$Demand\ Savings(kW_{ER}) = 5ton \times \left(\frac{12}{9\ EER} - \frac{12}{13\ EER} \right) \times 0.86 = 1.76\ kW$$

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$$\text{Energy Savings}(kWh_{ER}) = 5\text{ton} \times \left(\frac{12}{10 SEER} - \frac{12}{15 SEER} \right) \times 1546 \text{ hrs} = 3092 \text{ kWh}$$

$$\text{Weighted ER Measure Savings (kW)} = \frac{1.76 \text{ kW} \times 8.2\text{yr} + 0.85 \text{ kW} \times (15\text{yr} - 8.2\text{yr})}{15\text{yr}} = 1.35 \text{ kW}$$

$$\text{Weighted ER Measure Savings (kWh)} = \frac{3092\text{kWh} \times 8.2\text{yr} + 1273\text{kWh} \times (15\text{yr} - 8.2\text{yr})}{15} = 2267 \text{ kWh}$$

Table 4 - Efficiency Levels for Unitary Air Conditioning Equipment

Manuf. Year ^f	Split System <65,000 Btu/h			Package System < 65k Btu/h			All Systems ≥ 65k and <135k Btu/h ⁵			All Systems ≥ 135k and <240k Btu/h ⁵			All Systems ≥ 240k and <760k Btu/h ⁵			All Systems > 760k Btu/h ⁵			Applicable Standard
	EER ^a	SEER	SEERadj ^b	EER ^a	SEER	SEERadj ^b	EER	IEER or IPLV	IEERadj ^d	EER	IEER or IPLV	IEERadj ^d	EER	IEER or IPLV	IEERadj ^d	EER	IEER or IPLV	IEERadj ^d	
1990	9.0	10	10	8.8	9.7	9.7	8.9	8.3 IPLV	9.1	8	8.3 IPLV	8.2	8	7.0 IPLV	8.1	7.8	7.0 IPLV	7.9	ASHRAE 90.1-1989
1991	9.0	10	10	8.8	9.7	9.7	8.9	8.3 IPLV	9.1	8	8.3 IPLV	8.2	8	7.0 IPLV	8.1	7.8	7.0 IPLV	7.9	ASHRAE 90.1-1989
1992	9.0	10	10	8.8	9.7	9.7	8.9	8.3 IPLV	9.1	8.3	8.3 IPLV	8.5	8.3	7.3 IPLV	8.4	8.0	7.3 IPLV	8.1	ASHRAE 90.1-1989 (as of Jan. 1, 1992)
1993	9.0	10	10	8.8	9.7	9.7	8.9	8.3 IPLV	9.1	8.3	8.3 IPLV	8.5	8.3	7.3 IPLV	8.4	8.0	7.3 IPLV	8.1	ASHRAE 90.1-1989 (as of Jan. 1, 1992)
1994	9.0	10	10	8.8	9.7	9.7	8.9	8.3 IPLV	9.1	8.3	8.3 IPLV	8.5	8.3	7.3 IPLV	8.4	8.0	7.3 IPLV	8.1	ASHRAE 90.1-1989 (as of Jan. 1, 1992)
1995	9.0	10	10	8.8	9.7	9.7	8.9	8.3 IPLV	9.1	8.3	8.3 IPLV	8.5	8.3	7.3 IPLV	8.4	8.0	7.3 IPLV	8.1	ASHRAE 90.1-1989 (as of Jan. 1, 1992)
1996	9.0	10	10	8.8	9.7	9.7	8.9	8.3 IPLV	9.1	8.3	8.3 IPLV	8.5	8.3	7.3 IPLV	8.4	8.0	7.3 IPLV	8.1	ASHRAE 90.1-1989 (as of Jan. 1, 1992)
1997	9.0	10	10	8.8	9.7	9.7	8.9	8.3 IPLV	9.1	8.3	8.3 IPLV	8.5	8.3	7.3 IPLV	8.4	8.0	7.3 IPLV	8.1	ASHRAE 90.1-1989 (as of Jan. 1, 1992)
1998	9.0	10	10	8.8	9.7	9.7	8.9	8.3 IPLV	9.1	8.3	8.3 IPLV	8.5	8.3	7.3 IPLV	8.4	8.0	7.3 IPLV	8.1	ASHRAE 90.1-1989 (as of Jan. 1, 1992)
1999	9.0	10	10	8.8	9.7	9.7	8.9	n/a	9.1	8.3	n/a	8.5	8.3	7.3 IPLV	8.4	8.0	7.3 IPLV	8.1	ASHRAE 90.1-1999
2000	9.0	10	10	8.8	9.7	9.7	8.9	n/a	9.1	8.3	n/a	8.5	8.3	7.3 IPLV	8.4	8.0	7.3 IPLV	8.1	ASHRAE 90.1-1999
2001	9.0	10	10	8.8	9.7	9.7	8.9	n/a	9.1	8.3	n/a	8.5	8.3	7.3 IPLV	8.4	8.0	7.3 IPLV	8.1	ASHRAE 90.1-1999
2002	9.0	10	10	8.8	9.7	9.7	10.1	n/a	10.3	9.5	n/a	9.7	9.3	9.5 IPLV	9.4	9.0	9.2 IPLV	9.1	ASHRAE 90.1-1999 (as of 10/29/2001)
2003	9.0	10	10	8.8	9.7	9.7	10.1	n/a	10.3	9.5	n/a	9.7	9.3	9.5 IPLV	9.4	9.0	9.2 IPLV	9.1	ASHRAE 90.1-1999 (as of 10/29/2001)
2004	9.0	10	10	8.8	9.7	9.7	10.1	n/a	10.3	9.5	n/a	9.7	9.3	9.5 IPLV	9.4	9.0	9.2 IPLV	9.1	ASHRAE 90.1-2004
2005	9.0	10	10	8.8	9.7	9.7	10.1	n/a	10.3	9.5	n/a	9.7	9.3	9.5 IPLV	9.4	9.0	9.2 IPLV	9.1	ASHRAE 90.1-2004
2006 ^a	10.7	13	12.44	10.7	13	12.44	10.1	n/a	10.3	9.5	n/a	9.7	9.3	9.5 IPLV	9.4	9.0	9.2 IPLV	9.1	Federal Standard/ASHRAE 90.1-2004 (as of 1/23/2006) ^b
2007 ^b	10.7	13	12.44	10.7	13	12.44	10.1	n/a	10.3	9.5	n/a	9.7	9.3	9.5 IPLV	9.4	9.0	9.2 IPLV	9.1	Federal Standard/ASHRAE 90.1-2007 (as of 1/23/2006) ^b
2008 ^c	10.7	13	12.44	10.7	13	12.44	10.1	n/a	10.3	9.5	n/a	9.7	9.3	9.5 IPLV	9.4	9.0	9.2 IPLV	9.1	Federal Standard/ASHRAE 90.1-2007 (as of 1/23/2006) ^b
2009 ^c	10.7	13	12.44	10.7	13	12.44	10.1	n/a	10.3	9.5	n/a	9.7	9.3	9.5 IPLV	9.4	9.0	9.2 IPLV	9.1	Federal Standard/ASHRAE 90.1-2007 (as of 1/23/2006) ^b
2010 ^d	10.7	13	12.44	10.7	13	12.44	11.0	11.2 IER	11.2	10.8	11.0 IER	11.0	9.8	9.9 IER	9.9	9.5	9.6 IER	9.6	Federal Standard/ASHRAE 90.1-2007 (as of 1/1/2010) ^e
2011 ^e	10.7	13	12.44	10.7	13	12.44	11.0	11.2 IER	11.2	10.8	11.0 IER	11.0	9.8	9.9 IER	9.9	9.5	9.6 IER	9.6	Federal Standard/ASHRAE 90.1-2007 (as of 1/1/2010) ^e
2012 ^f	10.7	13	12.44	10.7	13	12.44	11.0	11.2 IER	11.2	10.8	11.0 IER	11.0	9.8	9.9 IER	9.9	9.5	9.6 IER	9.6	Federal Standard/ASHRAE 90.1-2007 (as of 1/1/2010) ^e
ROB ^g	10.7	13	12.44	10.7	13	12.44	11.0	11.2 IER	11.2	10.8	11.0 IER	11.0	9.8	9.9 IER	9.9	9.5	9.6 IER	9.6	Federal Standard/ASHRAE 90.1-2007 (as of 1/1/2010) ^e
NC	11.1	13	13	11.1	13	13	11.0	11.2 IER	11.2	10.8	11.0 IER	11.0	9.8	9.9 IER	9.9	9.5	9.6 IER	9.6	Federal Standard/ASHRAE 90.1-2007 (as of 1/1/2010)
Min Efficiency	12.5	15.0	15	12	15.0	15	12.0	13.8 IER	13.8	12.0	13.0 IER	13.0	10.6	12.1 IER	12.1	10.2	11.4 IER	11.4	CEE Tier ²

a. For equipment under 65k Btu/h, EER = SEERadj / (0.697 + 2.0394)
 b. All equipment under 65k Btu/h, the 13SEER baseline was adjusted to 12.44 to account for partial system changeout (e.g. Compressor or Condensing Unit Only), for ROB and existing equipment retrofits.
 c. All efficiencies are based on "All Other" heating section type, if heating section is "Electric Resistance or None", add 0.2 to all efficiency values.
 d. Equipment manufactured prior to 2010 and with capacities ≥ 65k and <240k Btu/h an adjusted IEER (IEERadj) = EER + 0.2).
 e. Equipment manufactured prior to 2010 and with capacities ≥ 240k Btu/h an adjusted IEER (IEERadj) = EER + 0.1).
 f. Minimum Efficiency based on CEE Commercial Unitary AC and HP Specification Tier 2, effective 1/6/2012.
 g. For split-dx equipment manufactured year's based on outdoor condensing unit.

Table 5 - Efficiency Levels for Unitary Heat Pump Equipment

Manuf. Year ^h	Split System < 65,000 Btu/h				Package System < 65k Btu/h				All Systems ≥ 65k < 135k Btu/h ^e				All Systems ≥ 135k and < 240k Btu/h ^e				All Systems ≥ 240k Btu/h ^e				Applicable Standard
	EER ^a	SEER	SEERadj ^b	HSPF	EER ^a	SEER	SEERadj ^b	HSPF	EER	IEER or IPLV	IEERadj ^c	COP ^f	EER	IEER or IPLV	IEERadj ^c	COP ^f	EER	IEER or IPLV	IEERadj ^c	COP ^f	
1990	9.0	10	10	6.8	8.8	9.7	6.6	8.9	8.3 IPLV	9.1	3	8	7.0 IPLV	8.1	2.8	8	7.0 IPLV	8.1	2.8	ASHRAE 90.1-1989	
1991	9.0	10	10	6.8	8.8	9.7	6.6	8.9	8.3 IPLV	9.1	3	8	7.0 IPLV	8.1	2.8	8	7.0 IPLV	8.1	2.8	ASHRAE 90.1-1989	
1992	9.0	10	10	6.8	8.8	9.7	6.6	8.9	8.3 IPLV	9.1	3	8.3	7.3 IPLV	8.4	2.9	8.3	7.3 IPLV	8.4	2.9	ASHRAE 90.1-1989 (as of Jan. 1, 1992)	
1993	9.0	10	10	6.8	8.8	9.7	6.6	8.9	8.3 IPLV	9.1	3	8.3	7.3 IPLV	8.4	2.9	8.3	7.3 IPLV	8.4	2.9	ASHRAE 90.1-1989 (as of Jan. 1, 1992)	
1994	9.0	10	10	6.8	8.8	9.7	6.6	8.9	8.3 IPLV	9.1	3	8.3	7.3 IPLV	8.4	2.9	8.3	7.3 IPLV	8.4	2.9	ASHRAE 90.1-1989 (as of Jan. 1, 1992)	
1995	9.0	10	10	6.8	8.8	9.7	6.6	8.9	8.3 IPLV	9.1	3	8.3	7.3 IPLV	8.4	2.9	8.3	7.3 IPLV	8.4	2.9	ASHRAE 90.1-1989 (as of Jan. 1, 1992)	
1996	9.0	10	10	6.8	8.8	9.7	6.6	8.9	8.3 IPLV	9.1	3	8.3	7.3 IPLV	8.4	2.9	8.3	7.3 IPLV	8.4	2.9	ASHRAE 90.1-1989 (as of Jan. 1, 1992)	
1997	9.0	10	10	6.8	8.8	9.7	6.6	8.9	8.3 IPLV	9.1	3	8.3	7.3 IPLV	8.4	2.9	8.3	7.3 IPLV	8.4	2.9	ASHRAE 90.1-1989 (as of Jan. 1, 1992)	
1998	9.0	10	10	6.8	8.8	9.7	6.6	8.9	8.3 IPLV	9.1	3	8.3	7.3 IPLV	8.4	2.9	8.3	7.3 IPLV	8.4	2.9	ASHRAE 90.1-1989 (as of Jan. 1, 1992)	
1999	9.0	10	10	6.8	8.8	9.7	6.6	8.9	n/a	9.1	3	8.3	n/a	8.4	2.9	8.3	7.3 IPLV	8.4	2.9	ASHRAE 90.1-1999	
2000	9.0	10	10	6.8	8.8	9.7	6.6	8.9	n/a	9.1	3.2	8.3	n/a	8.4	3.1	8.3	7.3 IPLV	8.4	3.1	ASHRAE 90.1-1999	
2001	9.0	10	10	6.8	8.8	9.7	6.6	8.9	n/a	10.1	3.2	9.1	n/a	9.2	3.1	8.8	9.0 IPLV	8.9	3.1	ASHRAE 90.1-1999 (as of 10/29/2001)	
2002	9.0	10	10	6.8	8.8	9.7	6.6	8.9	n/a	10.1	3.2	9.1	n/a	9.2	3.1	8.8	9.0 IPLV	8.9	3.1	ASHRAE 90.1-1999 (as of 10/29/2001)	
2003	9.0	10	10	6.8	8.8	9.7	6.6	8.9	n/a	10.1	3.2	9.1	n/a	9.2	3.1	8.8	9.0 IPLV	8.9	3.1	ASHRAE 90.1-1999 (as of 10/29/2001)	
2004	9.0	10	10	6.8	8.8	9.7	6.6	8.9	n/a	10.1	3.2	9.1	n/a	9.2	3.1	8.8	9.0 IPLV	8.9	3.1	ASHRAE 90.1-2004	
2005	9.0	10	10	6.8	8.8	9.7	6.6	8.9	n/a	10.1	3.2	9.1	n/a	9.2	3.1	8.8	9.0 IPLV	8.9	3.1	ASHRAE 90.1-2004	
2006 ^a	10.7	13	12.44	7.7	10.7	13	12.44	7.7	9.9	10.1	3.2	9.1	n/a	9.2	3.1	8.8	9.0 IPLV	8.9	3.1	Federal Standard/ASHRAE 90.1-2004 (as of 1/23/2006) ^b	
2007 ^a	10.7	13	12.44	7.7	10.7	13	12.44	7.7	9.9	10.1	3.2	9.1	n/a	9.2	3.1	8.8	9.0 IPLV	8.9	3.1	Federal Standard/ASHRAE 90.1-2007 (as of 1/1/2010) ^b	
2008 ^a	10.7	13	12.44	7.7	10.7	13	12.44	7.7	9.9	10.1	3.2	9.1	n/a	9.2	3.1	8.8	9.0 IPLV	8.9	3.1	Federal Standard/ASHRAE 90.1-2007 (as of 1/23/2006) ^b	
2009 ^a	10.7	13	12.44	7.7	10.7	13	12.44	7.7	9.9	10.1	3.2	9.1	n/a	9.2	3.1	8.8	9.0 IPLV	8.9	3.1	Federal Standard/ASHRAE 90.1-2007 (as of 1/23/2006) ^b	
2010 ^a	10.7	13	12.44	7.7	10.7	13	12.44	7.7	10.8	11.0 IER	11.0	3.3	10.4	10.5 IER	10.5	3.2	9.3	9.4 IER	9.4	3.2	Federal Standard/ASHRAE 90.1-2007 (as of 1/1/2010) ^b
2011 ^a	10.7	13	12.44	7.7	10.7	13	12.44	7.7	10.8	11.0 IER	11	3.3	10.4	10.5 IER	10.5	3.2	9.3	9.4 IER	9.4	3.2	Federal Standard/ASHRAE 90.1-2007 (as of 1/1/2010) ^b
2012 ^a	10.7	13	12.44	7.7	10.7	13	12.44	7.7	10.8	11.0 IER	11	3.3	10.4	10.5 IER	10.5	3.2	9.3	9.4 IER	9.4	3.2	Federal Standard/ASHRAE 90.1-2007 (as of 1/1/2010) ^b
ROB ^a	10.7	13	12.44	7.7	10.7	13	12.44	7.7	10.8	11.0 IER	11	3.3	10.4	10.5 IER	10.5	3.2	9.3	9.4 IER	9.4	3.2	Federal Standard/ASHRAE 90.1-2007 (as of 1/1/2010)
New Construction	11.1	13	13	7.7	11.1	13	13	7.7	10.8	11.0 IER	11	3.3	10.4	10.5 IER	10.5	3.2	9.3	9.4 IER	9.4	3.2	Federal Standard/ASHRAE 90.1-2007 (as of 1/1/2010)
Minimum Efficiency	12.5	15.0	15	9.0	12	15	8.5	11.1	12.1 IER	12.1	3.4	10.7	11.7 IER	11.7	3.2	10.1	10.7 IER	10.7	3.2	CIE Tier 2 ^g	

a. For equipment under 65k Btu/h, EER = SEERadj * 2.0394
b. All equipment under 65k Btu/h, the 13 SEER baseline was adjusted to 12.44 to account for partial system changeout (e.g. Compressor or Condensing Unit Only), for ROB and existing equipment retrofits.
c. All efficiencies are based on "All Other" heating section type. If heating section is "Electric Resistance or Non-e" add 0.2 to all efficiency values.
d. Equipment manufactured prior to 2010 and with capacities ≥ 65k and < 135k Btu/h an adjusted IER (EERadj = EER + 0.2).
e. Equipment manufactured prior to 2010 and with capacities ≥ 135k Btu/h an adjusted IER (EERadj = EER + 0.1).
f. COP is based on 47°F db/43°F wb outdoor air.
g. Minimum Efficiency based on CEE Commercial Unitary AC and HP Specification Tier 1 or Tier 2 (where applicable), effective 1/6/2012.
h. For split-dx equipment manufactured year is based on outdoor condensing unit.

Table 6 - Efficiency Level for Packaged Terminal AC and HP (PTAC & PTHP)

Manuf. Year	Air Conditioners - Cooling Mode		Heat Pumps - Cooling Mode	Heat Pumps - Heating Mode	Applicable Standard
	EER				
1990	10-(0.16* CAP/1000)		10-(0.16* CAP/1000)	2.9-(0.026* CAP/1000)	ASHRAE 90.1--1989
1991	10-(0.16* CAP/1000)		10-(0.16* CAP/1000)	2.9-(0.026* CAP/1000)	ASHRAE 90.1--1989
1992	10-(0.16* CAP/1000)		10-(0.16* CAP/1000)	2.9-(0.026* CAP/1000)	ASHRAE 90.1--1989
1993	10-(0.16* CAP/1000)		10-(0.16* CAP/1000)	2.9-(0.026* CAP/1000)	ASHRAE 90.1--1989
1994	10-(0.16* CAP/1000)		10-(0.16* CAP/1000)	2.9-(0.026* CAP/1000)	ASHRAE 90.1--1989
1995	10-(0.16* CAP/1000)		10-(0.16* CAP/1000)	2.9-(0.026* CAP/1000)	ASHRAE 90.1--1989
1996	10-(0.16* CAP/1000)		10-(0.16* CAP/1000)	2.9-(0.026* CAP/1000)	ASHRAE 90.1--1989
1997	10-(0.16* CAP/1000)		10-(0.16* CAP/1000)	2.9-(0.026* CAP/1000)	ASHRAE 90.1--1989
1998	10-(0.16* CAP/1000)		10-(0.16* CAP/1000)	2.9-(0.026* CAP/1000)	ASHRAE 90.1--1989
1999	10-(0.16* CAP/1000)		10-(0.16* CAP/1000)	2.9-(0.026* CAP/1000)	ASHRAE 90.1--1999
2000	10-(0.16* CAP/1000)		10-(0.16* CAP/1000)	2.9-(0.026* CAP/1000)	ASHRAE 90.1--1999
2001	10-(0.16* CAP/1000)		10-(0.16* CAP/1000)	2.9-(0.026* CAP/1000)	ASHRAE 90.1--1999
2002	10.9-(0.213* CAP/1000)		10.8-(0.213* CAP/1000)	2.9-(0.026* CAP/1000)	ASHRAE 90.1--1999 (as of 10/29/2001)
2003	10.9-(0.213* CAP/1000)		10.8-(0.213* CAP/1000)	2.9-(0.026* CAP/1000)	ASHRAE 90.1--1999 (as of 10/29/2001)
2004	10.9-(0.213* CAP/1000)		10.8-(0.213* CAP/1000)	2.9-(0.026* CAP/1000)	ASHRAE 90.1--2004
2005	10.9-(0.213* CAP/1000)		10.8-(0.213* CAP/1000)	2.9-(0.026* CAP/1000)	ASHRAE 90.1--2004
2006	10.9-(0.213* CAP/1000)		10.8-(0.213* CAP/1000)	2.9-(0.026* CAP/1000)	Federal Standard/ASHRAE 90.1--2004
2007	10.9-(0.213* CAP/1000)		10.8-(0.213* CAP/1000)	2.9-(0.026* CAP/1000)	Federal Standard/ASHRAE 90.1--2007
2008	10.9-(0.213* CAP/1000)		10.8-(0.213* CAP/1000)	2.9-(0.026* CAP/1000)	Federal Standard/ASHRAE 90.1--2007
2009	10.9-(0.213* CAP/1000)		10.8-(0.213* CAP/1000)	2.9-(0.026* CAP/1000)	Federal Standard/ASHRAE 90.1--2007
2010	10.9-(0.213* CAP/1000)		10.8-(0.213* CAP/1000)	2.9-(0.026* CAP/1000)	Federal Standard/ASHRAE 90.1--2007 (as of 1/1/2010)
2011	10.9-(0.213* CAP/1000)		10.8-(0.213* CAP/1000)	2.9-(0.026* CAP/1000)	Federal Standard/ASHRAE 90.1--2007 (as of 1/1/2010)
2012	10.9-(0.213* CAP/1000)		10.8-(0.213* CAP/1000)	2.9-(0.026* CAP/1000)	Federal Standard/ASHRAE 90.1--2007 (as of 1/1/2010)
ROB	10.9-(0.213* CAP/1000)		10.8-(0.213* CAP/1000)	2.9-(0.026* CAP/1000)	Federal Standard/ASHRAE 90.1--2007 (as of 1/1/2010)
NC	12.5-(0.213* CAP/1000)		12.3-(0.213* CAP/1000)	3.2-(0.026* CAP/1000)	Federal Standard/ASHRAE 90.1--2007 (as of 1/1/2010)
Minimum Efficiency	13.8-(0.3* CAP/1000)		14-(0.3* CAP/1000)	3.7-(0.052* CAP/1000)	ASHRAE 90.1--2010 (as of 10/8/2012)

CAP = Capacity in Btu/h. If less than 7,000, use 7,000 for calculations. If more than 15,000, use 15,000 for calculations.
 All efficiency based on 95degF db outdoor temperature

Table 7 - Efficiency Levels for Single Package Vertical Air Conditioners and Heat Pumps (SPVAC & SPVHP)

Manuf. Year	SPVAC - Cooling Mode			SPVHP - Cooling Mode			SPVHP - Heating Mode			Applicable Standard
	< 65,000 Btu/h	>=65,000, < 135,000	>= 135,000, < 240,000	< 65,000 Btu/h	>=65,000, < 135,000	>= 135,000, < 240,000	< 65,000 Btu/h	>=65,000, < 135,000	>= 135,000, < 240,000	
1990	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ASHRAE 90.1--1989
1991	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ASHRAE 90.1--1989
1992	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ASHRAE 90.1--1989
1993	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ASHRAE 90.1--1989
1994	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ASHRAE 90.1--1989
1995	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ASHRAE 90.1--1989
1996	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ASHRAE 90.1--1989
1997	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ASHRAE 90.1--1989
1998	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ASHRAE 90.1--1989
1999	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ASHRAE 90.1--1999
2000	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ASHRAE 90.1--1999
2001	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ASHRAE 90.1--1999
2002	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ASHRAE 90.1--1999 (as of 10/29/2001)
2003	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ASHRAE 90.1--1999 (as of 10/29/2001)
2004	8.6	8.6	8.6	8.6	8.6	8.6	2.7	2.7	2.7	ASHRAE 90.1--2004
2005	8.6	8.6	8.6	8.6	8.6	8.6	2.7	2.7	2.7	ASHRAE 90.1--2004
2006	8.6	8.6	8.6	8.6	8.6	8.6	2.7	2.7	2.7	Federal Standard/ASHRAE 90.1--2004
2007	9.0	8.9	8.6	9.0	8.9	8.6	3.0	3.0	2.9	Federal Standard/ASHRAE 90.1--2007
2008	9.0	8.9	8.6	9.0	8.9	8.6	3.0	3.0	2.9	Federal Standard/ASHRAE 90.1--2007
2009	9.0	8.9	8.6	9.0	8.9	8.6	3.0	3.0	2.9	Federal Standard/ASHRAE 90.1--2007
2010	9.0	8.9	8.6	9.0	8.9	8.6	3.0	3.0	2.9	Federal Standard/ASHRAE 90.1--2007 (as of 1/1/2010)
2011	9.0	8.9	8.6	9.0	8.9	8.6	3.0	3.0	2.9	Federal Standard/ASHRAE 90.1--2007 (as of 1/1/2010)
2012	9.0	8.9	8.6	9.0	8.9	8.6	3.0	3.0	2.9	Federal Standard/ASHRAE 90.1--2007 (as of 1/1/2010)
ROB	9.0	8.9	8.6	9.0	8.9	8.6	3.0	3.0	2.9	Federal Standard/ASHRAE 90.1--2007 (as of 1/1/2010)
NC	9.0	8.9	8.6	9.0	8.9	8.6	3.0	3.0	2.9	Federal Standard/ASHRAE 90.1--2007 (as of 1/1/2010)
Minimum Efficiency	9.0	8.9	8.6	9.0	8.9	8.6	3.0	3.0	2.9	ASHRAE 90.1--2010

* EER - 95db/75wb outdoor air

** COP - 47db/43wb outdoor air

Table 8 - Efficiency Levels for Room Air Conditioners & Room Heat Pumps

Manuf. Year	Without Reverse Cycle, With Louvered Sides					Without Reverse Cycle, Without Louvered Sides					With Reverse Cycle (HRP), With Louvered Sides		With Reverse Cycle (HRP), Without Louvered Sides		Applicable Standard
	< 6,000 Btu/h	>= 6,000, < 8,000 Btu/h	>= 8,000, < 14,000 Btu/h	>= 14,000, < 20,000 Btu/h	>= 20,000 Btu/h	< 6,000 Btu/h	>= 6,000, < 8,000 Btu/h	>= 8,000, < 20,000 Btu/h	>= 20,000 Btu/h	< 20,000 Btu/h	>= 20,000 Btu/h	< 14,000 Btu/h	>= 14,000 Btu/h		
1990	8.0	8.5	9.0	8.8	8.2	8.0	8.5	8.5	8.2	8.5	8.5	8.0	8.0	ASHRAE 90.1--1989	
1991	8.0	8.5	9.0	8.8	8.2	8.0	8.5	8.5	8.2	8.5	8.5	8.0	8.0	ASHRAE 90.1--1989	
1992	8.0	8.5	9.0	8.8	8.2	8.0	8.5	8.5	8.2	8.5	8.5	8.0	8.0	ASHRAE 90.1--1989	
1993	8.0	8.5	9.0	8.8	8.2	8.0	8.5	8.5	8.2	8.5	8.5	8.0	8.0	ASHRAE 90.1--1989	
1994	8.0	8.5	9.0	8.8	8.2	8.0	8.5	8.5	8.2	8.5	8.5	8.0	8.0	ASHRAE 90.1--1989	
1995	8.0	8.5	9.0	8.8	8.2	8.0	8.5	8.5	8.2	8.5	8.5	8.0	8.0	ASHRAE 90.1--1989	
1996	8.0	8.5	9.0	8.8	8.2	8.0	8.5	8.5	8.2	8.5	8.5	8.0	8.0	ASHRAE 90.1--1989	
1997	8.0	8.5	9.0	8.8	8.2	8.0	8.5	8.5	8.2	8.5	8.5	8.0	8.0	ASHRAE 90.1--1989	
1998	8.0	8.5	9.0	8.8	8.2	8.0	8.5	8.5	8.2	8.5	8.5	8.0	8.0	ASHRAE 90.1--1989	
1999	8.0	8.5	9.0	8.8	8.2	8.0	8.5	8.5	8.2	8.5	8.5	8.0	8.0	ASHRAE 90.1--1999	
2000	8.0	8.5	9.0	8.8	8.2	8.0	8.5	8.5	8.2	8.5	8.5	8.0	8.0	ASHRAE 90.1--1999	
2001	8.0	8.5	9.0	8.8	8.2	8.0	8.5	8.5	8.2	8.5	8.5	8.0	8.0	ASHRAE 90.1--1999	
2002	9.7	9.7	9.8	9.7	8.5	9.0	9.0	8.5	8.5	9.0	8.5	8.5	8.0	ASHRAE 90.1--1999 (as of 10/29/2001)	
2003	9.7	9.7	9.8	9.7	8.5	9.0	9.0	8.5	8.5	9.0	8.5	8.5	8.0	ASHRAE 90.1--1999 (as of 10/29/2001)	
2004	9.7*	9.7	9.8	9.7*	8.5	9.0	9.0	8.5	8.5	9.0	8.5	8.5	8.0	ASHRAE 90.1--2004	
2005	9.7*	9.7	9.8	9.7*	8.5	9.0	9.0	8.5	8.5	9.0	8.5	8.5	8.0	ASHRAE 90.1--2004	
2006	9.7*	9.7	9.8	9.7*	8.5	9.0	9.0	8.5	8.5	9.0	8.5	8.5	8.0	Federal Standard/ASHRAE 90.1--2004	
2007	9.7*	9.7	9.8	9.7*	8.5	9.0	9.0	8.5	8.5	9.0	8.5	8.5	8.0	Federal Standard/ASHRAE 90.1--2007	
2008	9.7*	9.7	9.8	9.7*	8.5	9.0	9.0	8.5	8.5	9.0	8.5	8.5	8.0	Federal Standard/ASHRAE 90.1--2007	
2009	9.7*	9.7	9.8	9.7*	8.5	9.0	9.0	8.5	8.5	9.0	8.5	8.5	8.0	Federal Standard/ASHRAE 90.1--2007 (as of 1/1/2010)	
2010	9.7*	9.7	9.8	9.7*	8.5	9.0	9.0	8.5	8.5	9.0	8.5	8.5	8.0	Federal Standard/ASHRAE 90.1--2007 (as of 1/1/2010)	
2011	9.7*	9.7	9.8	9.7*	8.5	9.0	9.0	8.5	8.5	9.0	8.5	8.5	8.0	Federal Standard/ASHRAE 90.1--2007 (as of 1/1/2010)	
2012	9.7*	9.7	9.8	9.7*	8.5	9.0	9.0	8.5	8.5	9.0	8.5	8.5	8.0	Federal Standard/ASHRAE 90.1--2007 (as of 1/1/2010)	
ROB	9.7*	9.7	9.8	9.7*	8.5	9.0	9.0	8.5	8.5	9.0	8.5	8.5	8.0	Federal Standard/ASHRAE 90.1--2007 (as of 1/1/2010)	
NC	9.7*	9.7	9.8	9.7*	8.5	9.0	9.0	8.5	8.5	9.0	8.5	8.5	8.0	Federal Standard/ASHRAE 90.1--2007 (as of 1/1/2010)	
Minimum Efficiency	9.7*	9.7*	9.8	9.7*	8.5	9.0	9.0	8.5	8.5	9.0	8.5	8.5	8.0	ASHRAE 90.1--2010	

* Efficiency is in SEER

Table 9 - Efficiency Levels for Air-Cooled Packaged Chillers

Manuf. Year	Air Cooled w. Condensor						Air Cooled w. out Condensor						Applicable Standard
	< 150 Tons			≥150 Tons			< 150 Tons			≥150 Tons			
	Full	IPLV	Rating	Full	IPLV	Rating	Full	IPLV	Rating	Full	IPLV	Rating	
1972 - 1990	2.70	2.80	COP	2.50	2.50	COP	3.10	3.20	COP	3.10	3.20	COP	ASHRAE 90.1--1989
1991	2.70	2.80	COP	2.50	2.50	COP	3.10	3.20	COP	3.10	3.20	COP	ASHRAE 90.1--1989
1992	2.70	2.80	COP	2.50	2.50	COP	3.10	3.20	COP	3.10	3.20	COP	ASHRAE 90.1--1989 (as of Jan. 1, 1992)
1993	2.70	2.80	COP	2.50	2.50	COP	3.10	3.20	COP	3.10	3.20	COP	ASHRAE 90.1--1989 (as of Jan. 1, 1992)
1994	2.70	2.80	COP	2.50	2.50	COP	3.10	3.20	COP	3.10	3.20	COP	ASHRAE 90.1--1989 (as of Jan. 1, 1992)
1995	2.70	2.80	COP	2.50	2.50	COP	3.10	3.20	COP	3.10	3.20	COP	ASHRAE 90.1--1989 (as of Jan. 1, 1992)
1996	2.70	2.80	COP	2.50	2.50	COP	3.10	3.20	COP	3.10	3.20	COP	ASHRAE 90.1--1989 (as of Jan. 1, 1992)
1997	2.70	2.80	COP	2.50	2.50	COP	3.10	3.20	COP	3.10	3.20	COP	ASHRAE 90.1--1989 (as of Jan. 1, 1992)
1998	2.70	2.80	COP	2.50	2.50	COP	3.10	3.20	COP	3.10	3.20	COP	ASHRAE 90.1--1989 (as of Jan. 1, 1992)
1999	2.70	2.80	COP	2.50	2.50	COP	3.10	3.20	COP	3.10	3.20	COP	ASHRAE 90.1--1999
2000	2.70	2.80	COP	2.50	2.50	COP	3.10	3.20	COP	3.10	3.20	COP	ASHRAE 90.1--1999
2001	2.70	2.80	COP	2.50	2.50	COP	3.10	3.20	COP	3.10	3.20	COP	ASHRAE 90.1--1999
2002	2.80	2.80	COP	2.80	2.80	COP	3.10	3.10	COP	3.10	3.10	COP	ASHRAE 90.1--1999 (as of 10/29/2001)
2003	2.80	2.80	COP	2.80	2.80	COP	3.10	3.10	COP	3.10	3.10	COP	ASHRAE 90.1--1999 (as of 10/29/2001)
2004	2.80	3.05	COP	2.80	3.05	COP	3.10	3.45	COP	3.10	3.45	COP	ASHRAE 90.1--2004
2005	2.80	3.05	COP	2.80	3.05	COP	3.10	3.45	COP	3.10	3.45	COP	ASHRAE 90.1--2004
2006	2.80	3.05	COP	2.80	3.05	COP	3.10	3.45	COP	3.10	3.45	COP	Federal Standard/ASHRAE 90.1--2004
2007	2.80	3.05	COP	2.80	3.05	COP	3.10	3.45	COP	3.10	3.45	COP	Federal Standard/ASHRAE 90.1--2007
2008	2.80	3.05	COP	2.80	3.05	COP	3.10	3.45	COP	3.10	3.45	COP	Federal Standard/ASHRAE 90.1--2007
2009	2.80	3.05	COP	2.80	3.05	COP	3.10	3.45	COP	3.10	3.45	COP	Federal Standard/ASHRAE 90.1--2007
2010	2.80	3.05	COP	2.80	3.05	COP	3.10	3.45	COP	3.10	3.45	COP	Federal Standard/ASHRAE 90.1--2007 (as of 1/1/2010)
2011	2.80	3.05	COP	2.80	3.05	COP	3.10	3.45	COP	3.10	3.45	COP	Federal Standard/ASHRAE 90.1--2007 (as of 1/1/2010)
2012	2.80	3.05	COP	2.80	3.05	COP	3.10	3.45	COP	3.10	3.45	COP	Federal Standard/ASHRAE 90.1--2007 (as of 1/1/2010)
ROB	2.80	3.05	COP	2.80	3.05	COP	3.10	3.45	COP	3.10	3.45	COP	Federal Standard/ASHRAE 90.1--2007 (as of 1/1/2010)
NC	2.80	3.05	COP	2.80	3.05	COP	3.10	3.45	COP	3.10	3.45	COP	Federal Standard/ASHRAE 90.1--2007 (as of 1/1/2010)
Minimum Efficiency	9.562	12.50	EER	9.562	12.75	EER	9.562	12.50	EER	9.562	12.75	EER	ASHRAE 90.1--2010

Table 10 - Efficiency Levels for Water Cooled Reciprocating Packaged Chillers

Manuf. Year	Water Cooled Reciprocating											
	<75 Tons Path A			<150 Tons, >=75 tons Path A			<300, >=150 Tons Path A			>=300 Tons Path A		
	Full	IPLV	Rating	Full	IPLV	Rating	Full	IPLV	Rating	Full	IPLV	Rating
1972 - 1990	3.80	3.90	COP	3.80	3.90	COP	4.20	4.50	COP	5.20	5.3a	COP
1991	3.80	3.90	COP	3.80	3.90	COP	4.20	4.50	COP	5.20	5.3a	ASHRAE 90.1--1989
1992	3.80	3.90	COP	3.80	3.90	COP	4.20	4.50	COP	5.20	5.3a	ASHRAE 90.1--1989 (as of Jan. 1, 1992)
1993	3.80	3.90	COP	3.80	3.90	COP	4.20	4.50	COP	5.20	5.3a	ASHRAE 90.1--1989 (as of Jan. 1, 1992)
1994	3.80	3.90	COP	3.80	3.90	COP	4.20	4.50	COP	5.20	5.3a	ASHRAE 90.1--1989 (as of Jan. 1, 1992)
1995	3.80	3.90	COP	3.80	3.90	COP	4.20	4.50	COP	5.20	5.3a	ASHRAE 90.1--1989 (as of Jan. 1, 1992)
1996	3.80	3.90	COP	3.80	3.90	COP	4.20	4.50	COP	5.20	5.3a	ASHRAE 90.1--1989 (as of Jan. 1, 1992)
1997	3.80	3.90	COP	3.80	3.90	COP	4.20	4.50	COP	5.20	5.3a	ASHRAE 90.1--1989 (as of Jan. 1, 1992)
1998	3.80	3.90	COP	3.80	3.90	COP	4.20	4.50	COP	5.20	5.3a	ASHRAE 90.1--1989 (as of Jan. 1, 1992)
1999	3.80	3.90	COP	3.80	3.90	COP	4.20	3.90	COP	3.80	3.90	ASHRAE 90.1--1999
2000	3.80	3.90	COP	3.80	3.90	COP	3.80	3.90	COP	3.80	3.90	ASHRAE 90.1--1999
2001	3.80	3.90	COP	3.80	3.90	COP	3.80	3.90	COP	3.80	3.90	ASHRAE 90.1--1999
2002	4.20	4.65	COP	4.20	4.65	COP	4.20	4.65	COP	4.20	4.65	ASHRAE 90.1--1999 (as of 10/29/2001)
2003	4.20	4.65	COP	4.20	4.65	COP	4.20	4.65	COP	4.20	4.65	ASHRAE 90.1--1999 (as of 10/29/2001)
2004	4.20	5.05	COP	4.20	5.05	COP	4.20	5.05	COP	4.20	5.05	ASHRAE 90.1--2004
2005	4.20	5.05	COP	4.20	5.05	COP	4.20	5.05	COP	4.20	5.05	ASHRAE 90.1--2004
2006	4.20	5.05	COP	4.20	5.05	COP	4.20	5.05	COP	4.20	5.05	Federal Standard/ASHRAE 90.1--2004
2007	4.20	5.05	COP	4.20	5.05	COP	4.20	5.05	COP	4.20	5.05	Federal Standard/ASHRAE 90.1--2007
2008	4.20	5.05	COP	4.20	5.05	COP	4.20	5.05	COP	4.20	5.05	Federal Standard/ASHRAE 90.1--2007
2009	4.20	5.05	COP	4.20	5.05	COP	4.20	5.05	COP	4.20	5.05	Federal Standard/ASHRAE 90.1--2007
2010	4.20	5.05	COP	4.20	5.05	COP	4.20	5.05	COP	4.20	5.05	Federal Standard/ASHRAE 90.1--2007 (as of 1/1/2010)
2011	4.20	5.05	COP	4.20	5.05	COP	4.20	5.05	COP	4.20	5.05	Federal Standard/ASHRAE 90.1--2007 (as of 1/1/2010)
2012	4.20	5.05	COP	4.20	5.05	COP	4.20	5.05	COP	4.20	5.05	Federal Standard/ASHRAE 90.1--2007 (as of 1/1/2010)
ROB	4.20	5.05	COP	4.20	5.05	COP	4.20	5.05	COP	4.20	5.05	Federal Standard/ASHRAE 90.1--2007 (as of 1/1/2010)
NC	4.20	5.05	COP	4.20	5.05	COP	4.20	5.05	COP	4.20	5.05	Federal Standard/ASHRAE 90.1--2007 (as of 1/1/2010)
Minimum Efficiency	0.78	0.63	Path A - kW/ton	0.78	0.62	Path A - kW/ton	0.68	0.58	Path A - kW/ton	0.620	0.540	ASHRAE 90.1--2010
	0.80	0.60	Path B - kW/ton	0.79	0.59	Path B - kW/ton	0.72	0.54	Path B - kW/ton	0.639	0.490	

a - Requirements reduces to 4.7 COP & 4.8 IPLV when R-22 is used or where CFC refrigerators with ozone depletion factors less than or equal to those for R-22 are used

Table 11 - Efficiency Levels for Water Cooled Positive Displacement Packaged Chillers (Rotary Screw & Scroll)

Manuf. Year	Water Cooled - Positive Displacement (Rotary Screw & Scroll)												Applicable Standard				
	<75 Tons Path A				<150 Tons, >=75 Tons Path A				<300, >=150 Tons Path A					>=300 Tons Path A			
	Full	IP/LV	Rating	COP	Full	IP/LV	Rating	COP	Full	IP/LV	Rating	COP		Full	IP/LV	Rating	COP
1972 - 1990	3.80	3.90	COP	3.80	3.80	3.90	COP	4.20	4.50	5.20	5.3a	COP	4.20	4.50	5.20	5.3a	ASHRAE 90.1--1989
1991	3.80	3.90	COP	3.80	3.90	COP	4.20	4.50	5.20	5.3a	COP	4.20	4.50	5.20	5.3a	COP	ASHRAE 90.1--1989
1992	3.80	3.90	COP	3.80	3.90	COP	4.20	4.50	5.20	5.3a	COP	4.20	4.50	5.20	5.3a	COP	ASHRAE 90.1--1989 (as of Jan. 1, 1992)
1993	3.80	3.90	COP	3.80	3.90	COP	4.20	4.50	5.20	5.3a	COP	4.20	4.50	5.20	5.3a	COP	ASHRAE 90.1--1989 (as of Jan. 1, 1992)
1994	3.80	3.90	COP	3.80	3.90	COP	4.20	4.50	5.20	5.3a	COP	4.20	4.50	5.20	5.3a	COP	ASHRAE 90.1--1989 (as of Jan. 1, 1992)
1995	3.80	3.90	COP	3.80	3.90	COP	4.20	4.50	5.20	5.3a	COP	4.20	4.50	5.20	5.3a	COP	ASHRAE 90.1--1989 (as of Jan. 1, 1992)
1996	3.80	3.90	COP	3.80	3.90	COP	4.20	4.50	5.20	5.3a	COP	4.20	4.50	5.20	5.3a	COP	ASHRAE 90.1--1989 (as of Jan. 1, 1992)
1997	3.80	3.90	COP	3.80	3.90	COP	4.20	4.50	5.20	5.3a	COP	4.20	4.50	5.20	5.3a	COP	ASHRAE 90.1--1989 (as of Jan. 1, 1992)
1998	3.80	3.90	COP	3.80	3.90	COP	4.20	4.50	5.20	5.3a	COP	4.20	4.50	5.20	5.3a	COP	ASHRAE 90.1--1989 (as of Jan. 1, 1992)
1999	3.80	3.90	COP	3.80	3.90	COP	4.20	4.50	5.20	5.30	COP	4.20	4.50	5.20	5.30	COP	ASHRAE 90.1--1999
2000	3.80	3.90	COP	3.80	3.90	COP	4.20	4.50	5.20	5.30	COP	4.20	4.50	5.20	5.30	COP	ASHRAE 90.1--1999
2001	3.80	3.90	COP	3.80	3.90	COP	4.20	4.50	5.20	5.30	COP	4.20	4.50	5.20	5.30	COP	ASHRAE 90.1--1999
2002	3.80	3.90	COP	4.45	4.50	COP	4.90	4.95	5.50	5.60	COP	4.90	4.95	5.50	5.60	COP	ASHRAE 90.1--1999 (as of 10/29/2001)
2003	4.45	4.50	COP	4.45	4.50	COP	4.90	4.95	5.50	5.60	COP	4.90	4.95	5.50	5.60	COP	ASHRAE 90.1--1999 (as of 10/29/2001)
2004	4.45	4.50	COP	4.45	4.50	COP	4.90	4.95	5.50	5.60	COP	4.90	4.95	5.50	5.60	COP	ASHRAE 90.1--2004
2005	4.45	5.20	COP	4.45	5.20	COP	4.90	5.60	5.50	6.15	COP	4.90	5.60	5.50	6.15	COP	ASHRAE 90.1--2004
2006	4.45	5.20	COP	4.45	5.20	COP	4.90	5.60	5.50	6.15	COP	4.90	5.60	5.50	6.15	COP	Federal Standard/ASHRAE 90.1--2004
2007	4.45	5.20	COP	4.45	5.20	COP	4.90	5.60	5.50	6.15	COP	4.90	5.60	5.50	6.15	COP	Federal Standard/ASHRAE 90.1--2007
2008	4.45	5.20	COP	4.45	5.20	COP	4.90	5.60	5.50	6.15	COP	4.90	5.60	5.50	6.15	COP	Federal Standard/ASHRAE 90.1--2007
2009	4.45	5.20	COP	4.45	5.20	COP	4.90	5.60	5.50	6.15	COP	4.90	5.60	5.50	6.15	COP	Federal Standard/ASHRAE 90.1--2007
2010	4.45	5.20	COP	4.45	5.20	COP	4.90	5.60	5.50	6.15	COP	4.90	5.60	5.50	6.15	COP	Federal Standard/ASHRAE 90.1--2007 (as of 1/1/2010)
2011	4.45	5.20	COP	4.45	5.20	COP	4.90	5.60	5.50	6.15	COP	4.90	5.60	5.50	6.15	COP	Federal Standard/ASHRAE 90.1--2007 (as of 1/1/2010)
2012	4.45	5.20	COP	4.45	5.20	COP	4.90	5.60	5.50	6.15	COP	4.90	5.60	5.50	6.15	COP	Federal Standard/ASHRAE 90.1--2007 (as of 1/1/2010)
ROB	4.45	5.20	COP	4.45	5.20	COP	4.90	5.60	5.50	6.15	COP	4.90	5.60	5.50	6.15	COP	Federal Standard/ASHRAE 90.1--2007 (as of 1/1/2010)
NC	4.45	5.20	COP	4.45	5.20	COP	4.90	5.60	5.50	6.15	COP	4.90	5.60	5.50	6.15	COP	Federal Standard/ASHRAE 90.1--2007 (as of 1/1/2010)
Minimum Efficiency	0.78	0.63	Path A - kW/ton	0.78	0.62	Path A - kW/ton	0.68	0.58	0.62	0.54	Path A - kW/ton	0.62	0.54	0.62	0.54	Path A - kW/ton	ASHRAE 90.1--2010
	0.80	0.60	Path B - kW/ton	0.79	0.59	Path B - kW/ton	0.72	0.54	0.64	0.49	Path B - kW/ton	0.64	0.49	0.64	0.49	Path B - kW/ton	

a - Requirements reduces to 4.7 COP & 4.8 IP/LV when R-22 is used or where CFC refrigerators with ozone depletion factors less than or equal to those for R-22 are used

**Attachment B: Supporting Documentation from Texas Filing
Addressing T12 Baselines**

o **Excerpts from Texas petition (docket #39146):**

Estimated Useful Life (T12 Fixture with Magnetic Ballast) Methodology

An estimated useful life (EUL) is the typical period of time a given type of equipment is expected to last and provide savings under a given program measure. Occasionally, it is necessary to update EUL's in order to properly account for savings over the life of a measure. It is currently appropriate to update the EUL of T12 lighting fixtures with magnetic ballasts.

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The EUL for retrofits of T12 magnetic ballasts to T5 or T8 linear fluorescent equipment shall be 8.5 years in Program Years 2011 through 2014, based upon the findings of the Commercial Lighting T12 Baseline Analysis provided in Appendix C. Per those findings, beginning in Program Year 2015 all 4-foot and 8-foot linear fluorescent retrofit projects will assume a baseline of standard T8 electronic ballast with 32W lamps or better.

Post-retrofit systems using T-12 electronic ballasts or standard T8 electronic ballasts are not eligible for incentives and all post-retrofit technologies must use reduced wattage T-8 systems or high performance T-8 systems and meet the High Performance and Reduced Wattage lamp and ballast efficiency specifications developed by the Consortium for Energy Efficiency (CEE) as published on the CEE website.⁴ This will be a requirement for all T8 systems.

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⁴ Consortium for Energy Efficiency. *Commercial Programs: Commercial Lighting*. Online. Available: <http://www.cee1.org/com-ll/com-ll-main.php3>. Accessed December 29, 2010.

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Appendix C. T12 Baseline Calculation Methodology

This appendix provides the rationale used to determine the remaining useful life of existing magnetic ballasts existing in the marketplace, and based on this estimated remaining useful life, derives the proposed adjustment to the measure life of a lighting retrofit project in which a T12 fixture is replaced by a T5 or high performance T8 system.

Ballast Life

The “Texas Estimated Useful Life Table” gives the current measure life of linear fluorescent fixtures as 15.5 years.² The value of 15.5 years was taken from the 2003 Navigant US Lighting Study that identified T8 and T5 linear fluorescent fixtures as having a 50,000 hour manufacturer rated life and a weighted-average of 3,211 annual operating hours.

Magnetic Ballast Remaining Life

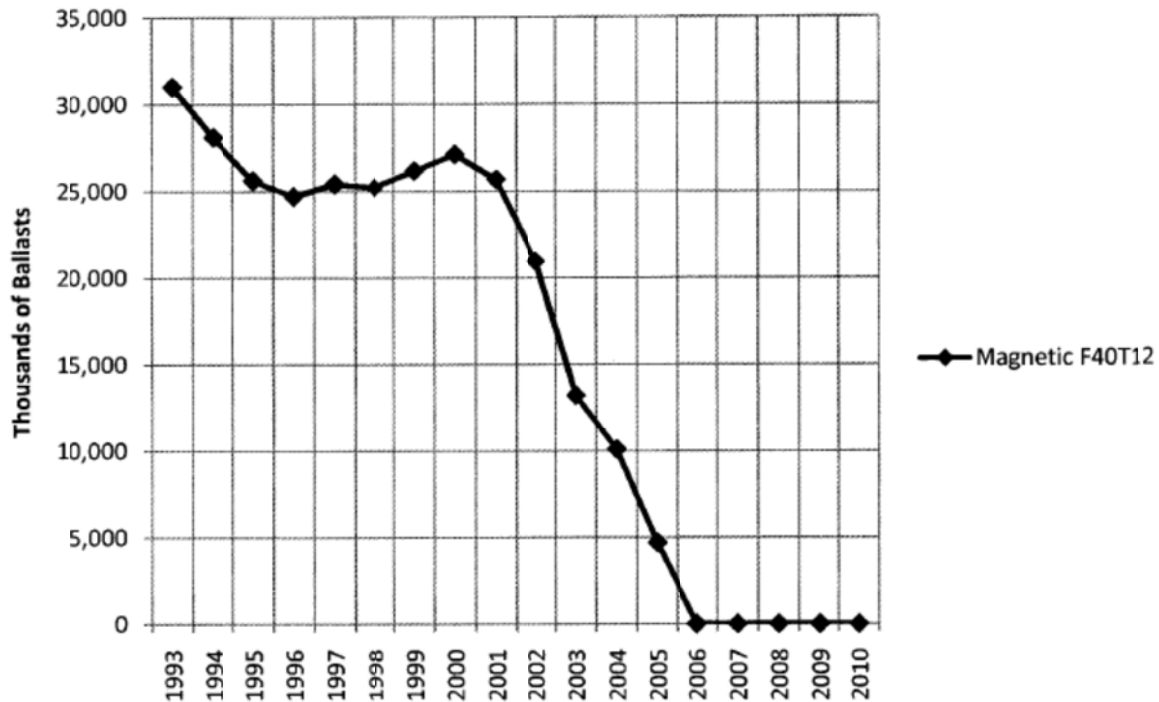
To determine the useful remaining life of T12 magnetic ballast currently in use throughout the United States, historical US Census data for magnetic ballast shipments were analyzed. The ballast “National Impact Analysis” spreadsheet⁵ contains a table of total historical fluorescent ballast shipments from 1990 through 2005. To distinguish between magnetic F40T12 ballasts and electronic F40T12 ballasts, additional data were analyzed from appendix B of the “Fluorescent Lamp Ballast Technical Support Document for the Final Rule, 2000” that contains information on ballast shipments and estimates the impact on ballast sales due to new regulations (DOE 2000b)⁶. The data in the 2000 document break down the F40T12 ballasts into magnetic and electronic categories. Additionally, Appendix B : Table B.18 of the “Fluorescent Lamp Ballast Technical Support Document for the Final Rule, 2000” contains projected ballast sales including the impact of existing programs on state adoption and code compliance.

Data from these sources were combined to determine the number of magnetic F40T12 ballast sales from 1993 through 2010. The difference between the total magnetic ballast and the F40T12 magnetic ballast was calculated for 1993 through 1997. For a conservative estimate of magnetic F40T12 remaining life, the differential was adjusted to take the sales of magnetic F40T12 ballast to zero by the year 2006. Figure 1 is a plot of the adjusted data showing the sales of magnetic F40T12 ballast from 1993 through 2010.

⁵ DOE 2010b. “Fluorescent Lamp Ballasts Preliminary Analytical Tools: National Impact Analysis.” Excel Spreadsheet. U.S. Department of Energy: 2010.

⁶ DOE 2000b. “Fluorescent Lamp Ballast Technical Support Document for the Final Rule, 2000.” September 2000.

Figure C-1. Adjusted magnetic F40T12 ballast sales for remaining useful life calculation



A weighted average of the data in Figure C-1 can be calculated to determine the current average age of magnetic 4-foot T12 MBP ballasts. Table C-1 presents the average age of magnetic 4-foot T12 ballasts based on an assumed ballast life. As determined from Table C-1, for an assumed ballast life of 15.5 years, the average age of magnetic 4-foot T12 ballast for the 2010 year is 9.8 years; thus, the average remaining useful life for magnetic 4-foot F40T12 ballasts is approximately 5.7 years (15.5 years – 9.8 years = 5.7 years). Average remaining Useful Life of T12 Systems at the end of 2012 (midpoint of 2011 and 2014 Program Years) is 4.1 years (15.5 years – 11.3 years = 4.2 years).

Table C-1. Average ballast age and quantity in use calculated from DOE historical shipment data and DOE market analysis using assumed ballast life

Assumed Ballast Life [yrs]	Average Age of Magnetic 4ft F40T12 Ballast [yrs]	Qty of Magnetic 4ft F40T12 Ballast in Use [thousands]
17	11.3	287851
16	10.7	256851
15	10.1	228751
14	9.5	203151
13	9.0	178451
12	8.4	153051
11	7.9	127851



MEMORANDUM

To: New Orleans Council Advisor

From: Jerrel Gustafson, CLEAResult

Date: January 14, 2013

Re: Modifications to Entergy New Orleans EnergySmart Program deemed savings

INTRODUCTION

The purpose of this letter is to summarize the changes CLEAResult made to the deemed savings for the Entergy New Orleans EnergySmart Program and to provide illustrations of how those changes were incorporated into the program documentation and calculation tools. These changes were based on recommendations made by Optimal Energy (3rd party evaluator) to help improve the validity of the savings.

On November 2011, CLEAResult conducted a technical review of the Entergy New Orleans EnergySmart Program's deemed savings. The intent of this technical review was to summarize the basis of the existing deemed savings and highlight any issues or areas of concern that would require updates or modifications to the calculation methods. CLEAResult presented the results of this technical review to Optimal Energy.

Then on February 2012, Optimal Energy, after reviewing CLEAResult's technical review, provided CLEAResult with a set of general recommendations that ultimately defined the basis for the changes made to the deemed savings. For the most part the existing deemed savings were found to be acceptable; however, a few measures were identified as needing some updates and/or modifications.

The following tables highlight the key recommendations made by Optimal Energy and CLEAResult's response and actions taken. They are broken up into logical categories (or measures) and illustrations of how the changes were implemented follow each of the applicable categories.

Table 1: Commercial Lighting Recommendations

Optimal Energy's Deemed Savings Recommendations	CLEAResult Action	Affected Measures
<p>Lighting Measures: Develop strategy to account for baseline shift due to new federal standards - T12 Linear Fluorescent Lamp and Ballast Rules</p>	<p>CLEAResult developed a modified estimated useful life (EUL) of 8.0 years to account for the dimming remaining useful life of 4-ft T12 linear fluorescent 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) are required on retrofit projects involving T12 magnetically ballasted baseline equipment.</p> <p>The Lighting measure calculator has been updated to only allow CEE-approved High Performance and Reduced-wattage T8 Systems as an eligible post-retrofit technology for retrofits of systems with T12 magnetic ballasts. It also separately tracks the measure life and savings for each unique technology to ensure accurate reporting.</p> <p>See Attachment B for a more detailed explanation of this approach from the Texas filing.</p>	<p>All Commercial Lighting Measures</p>

Screenshots from Commercial Lighting Calculator:

- o Broad view of overall calculation interface with the required inputs and calculated savings results

Line Item	BUILDING INFORMATION			PRE-RETROFIT LIGHTING				POST-RETROFIT LIGHTING				CALCULATED RESULTS			
	Room Number	Room, Area Description or Other Information	Building Type	Air Conditioning Type	Fixture Code	Fixture Description	# Fixtures	# Non-Operating Fixtures	Control Device	Fixture Code	Fixture Description	# Fixtures	Control Device	Demand Reduction (kW)	Energy Saved (kWh)
1	1	Office 1	Office	Refrigerated Case (33 to 41°F)	I44svs	F48T12/MHO Fluorescent, (4) 48" STD VHO lamps (484 Watt/Unit)	10	0	None	I44I	T8 fixtures replacing T12 magnetic equipment must have CEE approved premium efficiency ballasts and lamps	10	None	0.00	0
2	2	Office 2	Office	Air-Conditioned	I44svs	F48T12/MHO Fluorescent, (4) 48" STD VHO lamps (484 Watt/Unit)	10	0	None	I44Hlu	F32T8-28W Fluorescent, (4) 48", T-8 @ 28W lamps, Instant Start Ballast, NLO (0.85 < BF < 0.95) (94 Watt/Unit)	10	None	3.30	15,303
3	3	Office 3	Office	Air-Conditioned	I44svs	F48T12/MHO Fluorescent, (4) 48" STD VHO lamps (484 Watt/Unit)	10	0	None	I44I	T8 fixtures replacing T12 magnetic equipment must have CEE approved premium efficiency ballasts and lamps	10	None	0.00	0
														(Total)	(Total)

○ Key functionality (close-up of previous screen) showing ineligibility Warning Message & 0.00 Savings:

POST-RETROFIT LIGHTING				CALCULATED RESULTS	
Fixture Code	Fixture Description	# Fixtures	Control Device	Demand Reduction (kW)	Energy Saved (kWh)
				(Total)	(Total)
f44ll	T8 Fixtures replacing T12 magnetic equipment must have CEE-approved premium efficiency ballasts and lamps	10	None	0.00	0
f44lntu	F32T8-28W Fluorescent, (4) 48" T-8 @ 28W lamps, Instant Start Ballast, NLO (0.85 < BF < 0.95) (94 Watt/Unit)	10	None	3.30	15,303
f44ll	T8 Fixtures replacing T12 magnetic equipment must have CEE-approved premium efficiency ballasts and lamps	10	None	0.00	0

- Key functionality (close-up); Savings and Estimated Useful Life (EUL) tracked by unique technology:

Savings by Lighting Group				
Lighting Group	EUL	kW	kWh	
Halogen	1.5	-	-	-
High Intensity Discharge (HID)	15.5	-	-	-
Integrated-ballast CCFL Lamps	4.5	-	-	-
Integrated-ballast CFL Lamps	2.5	-	-	-
Integrated-ballast LED Lamps (ENERGY STAR)	9.0	-	-	-
Integrated-ballast LED Lamps (Lighting Facts)	4.5	-	-	-
Light Emitting Diode (LED) Fixture	15.0	-	-	-
Modular CFL and CCFL Fixtures	16.0	-	-	-
Linear Fluorescent	15.5	-	-	-
Linear Fluorescent T12	8.0	3.30	15,303.02	-
Occupancy Sensor for Lighting	10.0	-	-	-
Photocell for Lighting	10.0	-	-	-
Timeclock for Lighting	10.0	-	-	-
Project Weighted EUL:				8.0

Table 1 (cont.): Commercial HVAC Recommendations

Optimal Energy's Deemed Savings Recommendations	CLEAResult Action	Affected Measures
<p>Add a systematic approach for dealing with early retirement retrofits</p>	<p>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.</p> <p>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.</p> <p>For early retirement (ER) projects the measure's energy savings will be calculated by considering the project to have two separate components:</p> <ol style="list-style-type: none"> 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. <p>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.</p> <p>Weighted ER Measure Savings (kWh) = $(\text{kWh}_{\text{ER}} \times \text{RUL} + \text{kWh}_{\text{ROB}} \times (\text{EUL} - \text{RUL})) / \text{EUL}$</p> <p>Where:</p> <p>$\text{kWh}_{\text{ER}}$ = Early Retirement (ER) Energy Savings kWh_{ROB} = Replace on Burnout (ROB) Energy Savings Remaining Useful Life (RUL) Estimated Useful Life (EUL)</p>	<p>All Commercial HVAC measures</p>

	See Attachment A for a more detailed explanation and calculator screenshots and other illustrations of how the updates were incorporated into the calculation tools below.	
Commercial HVAC: use less stringent 2008 federal standards, rather than ASHRAE 90.1-2007, as baseline for retrofits	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 CLEARResult's systematic approach to handle early retirement retrofits.	All Commercial HVAC measures
Chillers: Develop algorithm for water cooled chillers from kW/ton	Updated algorithm to handle kW/ton efficiency rating. See Attachment A for a detailed explanation.	Chiller Measures
Unitary AC: update typo in table - IEER should be 9.4, not 94	Table has been updated.	Unitary AC
Commercial HVAC measures: update efficiencies to match current CEE specification	Updated minimum efficiency table to match current CEE specifications (updated on January 6, 2012), http://www.cee1.org/files/CEE_CommHVAC_UnitarySpec2012.pdf	Commercial Unitary AC and HP
Commercial HVAC measures: find documentation for coincidence factor of 1.0, or use 0.8.	The calculator screenshot in the following page helps illustrate the minimum efficiency used based on the CEE specifications. Also see Attachment A-19 and A-20 , which references the baseline lookup tables. CLEARResult will use a 0.86 coincidence factor for all HVAC measure when calculating demand savings. The HVAC calculator screenshot shown on the following page helps illustrate how this factor is used in the demand savings calculation. See Attachment A-10 for further explanation of this factor.	All Commercial HVAC measures

Below is a screenshot of the updated commercial HVAC calculator. On the left is a screenshot of the inputs and resultant savings generated by the calculator. To the right is the step by step calculation on how the savings was calculated. The table below helps illustrate the changes made to address Optimal Energy's recommendations previously mentioned.

HVAC Calculator Screenshot

Commercial HVAC Calculator

1

Application Type	Project Type
	Early Retirement
Building Type	Large Office
Existing Equipment Type	
Equipment Type 1	DX Air Cooled
Equipment Type 2	Unitary Air Conditioner
Equipment Type 3	Split System Under 5.42 tons
Existing Equipment	
Existing Equip Manuf. Year	2005
Cooling Capacity (tons)	5 tons
New Equipment Nameplate	
New Full-Load Efficiency	13.00 EER
New Part-Load Efficiency	16.00 IEER
Efficiency Requirements	
Cooling Full-load	12.50 EER
Cooling Part-load	15.00 IEER
COOLING BASELINES	
ER Full Load	9.00 EER
ER Part Load	10.00 SEER
ROB Full Load	10.70 EER
ROB Part Load	12.44 SEER
Savings	
Demand Savings (kW)	1.30 kW
Energy Savings (kWh)	4,253 kWh

Early Retirement Demand Savings (kW) Calculations

$$kW_{ER} = Tons \times \left(\frac{12}{Old\ EER} - \frac{12}{New\ EER} \right) \times CF = 5 \times \left(\frac{12}{9} - \frac{12}{13} \right) \times 0.86 = 1.764\ kW$$

$$kW_{ROB} = Tons \times \left(\frac{12}{Old\ EER} - \frac{12}{New\ EER} \right) \times CF = 5 \times \left(\frac{12}{10.7} - \frac{12}{13} \right) \times 0.86 = 0.853\ kW$$

$$ER\ Savings\ (kW) = \frac{kW_{ER} \times RUL + kW_{ROB} \times (EUL - RUL)}{EUL} = \frac{1.764 \times 7.3 + 0.853 \times (15 - 7.3)}{15} = 1.30\ kW$$

Early Retirement Energy Savings (kWh) Calculations

$$kWh_{ER} = Tons \times \left(\frac{12}{Old\ SEER_{adj}} - \frac{12}{New\ SEER_{adj}} \right) \times Cooling\ EFLH = 5 \times \left(\frac{12}{10} - \frac{12}{16} \right) \times 2584 = 5,814\ kWh$$

$$kWh_{ROB} = Tons \times \left(\frac{12}{Old\ SEER_{adj}} - \frac{12}{New\ SEER_{adj}} \right) \times Cooling\ EFLH = 5 \times \left(\frac{12}{12.44} - \frac{12}{16} \right) \times 2584 = 2,773\ kWh$$

$$ER\ Savings\ (kWh) = \frac{kWh_{ER} \times RUL + kWh_{ROB} \times (EUL - RUL)}{EUL} = \frac{5,814 \times 7.3 + 2,773 \times (15 - 7.3)}{15} = 4,253\ kWh$$

Where:

Baseline lookups are referenced in the calculator's lookup table shown below.
 CF = Coincidence Factor as 0.86
 EFLH = 2,584 hrs based on large office see Table in Attachment A-11

Screenshot of Calculator's Baseline Lookups for Split Systems Under 65,000 BTUH

	Manuf. Year ^e	Split System < 65,000 Btu/h			Applicable Standard
		EER ^a	SEER	SEERadj ^b	
BASELINE EFFICIENCIES	2005	9.0	10	10	ASHRAE 90.1--2004
	2006 ^b	10.7	13	12.44	Federal Standard/ASHRAE 90.1--2004 (as of 1/23/2006) ^b
	2007 ^b	10.7	13	12.44	Federal Standard/ASHRAE 90.1-2007 (as of 1/23/2006) ^b
	2008 ^b	10.7	13	12.44	Federal Standard/ASHRAE 90.1-2007 (as of 1/23/2006) ^b
	2009 ^b	10.7	13	12.44	Federal Standard/ASHRAE 90.1-2007 (as of 1/23/2006) ^b
	2010 ^b	10.7	13	12.44	Federal Standard/ASHRAE 90.1-2007 (as of 1/1/2010) ^b
	2011 ^b	10.7	13	12.44	Federal Standard/ASHRAE 90.1-2007 (as of 1/1/2010) ^b
	2012 ^b	10.7	13	12.44	Federal Standard/ASHRAE 90.1-2007 (as of 1/1/2010) ^b
	ROB ^b	10.7	13	12.44	Federal Standard/ASHRAE 90.1-2007 (as of 1/1/2010) ^b
	NC	11.1	13	13	Federal Standard/ASHRAE 90.1-2007 (as of 1/1/2010)
Min Efficiency	12.5	15.0	15	CEE Tier 2 ^f	

- a. For equipment under 65k Btu/h, EER = SEERadj *0.697 + 2.0394
- b. All equipment under 65k Btu/h, the 13 SEER baseline was adjusted to 12.44 to account for partial system changeout (e.g. Compressor or Condensing Unit Only), for ROB and existing equipment retrofits.
- c. All efficiencies are based on "All Other" heating section type, if heating section is "Electric Resistance or None" add 0.2 to all efficiency values.
- d. Equipment manufactured prior to 2010 and with capacities ≥ 65k and < 240k Btu/h an adjusted IEER (IEERadj = EER + 0.2).
- e. Equipment manufactured prior to 2010 and with capacities ≥ 240k Btu/h an adjusted IEER (IEERadj = EER + 0.1).
- f. Minimum Efficiency based on CEE Commercial Unitary AC and HP Specification Tier 2, effective 1/6/2012.

Table 1 (cont.): Residential Solar Screen Recommendations

Optimal Energy's Deemed Savings Recommendations	CLEAResult Action	Affected Measures
<p>Solar Screen: Update baseline SHGC assumption</p>	<p>The existing deemed savings assumes a base SHGC of 0.75. CLEAResult has program eligibility requirements printed in the Program Manual which ensures that only windows with existing SHGC greater than or equal to 0.75 (e.g. single-pane glass) are incentivized (see Program Manual excerpt below)</p>	<p>Solar Screens</p>

3. All new duct installations should be sealed to the same standards listed in the Repair and/or Sealing of Ducts
4. All new duct installations and repairs shall be tested for air tightness and pass the program standards in place at the time of retrofits.

SOLAR SCREENS

1. An Energy Smart Informational Assessment is required before Solar Screens are installed. Solar Screens must be a recommended measure to qualify for a rebate.
2. Solar Screen must be installed on an existing single-pane clear glass window. Windows on exterior doors are also eligible for solar screen incentives.
3. The windows must be facing predominately east or west.
4. The windows must receive significant direct sun exposure.
5. Solar screen must have a Solar Heat Factor (SHGF) of .35 or less. A copy of the manufacturers' data showing the Shading Coefficient (SC) or Solar Heat Gain Coefficient (SHGC) is required to qualify for a rebate.
6. Screens must be installed securely.

Table 1 (cont.): Residential HVAC Recommendations

Optimal Energy's Deemed Savings Recommendations	CLEAResult Action	Affected Measures
Heat pump replacement: revise column headers to be more explicit about the range of covered efficiencies - e.g., ">= 8.0 and <8.2"	Deemed savings table has been updated to clarify appropriate savings ranges.	Heat Pump Replacement

Table 1. Heat Pump Energy Savings

Heat Pump – Energy Savings (Heating kWh Only), Climate Zone New Orleans					
HSPF Range					
Size (tons)	< 8.4	≥ 8.4 and < 8.5	≥ 8.6 and < 8.7	≥ 8.8 and < 8.9	≥ 9.0 and < 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

Table 1 (cont.): Residential Duct Sealing Recommendations

<p>Duct sealing: Require that ducts run through an unconditioned space to be eligible for the measure</p>	<p>The deemed savings documentation defines the condition and unconditioned space criteria and the majority of ducts must run through unconditioned space. To ensure this duct sealing measure is properly applied, language is included in the measure best practices and quality control procedures within the Program Manual (see illustrations below). These details include inspection practices and specific eligibility requirements as they relate to unconditioned space.</p>	<p>Duct Sealing</p>
---	--	---------------------

Quality Control		DUCT EFFICIENCY IMPROVEMENTS																													
<p>Post-Installation Inspections (QC)</p>	<p>These requirements are applicable when customers apply for the duct efficiency improvement rebates for the sealing of existing duct systems and the replacement of existing duct systems. This includes the sealing of supply and return air ducts of the existing homes. To be eligible, at least 50% of the ductwork must be in unconditioned space post-improvement.</p> <p>The duct sealing must create a continuous air barrier throughout the air duct system. The air duct system must be sealed with both a strong mechanical attachment and a separate air seal, using approved latex mastic and a mechanical tie.</p> <p>To qualify for an incentive, total leakage rates must be reduced to less than 10% of total air handler fan flow, verified by a post-retrofit duct pressurization test. Beginning duct leakage must be at least 20% of total air handler flow to qualify for a rebate.</p> <p>Before and after any air sealing work is performed, the Contractor must perform a Combustion Appliance Zone (CAZ) test adhering to the standards set forth by BPL, HERS, or any other nationally recognized standard.</p> <p>Installation standards</p> <ol style="list-style-type: none"> 1. Use water-based latex mastic with at least 50% solids reinforced with fiberglass mesh at all duct connections, joints and seams of components that contain conditioned air. "Hard cap" type mastic or equivalent with reinforcing mesh is also acceptable. 2. Foil tapes, including UL 181 A-B type tapes, when used alone, will not be accepted. If tape is used to temporarily hold a seam, it must be overlaid with a coating of mastic that extends at least one inch (1") past the tape on all sides, and is thick enough to hide the tape completely. 3. Ducts shall be mechanically attached as per manufacturer's specifications. 4. All new and replacement ducts shall have R-8, as determined by Air Diffusion Council (ADC) guidelines, local codes, and must be listed by the Underwriters Laboratory (UL) duct program. 																														
<p>QA Inspection Metric General</p>	<p>Major Violation: A failure in this category requires immediate resolution that may include a contractor charge back of all or part of the Rebate amount.</p> <p>Minor Violation: The Quality Assurance Specialist will determine the impact of failing these measures and the schedule for their resolution.</p> <p>Major Violation Examples (not all inclusive)</p> <ul style="list-style-type: none"> Starting vs. finished air leakage rate: Verification reveals a discrepancy of >20%. Minimum Ventilation Rate (MVR): Failure to identify correct MVR or to take the proper action in the event of the MVR not being met. Duct sealing or air sealing materials: Use of improper sealing materials. Combustion Safety Test (CST): Not performing the CST or failing to take proper action on the results. Minor Violations (none) 																														
<p>QA Inspection Metric- Duct & Air Sealing</p>	<p>Duct Efficiency Measure Air Flow Requirements</p> <table border="1" data-bbox="284 1092 609 1690"> <thead> <tr> <th colspan="3">Air Flow Requirements for Duct Efficiency Measure</th> </tr> <tr> <th>AC Size (tons)</th> <th>Minimum Pre-Installation Leakage Rate (CFM)</th> <th>Maximum Post-Installation Leakage Rate (CFM)</th> </tr> </thead> <tbody> <tr> <td>1.5</td> <td>120</td> <td>60</td> </tr> <tr> <td>2.0</td> <td>160</td> <td>80</td> </tr> <tr> <td>2.5</td> <td>200</td> <td>100</td> </tr> <tr> <td>3.0</td> <td>240</td> <td>120</td> </tr> <tr> <td>3.5</td> <td>280</td> <td>140</td> </tr> <tr> <td>4.0</td> <td>320</td> <td>160</td> </tr> <tr> <td>4.5</td> <td>360</td> <td>180</td> </tr> <tr> <td>5.0</td> <td>400</td> <td>200</td> </tr> </tbody> </table>	Air Flow Requirements for Duct Efficiency Measure			AC Size (tons)	Minimum Pre-Installation Leakage Rate (CFM)	Maximum Post-Installation Leakage Rate (CFM)	1.5	120	60	2.0	160	80	2.5	200	100	3.0	240	120	3.5	280	140	4.0	320	160	4.5	360	180	5.0	400	200
Air Flow Requirements for Duct Efficiency Measure																															
AC Size (tons)	Minimum Pre-Installation Leakage Rate (CFM)	Maximum Post-Installation Leakage Rate (CFM)																													
1.5	120	60																													
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2.5	200	100																													
3.0	240	120																													
3.5	280	140																													
4.0	320	160																													
4.5	360	180																													
5.0	400	200																													

Table 1 (cont.): Recommendations and responses requiring no further illustration

Optimal Energy's Deemed Savings Recommendations	CLEARResult Action	Affected Measures
<p>Document sources for all assumptions in deemed savings document. If based on modeling, include a description of all modeling inputs in an appendix.</p>	<p>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".</p> <p>CLEARResult believes the existing documentation to be sufficient, given the savings values are "in-line" with industry accepted values</p> <p>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. Upon request references to the applicable PUCT docket numbers can be provided.</p>	<p>Ceiling Insulation, Wall Insulation, Floor Insulation, ENERGY STAR Windows, Air Infiltration, Solar Screens, Duct Efficiency Improvement</p>
<p>Include O&M and gas savings in deemed savings document</p>	<p>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. CLEARResult has not adjusted the deemed savings document to calculate O&M and gas savings impacts.</p>	<p>All Measures</p>
<p>Add information necessary to calculate TRC</p>	<p>When conducting a cost-effectiveness review, CLEARResult researches and assigns measure costs based upon publicly-available and vetted industry sources. CLEARResult will document its assumptions and can add measure cost information where appropriate to the deemed savings document as cost-effectiveness results are determined.</p>	<p>All Measures</p>

<p>Variable Speed Pool Pumps: Find source documenting assumption of 365 day of pool operation, or use more conservative estimate</p>	<p>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.</p>	<p>Variable Speed Pool Pumps</p>
<p>HVAC measures: ensure a consistent methodology in deriving full load hours for residential and commercial HVAC, and describe in deemed savings document.</p>	<p>For residential HVAC measures, the EFLH are based on ENERGY STAR's AC & Heat Pump energy savings calculator.</p> <p>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.</p>	<p>All Commercial and Residential HVAC measures</p>

To: Entergy New Orleans Program Team

From: Core Engineering Services

Date: January 18, 2013

Re: CFL Savings for 2013 Program Year

.....

The objective of this memo is to outline the changes in savings for CFL measures in 2013.

2009 Deemed Savings

The following table is from the document “Deemed Savings, Installation & Efficiency Standards” prepared by Frontier Associates dated March 2009.

Table 1: 2009 Deemed Savings

Measure CFL (Watt)	Measure CFL (Range of Watts)	Comparable Incandescent Light (Watt)	Daily usage (Hrs./Day)	Annual Energy Savings (kWh)	Demand Savings (kW)
15	14-18	40	4	36.5	0.006
20	19-21	60	4	58.3	0.009
23	22-25	75	4	75.8	0.012
27	26-28	100	4	106.5	0.016

Changes to assumptions

Measure CFL: As CFL technology advances, the bulbs get more efficient; they can produce the same amount of light using less wattage. Therefore, the range of CFL wattages corresponding to equivalent-incandescent wattage has improved since 2009.

Comparable Incandescent: The Energy Independence & Security Act of 2007 removes incandescent bulbs from the market and replaces them with higher-efficiency halogen bulbs. A summary of the changes is in Table 2. The “Effective Date” assumes the continued market availability for a period of 3 months after the standards are implemented.

Table 2: EISA 2007 baseline changes

Pre-EISA 2007	Post-EISA 2007	Change Date	Effective Date
100 watt	72 watts	January 1, 2012	April 1, 2012
75 watt	53 watts	January 1, 2013	April 1, 2013
60 watt	43 watts	January 1, 2014	April 1, 2014
40 watt	29 watts	January 1, 2014	April 1, 2014

Daily usage: All sources known by CES regarding residential CFL hours of operation show values significantly less than 4 hours per day. A reliable source is the “2010 U.S. Lighting Market Characterization” written by the U.S. Department of Energy dated January 2012. It gives a value of 2.5 hours per day.

Coincidence Factor: The coincidence factor used is not listed in the table, but a simple calculation reveals 0.22 was used. Just like usage hours, this is high compared to all known sources. The source used for the 2012 CFL work papers is “Coincidence Factor Study: Residential and Commercial Industrial Lighting Measures” dated Spring 2007. It gives a CF of 0.08.

2012+ Deemed Savings

The following table is calculated based on the adjusted assumptions stated above.

Table 3: PY 2012 (4/1/2012-4/1/2013) Deemed Savings

Measure CFL (Watt)	Measure CFL (Range of Watts)	Comparable Baseline (Watt)	Daily usage (Hrs./Day)	Coincidence Factor	Annual Energy Savings (kWh)	Demand Savings (kW)
9	7-11	40	2.5	0.08	28.3	0.002
14	12-17	60	2.5	0.08	42.0	0.004
20	18-22	75	2.5	0.08	50.2	0.004
25	23-27	72	2.5	0.08	42.9	0.004

Table 4: PY 2013 (4/1/2013-4/1/2014) Deemed Savings

Measure CFL (Watt)	Measure CFL (Range of Watts)	Comparable Baseline (Watt)	Daily usage (Hrs./Day)	Coincidence Factor	Annual Energy Savings (kWh)	Demand Savings (kW)
9	7-11	40	2.5	0.08	28.3	0.002
14	12-17	60	2.5	0.08	42.0	0.004
20	18-22	53	2.5	0.08	30.1	0.003
25	23-27	72	2.5	0.08	42.9	0.004

Table 5: PY 2014+ (4/1/2014 and beyond) Deemed Savings

Measure CFL (Watt)	Measure CFL (Range of Watts)	Comparable Baseline (Watt)	Daily usage (Hrs./Day)	Coincidence Factor	Annual Energy Savings (kWh)	Demand Savings (kW)
9	7-11	29	2.5	0.08	18.3	0.002
14	12-17	43	2.5	0.08	26.5	0.002
20	18-22	53	2.5	0.08	30.1	0.003
25	23-27	72	2.5	0.08	42.9	0.004

Comparisons between deemed savings are in Table 6 below.

Table 6: Savings Comparison for PY 2013

Measure CFL (Watt)		Energy Savings (kWh)			Demand Savings (kW)		
2009	PY 2013	2009	PY 2013	Change	2009	PY 2013	Change
15	9	36.5	28.3	-23%	0.006	0.002	-55%
20	14	58.3	42.0	-28%	0.009	0.004	-58%
23	20	75.8	30.1	-60%	0.012	0.003	-77%
27	25	106.5	42.9	-60%	0.016	0.004	-77%

**Work Papers for
Low-Flow Showerheads,
Low-Flow Kitchen Faucet Aerators,
And
Low-Flow Bathroom Faucet Aerators
With Electric Water Heater
Savings Calculation Methodology for
Entergy New Orleans
Energy Efficiency Programs**

**Prepared by
Core Engineering Services**

by CLEARresult

May 31, 2012

**Adam Keeling
Rebecca Troutfetter**

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LOW-FLOW SHOWERHEAD – ELECTRIC WATER HEATER

Low-Flow Showerhead

Summary Characteristics for Low-Flow Showerhead

Measure Description	A low-flow showerhead reduces hot water usage and saves energy associated with heating the water. The maximum flow rate of qualifying showerheads is 2.0 gallons per minute (GPM) ¹
Market Sector	Multi-family residential showers
Base Case Description	For retrofits, existing showerhead has a flow rate of 2.5 GPM ²
Measure Unit	Showerhead used in residential showers
Unit Energy Savings	See Table 2
Unit Demand Savings	See Table 2
Unit Therm Savings	Not calculated in this report
Unit Therm Demand Savings	Not calculated in this report
Unit Water Savings	See Table 2
Base Case Cost	\$0 (do nothing for retrofit applications)
Measure Cost	\$7.15 ¹⁰ includes both labor and equipment cost
Incremental Cost	\$7.15 (incremental cost = measure cost for retrofit applications)
Measure Life	10 years ³

Measure Description

Replace an existing showerhead with a new low-flow showerhead, which reduces hot water usage and saves energy associated with heating the water. This work paper assumes the existing showerhead is operational with a flow rate of 2.5 GPM (or higher) in a multi-family residence with electric water heating. Energy savings will be achieved by reducing the usage of hot water.

Baseline Equipment

The nominal baseline showerhead uses 2.5 GPM².

Eligible Equipment

The flow rate required for the Energy New Orleans Residential Solutions program of qualifying showerheads is 2.0 GPM or less¹.

Savings Calculations

Assuming predictable flow rates and no other losses, the savings per unit equals:

$$\text{Water (Gallons/Unit)} = (F_B - F_P) \times U \times N \times P \times D / S \quad \text{Eq. 1}$$

$$\text{Energy (kWh/Unit)} = (F_B - F_P) \times U \times N \times P \times D \times (T_H - T_C) \times C_H / (S \times C_E \times \text{Eff}) \quad \text{Eq. 2}$$

$$\text{Demand (kW/Unit)} = (F_B - F_P) \times U \times N \times P \times C \times (T_H - T_P) \times C_H / (S \times C_E \times \text{Eff}) \quad \text{Eq. 3}$$

Definition of Variables

The parameters in the above equations are listed in Table 1 below.

Table 1: Calculation Variables

Parameter	Description	Value
F_B	Average Baseline Flow Rate of Showerhead (GPM)	2.5 ²
F_P	Average Post Measure Flow Rate of Showerhead (GPM)	2.0 ¹
U	Average duration of shower (min)	7.81 ⁴
N	Showers taken per person per day	1 ⁴
P	Number of people per residence	2.18 ⁶
D	Days per year	365
C	Peak demand coincidence factor	3.0% ⁵
T_H	Average mixed hot water at point-of-use temperature (°F)	105 ⁷
T_C	Average inlet water temperature for whole year (°F)	65.0 ⁸
T_P	Average inlet water temperature for peak (°F)	74.2 ⁸
C_H	Unit Conversion: 8.33 BTU/(Gallons-°F)	8.33
S	Number of showers per residence	Varies
C_E	Unit Conversion: 1 kWh = 3412 Btu	3412
Eff	Efficiency of Electric Water Heater	98% ⁹

Estimated Savings

Table 2: Water & Electrical Savings

S		Water Savings	Energy Savings	Demand Savings
# of showers/residence	# of showerheads replaced	Gallons/year	kWh/year	kW
1	1	3,107	310	0.020
2	1	1,554	155	0.010
2	2	3,107	310	0.020
3	1	1,036	103	0.007
3	2	2,071	206	0.013
3	3	3,107	310	0.020

The following example calculations are based on a 1-shower residence using Table 1 and Equations 1, 2, and 3.

$$\text{Water (Gallons/Unit)} = (2.5 - 2) \times 7.81 \times 1 \times 2.18 \times 365 / 1 = 3,107$$

$$\text{Energy (kWh/Unit)} = (2.5 - 2) \times 7.81 \times 1 \times 2.18 \times 365 \times (105 - 65) \times 8.33 / (1 \times 3412 \times 0.98) = 310$$

$$\text{Demand (kW/Unit)} = (2.5 - 2) \times 7.81 \times 1 \times 2.18 \times 0.03 \times (105 - 74.2) \times 8.33 / (1 \times 3412 \times 0.98) = 0.020$$

Measure Life

The effective life for this measure is 10 years³.

Measure Cost

The cost of a new low-flow showerhead is estimated at \$7.15¹⁰.

Evaluation Parameters

The evaluation protocol for this measure is verification of installation coupled with estimated energy savings.

References

- ¹ Program requirement for Entergy New Orleans Residential Solutions
- ² Current federal standard is 2.5 GPM
- ³ Estimated Useful Life from Database for Energy-Efficient Resources, 2011
http://www.deeresources.com/deer0911planning/downloads/EUL_Summary_10-1-08.xls
- ⁴ Table 12 in Building America Research Benchmark Definition (December 19, 2008) from National Renewable Energy Laboratory
http://apps1.eere.energy.gov/buildings/publications/pdfs/building_america/44816.pdf
- ⁵ Figure 8 in Building America Research Benchmark Definition (December 19, 2008) from National Renewable Energy Laboratory
- ⁶ American Community Survey national averages are 2.45 for owner occupied and 2.18 for renter occupied. Renter occupied value was used with assumption that most multi-family residences are renters.
http://factfinder.census.gov/servlet/STTable?_lang=en&_ss=1&_ds=1&_tid=1000000US&_all_geo_types=N&_geo_id=01000US&-qr_name=ACS_2009_5YR_G00_S2501&-context=st&-ds_name=ACS_2009_5YR_G00_&-tree_id=5309&-redoLog=false&-format=
- ⁷ Table 10 in Building America Research Benchmark Definition (December 19, 2008) from National Renewable Energy Laboratory
- ⁸ Department of Energy inlet water temperature calculation
http://www1.eere.energy.gov/buildings/appliance_standards/residential/pdfs/htgp_finalrule_app7d.pdf
- ⁹ Table 9 in Building America Research Benchmark Definition (December 19, 2008) from National Renewable Energy Laboratory
- ¹⁰ Entergy New Orleans actual cost data

LOW-FLOW KITCHEN FAUCET AERATORS – ELECTRIC WATER HEATER

Low-Flow Kitchen Faucet Aerator

Summary Characteristics for Low-Flow Kitchen Faucet Aerators

Measure Description	Low-flow aerators reduce water consumption associated with hand washing and dishwashing, and consequently reduce hot water usage and save energy associated with heating the water. The maximum flow rate of qualifying kitchen faucet aerator is 1.5 gallons per minute (GPM) ¹
Market Sector	Multi-family residential kitchens
Base Case Description	For retrofits, existing standard flow aerator has a flow rate of 2.2 or 2.0 GPM ²
Measure Unit	A low-flow aerator
Unit Energy Savings	See Table 2
Unit Demand Savings	See Table 2
Unit Therm Savings	Not calculated in this report
Unit Therm Demand Savings	Not calculated in this report
Unit Water Savings	See Table 2
Base Case Cost	\$0 (do nothing for retrofit applications)
Measure Cost	\$3.41 ¹⁰ Measure cost includes both labor and equipment costs
Incremental Cost	\$3.41
Measure Life	10 years ³

Measure Description

Installation of low-flow aerators is an inexpensive and lasting approach for water and energy conservation. These efficient aerators reduce water consumption associated with hand washing and dishwashing, and consequently reduce hot water usage and save energy associated with heating the water. This work paper presents the assumptions, analysis and savings from replacing a standard flow aerator with a low-flow aerator in multi-family residences with electric water heating.

Baseline Equipment

The nominal baseline aerator uses 2.2 or 2.0 GPM².

Eligible Equipment

The flow rate required for the Entergy New Orleans Residential Solutions program of qualifying low-flow aerator is 1.5 GPM¹.

Savings Calculations

Assuming predictable flow rates and no other losses, the savings per unit equals:

$$\text{Water (Gallons/Unit)} = (F_B - F_P) \times U \times P \times D \quad \text{Eq. 1}$$

$$\text{Energy (kWh/Unit)} = (F_B - F_P) \times U \times P \times D \times (T_H - T_C) \times C_H / (C_E \times \text{Eff}) \quad \text{Eq. 2}$$

$$\text{Demand (kW/Unit)} = (F_B - F_P) \times U \times P \times C \times (T_H - T_P) \times C_H / (C_E \times \text{Eff}) \quad \text{Eq. 3}$$

Definition of Variables

The parameters in the above equations are listed in Table 1 below.

Table 1: Calculation Variables

Parameter	Description	Value
F_B	Average Baseline Flow Rate of Kitchen Aerator (GPM)	2.2 or 2.0 ²
F_P	Average Post Measure Flow Rate of Kitchen Aerator (GPM)	1.5 ¹
U	Average kitchen sink use per person per day (min)	3 ⁴
P	Number of people per residence	2.18 ⁶
D	Days per year	365
C	Peak demand coincidence factor	4.7% ⁵
T_H	Average mixed hot water at point-of-use temperature (°F)	105 ⁷
T_C	Average inlet water temperature for whole year (°F)	65.0 ⁸
T_P	Average inlet water temperature for peak (°F)	74.2 ⁸
C_H	Unit Conversion: 8.33 BTU/(Gallons-°F)	8.33
C_E	Unit Conversion: 1 kWh = 3412 Btu	3412

Eff	Efficiency of Electric Water Heater	98% ⁹
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Table 2: Water & Electrical Savings

F _B	Water Savings	Energy Savings	Demand Savings
GPM	Gallons/year	kWh/year	kW
2.0	1,194	119	0.012
2.2	1,671	167	0.017

Estimated Savings Calculations

The following example savings calculations are for an existing kitchen flow rate of 2.2 using data in Table 1 and Equations 1, 2, and 3:

$$\text{Water (Gallons/Unit)} = (2.2 - 1.5) \times 3 \times 2.18 \times 365 = 1,671$$

$$\text{Energy (kWh/Unit)} = (2.2 - 1.5) \times 3 \times 2.18 \times 365 \times (105 - 65) \times 8.33 / (3412 \times 0.98) = 167$$

$$\text{Demand (kW/Unit)} = (2.2 - 1.5) \times 3 \times 2.18 \times 0.047 \times (105 - 74.2) \times 8.33 / (3412 \times 0.98) = 0.017$$

Measure Life

The effective life for this measure is 10 years³.

Measure Cost

A new low flow aerator will be estimated at \$3.41¹⁰.

Evaluation Parameters

The evaluation protocol for this measure is verification of installation coupled with assignment of estimated energy savings.

References

- ¹ Program requirement for Entergy New Orleans Residential Solutions
- ² Current federal standard is 2.5 GPM but majority removed were 2.0 or 2.2 GPM.
- ³ Estimated Useful Life from Database for Energy-Efficient Resources, 2011
http://www.deeresources.com/deer0911planning/downloads/EUL_Summary_10-1-08.xls
- ⁴ CLEARResult assumption
- ⁵ Figure 10 in Building America Research Benchmark Definition (December 19, 2008) from National Renewable Energy Laboratory
http://apps1.eere.energy.gov/buildings/publications/pdfs/building_america/44816.pdf
- ⁶ American Community Survey national averages are 2.45 for owner occupied and 2.18 for renter occupied. Renter occupied value was used with assumption that most multi-family residences are renters.
http://factfinder.census.gov/servlet/STTable?_bm=y&-geo_id=01000US&-qr_name=ACS_2009_5YR_G00_S2501&-context=st&-ds_name=ACS_2009_5YR_G00_&-tree_id=5309&-redoLog=false&-format=
- ⁷ Table 10 in Building America Research Benchmark Definition (December 19, 2008) from National Renewable Energy Laboratory
- ⁸ Department of Energy inlet water temperature calculation
http://www1.eere.energy.gov/buildings/appliance_standards/residential/pdfs/htgp_finalrule_app7d.pdf
- ⁹ Building America Research Benchmark Definition (December 19, 2008) from National Renewable Energy Laboratory
- ¹⁰ Entergy New Orleans actual cost data

LOW-FLOW BATHROOM FAUCET AERATORS – ELECTRIC WATER HEATER

Low-Flow Bathroom Faucet Aerator

Summary Characteristics for Low-Flow Bathroom Faucet Aerators

Measure Description	Low-flow aerators reduce water consumption associated with hand washing, face washing, and teeth brushing, and consequently reduce hot water usage and save energy associated with heating the water. The maximum flow rate of qualifying bathroom faucet aerator is 1.0 gallons per minute (GPM) ¹
Market Sector	Multi-family residential bathrooms
Base Case Description	For retrofits, existing standard flow aerator has a flow rate of 2.2 or 2.0 GPM ²
Measure Unit	A low-flow aerator
Unit Energy Savings	See Table 2
Unit Demand Savings	See Table 2
Unit Therm Savings	Not calculated in this report
Unit Therm Demand Savings	Not calculated in this report
Unit Water Savings	See Table 2
Base Case Cost	\$0 (do nothing for retrofit applications)
Measure Cost	\$2.41 ¹⁰ Measure cost includes both labor and equipment costs
Incremental Cost	\$2.41
Measure Life	10 years ³

Measure Description

Installation of low-flow aerators is an inexpensive and lasting approach for water and energy conservation. These efficient aerators reduce water consumption associated with hand washing, face washing, and teeth brushing, and consequently reduce hot water usage and save energy associated with heating the water. This work paper presents the assumptions, analysis and savings from replacing a standard flow aerator with a low-flow aerator in multi-family residences with electric water heating.

Baseline Equipment

The nominal baseline aerator uses 2.2 or 2.0 GPM².

Eligible Equipment

The flow rate required for the Entergy New Orleans Residential Solutions program of qualifying low-flow aerator is 1.0 GPM¹.

Savings Calculations

Assuming predictable flow rates and no other losses, the savings per unit equals:

$$\text{Water (Gallons/Unit)} = (F_B - F_P) \times U \times P \times D / S \quad \text{Eq. 1}$$

$$\text{Energy (kWh/Unit)} = (F_B - F_P) \times U \times P \times D \times (T_H - T_C) \times C_H / (S \times C_E \times \text{Eff}) \quad \text{Eq. 2}$$

$$\text{Demand (kW/Unit)} = (F_B - F_P) \times U \times P \times C \times (T_H - T_P) \times C_H / (S \times C_E \times \text{Eff}) \quad \text{Eq. 3}$$

Definition of Variables

The parameters in the above equations are listed in Table 1 below.

Table 1: Calculation Variables

Parameter	Description	Value
F_B	Average Baseline Flow Rate of Bathroom Aerator (GPM)	2.2 or 2.0 ²
F_P	Average Post Measure Flow Rate of Bathroom Aerator (GPM)	1.0 ¹
U	Average bathroom sink use per person per day (min)	2 ⁴
D	Days per year	365
C	Peak demand coincidence factor	4.7% ⁵
P	Number of people per residence	2.18 ⁶
S	Number of bathroom sinks per residence	Varies
T_H	Average mixed hot water at point-of-use temperature (°F)	105 ⁷
T_C	Average inlet water temperature for whole year (°F)	65.0 ⁸
T_P	Average inlet water temperature for peak (°F)	74.2 ⁸
C_H	Unit Conversion: 8.33 BTU/(Gallons-°F)	8.33

C_E	Unit Conversion: 1 kWh = 3412 Btu	3412
Eff	Efficiency of Electric Water Heater	98% ⁹

Table 2: Water & Electrical Savings

F _B	S		Water Savings	Energy Savings	Demand Savings
GPM	# of bathroom sinks/residence	# of aerators installed	Gallons /year	kWh/ year	kW
2.0	1	1	1,591	159	0.016
2.0	2	1	796	79	0.008
2.0	2	2	1,591	159	0.016
2.0	3	1	530	53	0.005
2.0	3	2	1,061	106	0.010
2.0	3	3	1,591	159	0.016
2.2	1	1	1,910	190	0.019
2.2	2	1	955	95	0.009
2.2	2	2	1,910	190	0.019
2.2	3	1	637	63	0.006
2.2	3	2	1,273	127	0.013
2.2	3	3	1,910	190	0.019

Estimated Savings Calculations

The following example savings calculations are for a residence with 2 bathrooms and existing bathroom sink flow rates of 2.2 using data in Table 1 and Equations 1, 2, and 3:

$$\text{Water (Gallons/Unit)} = (2.2 - 1) \times 2 \times 2.18 \times 365 / 2 = 955$$

$$\text{Energy (kWh/Unit)} = (2.2 - 1) \times 2 \times 2.18 \times 365 \times (105 - 65) \times 8.33 / (2 \times 3412 \times 0.98) = 95$$

$$\text{Demand (kW/Unit)} = (2.2 - 1) \times 2 \times 2.18 \times 0.047 \times (105 - 74.2) \times 8.33 / (2 \times 3412 \times 0.98) = 0.009$$

Measure Life

The effective life for this measure is 10 years³.

Measure Cost

A new low flow aerator will be estimated at \$2.41¹⁰.

Evaluation Parameters

The evaluation protocol for this measure is verification of installation coupled with assignment of estimated energy savings.

References

- ¹ Program requirement for Entergy New Orleans Residential Solutions
- ² Current federal standard is 2.5 GPM but majority removed were 2.0 or 2.2 GPM
- ³ Estimated Useful Life from Database for Energy-Efficient Resources, 2011
http://www.deeresources.com/deer0911planning/downloads/EUL_Summary_10-1-08.xls
- ⁴ CLEARResult assumption
- ⁵ Figure 10 in Building America Research Benchmark Definition (December 19, 2008) from National Renewable Energy Laboratory
http://apps1.eere.energy.gov/buildings/publications/pdfs/building_america/44816.pdf
- ⁶ American Community Survey national averages are 2.45 for owner occupied and 2.18 for renter occupied. Renter occupied value was used with assumption that most multi-family residences are renters.
http://factfinder.census.gov/servlet/STTable?_bm=y&-geo_id=01000US&-qr_name=ACS_2009_5YR_G00_S2501&-context=st&-ds_name=ACS_2009_5YR_G00_&-tree_id=5309&-redoLog=false&-format=
- ⁷ Table 10 in Building America Research Benchmark Definition (December 19, 2008) from National Renewable Energy Laboratory
- ⁸ Department of Energy inlet water temperature calculation
http://www1.eere.energy.gov/buildings/appliance_standards/residential/pdfs/htgp_finalrule_app7d.pdf
- ⁹ Building America Research Benchmark Definition (December 19, 2008) from National Renewable Energy Laboratory
- ¹⁰ Entergy New Orleans actual cost data

Work Papers for Compact Florescent Lamps in Multifamily Direct Install Applications

Savings Calculation Methodology for Application in Entergy New Orleans Energy Efficiency Programs

Prepared by
Core Engineering Services

Prepared for Entergy New Orleans
by CLEARresult
May 31, 2012

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Revisions:

None

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SAVINGS CALCULATION METHODOLOGY FOR COMPACT FLORESCENT LAMPS IN MULTIFAMILY DIRECT INSTALL APPLICATIONS

CLEAResult proposes the use of three savings calculations methodologies to determine savings for measures implemented as part of the Entergy New Orleans Energy Efficiency Programs:

1. Deemed Savings
2. Measurement & Verification
3. Work Papers

Deemed savings may be used when applicable.

IPMVP compliant measurement and verification will be used for commercial measures that do not fit into deemed savings measure descriptions and provide savings that warrant the rigor of the application of IPMVP*, e.g. custom projects.

The following Work Papers are being proposed for the direct installation of compact florescent lamps in multifamily residences. CFLs are included in the Entergy New Orleans Deemed Savings for general installation. The savings derived in this document reflect the known location and hours of operation of the bulbs installed since the delivery mechanism of the program tracks where the lamps are installed as well as the quantity. The savings achieved per facility do not warrant an IPMVP approach.

The Work Papers provide a transparent description of the methodology proposed to estimate and verify savings for the direct install of CFLs used in multifamily residential applications in Entergy New Orleans Energy Efficiency Programs. These Work Papers describe the measure, make appropriate conservative assumptions, list specific user inputs and explicitly outline the calculation steps.

The creation of these Work Papers involved reviewing Technical Reference Manuals (TRMs), case-studies, industry reports, energy codes and standards (IECC), ENERGY STAR, other utility program data, DEER cost information and other such references. When an individual report referenced an original study, or when one critical document was the only source, the original study was also reviewed. A consensus was reached on which reference(s) rigorously documented and explained the savings estimates.

* The IPMVP employs a rule-of-thumb that the costs for performing M&V should not be more than 10% of the value of one year of energy savings on a per facility basis.

SAVINGS FOR MULTIFAMILY DIRECT INSTALL CFLS

Revision # - None

Revision Date - None

Compact Florescent Lamps

Multifamily Direct Install

Summary Characteristics for Compact Florescent Lamps

Measure Description	CFLs reduce lighting energy consumption over standard incandescent lamps
Market Sector	Any multifamily residence where the program delivery mechanism installs the measure directly, that includes recording and tracking the exact locations of all lamps installed
Base Case Description	Federal Standard Incandescent Lamp
Measure Unit	Per lamp installed
Unit kWh Savings	see "Estimated Savings" section for savings by room type
Unit kW Savings	see "Estimated Savings" section for savings by room type
Coincidence factor	0.08 ¹
Base Case Cost	Standard 40 watt incandescent = \$1.00/lamp ² Standard 60 watt incandescent = \$1.25/lamp ²
Incremental Measure Cost	\$4/lamp for material and labor for 9 watt CFLs ² \$2.30/lamp for material and labor for 13 watt CFLs ²
Measure Life	6.6 years ³

Measure Description

CFLs provide the same amount of light as a standard incandescent but use less energy. The savings derived in this document apply specifically to multifamily direct install applications where the room type in which the bulbs are installed is recorded.

Baseline Equipment

The baseline for this measure is a standard incandescent lamp with a wattage of 40, 60, 75, or 72 (previously 100) watts⁴.

Eligible Equipment

The CFLs must be installed at the time of entry at the multifamily residence. The base wattage of the incandescent and the change wattage of the CFL must be recorded. In addition the room type in which the CFL was installed must also be recorded for each lamp.

Efficiency Level Required

Installation and efficiency standards must comply with the existing Entergy New Orleans Deemed Savings⁶.

Savings Calculations

Savings values for CFLs were calculated using the following equations:

$$\text{kWh savings} = (\text{base wattage} - \text{change wattage}) * \text{Annual Hours of Operation} / 1000$$

$$\text{kW Savings} = (\text{base wattage} - \text{change wattage}) / 1000 * \text{Coincidence factor}$$

Where the base wattage is the incandescent lamp wattage and change wattage is the average CFL wattage.

The base and change wattage equivalents applied were as follows:

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

The hours of operation used in the calculations were specific to the room type in which the lamps were installed. The table below displays the hours of operation by room type for a multifamily residence.

Table 1: Hours of Operation by Room Type⁵

Room Type	Hours of Operation
Porch	0
Kitchen	888
Living Room	1,015
Family Room	453
Dining Room	1,080
Bathrooms	577
Bedrooms	423
Office	401
Den	0
Entryway	0

Estimated Savings

The tables below list the calculated savings.

Table 2: kWh Savings Per Lamp by Room Type

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

Table 3: kW Savings Per Lamp by Room Type

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	0	0	0
Entryway	0	0	0	0	0

Measure Life

The effective life for this measure is 6.6 years.³

Measure Cost

The baseline measure cost was established from real pricing of incandescent lamps at large retail stores such as Home Depot and Lowes. A standard incandescent 60 watt lamp average price was \$1.25 per lamp². The standard price for 40 watt globe lights (for bathroom applications) was \$1.00 per lamp². The installed cost for material and labor for the 13 watt (60 watt equivalent) CFL lamps was \$2.30². The installed cost for material and labor the 9 watt (40 watt equivalent) CFL lamps was \$4.00².

Evaluation Parameters

The most appropriate evaluation protocol for this measure is verification of proper installation coupled with assignment of estimated energy savings.

References

1. “Coincidence Factor Study: Residential and Commercial Industrial Lighting Measures” RLW Analytics. New England State Program Working Group. Spring 2007.
2. Baseline costs are based on a review of major retailer websites, such as Home Depot and Lowes – May 2012. Incremental costs are based on actual program cost data. The program was offered in conjunction with local Energy Smart Participating Contractors which allowed for low cost delivery of the CFLs.
3. DEER 2008 EUL/RUL values updated 10 October 2008. The rated hours of operation for the average lamp installed in the program were 10,000 hours.
4. Due to changes in incandescent baselines under the Energy Independence and Security Act of 2007 on January 1, 2012 federal standard required a standard 100 watt incandescent lamp reduce the standard wattage to 72 watts. Additional incandescent wattages will occur in 2013, and 2014 at which time this work paper will need to be updated to comply.
5. “U.S. Lighting Market Characterization. Volume 1: National Lighting Inventory and Energy Consumption Estimates. Final Report” Navigant Consulting Inc. Prepared for U.S. Department of Energy. September 2002.
6. Deemed Savings, Installation and Efficiency Standards. Entergy New Orleans Inc. Prepared by Frontier Associates. March 2009.

Work Papers for Radiant Barrier Savings Calculation Methodology for Application in Entergy New Orleans Energy Efficiency Programs

Prepared by
Core Engineering Services

Prepared for Entergy New Orleans
by CLEAResult
May 31, 2012

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Revisions:

None

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SAVINGS CALCULATION METHODOLOGY FOR RADIANT BARRIER

CLEAResult proposes the use of three savings calculations methodologies to determine savings for measures implemented as part of the Entergy New Orleans Energy Efficiency Programs:

1. Deemed Savings
2. Measurement & Verification
3. Work Papers

Deemed savings may be used when applicable.

IPMVP compliant measurement and verification will be used for commercial measures that do not fit into deemed savings measure descriptions and provide savings that warrant the rigor of the application of IPMVP*, e.g. custom projects.

The following Work Papers are being proposed for the installation of radiant barriers in existing and new construction residences. This measure is not included in the Entergy New Orleans Deemed Savings⁷ and the savings achieved per facility do not warrant an IPMVP approach.

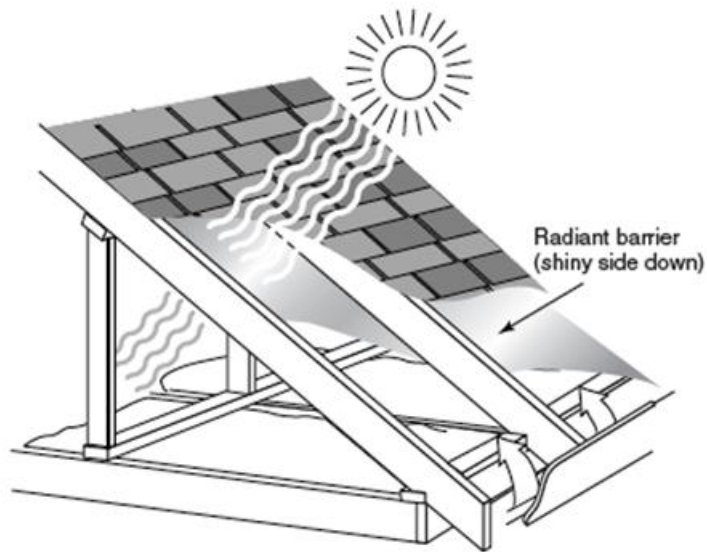
The Work Papers provide a transparent description of the methodology proposed to estimate and verify savings for radiant barriers used in residential applications in Entergy New Orleans Energy Efficiency Programs. The proposed methodology is based on sound engineering, and industry standards for energy modeling. These Work Papers describe the measure, make appropriate conservative assumptions, and list specific energy model inputs.

The creation of these Work Papers involved reviewing Technical Reference Manuals (TRMs), case-studies, industry reports, energy codes and standards (IECC), ENERGY STAR, other utility program data, DEER cost information and other such references. The difference in annual energy usage, with and without radiant barriers should only be solved with computer modeling software due to the complexity of the governing equations and the amount of data. EnergyGauge, the software used to develop these savings, is a widely used RESNET approved residential modeling and rating software.

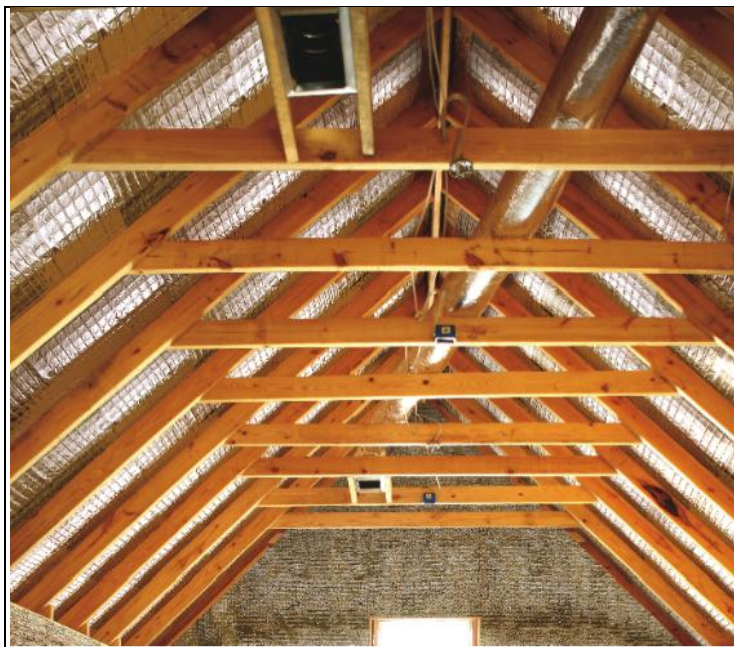
* The IPMVP employs a rule-of-thumb that the costs for performing M&V should not be more than 10% of the value of one year of energy savings on a per facility basis.

SKETCH DESCRIBING EQUIPMENT

These savings were derived for radiant barriers installed on the underside of the roof decking in an existing or new construction project.



Source: Dropyouenergybill.com



Example installation in a new construction application where the radiant barrier is pre-laminated to the roof decking

Source: Universal Forest Products

SAVINGS FOR RESIDENTIAL RADIANT BARRIERS

Revision # - None

Revision Date - None

Radiant Barrier (Residential)

New Construction and Retrofit

Summary Characteristics for Radiant Barrier

Measure Description	Radiant barriers are designed to block radiant heat transfer between a building roof and the attic space
Market Sector	Any existing or new construction residence with vented attic space
Base Case Description	In the base case, there is no radiant barrier in the home
Measure Unit	Square Feet of roof deck treated with radiant barrier
Unit kWh Savings	see “Estimated Savings” section for savings by heating type
Unit kW Savings	see “Estimated Savings” section for savings by heating type
Base Case Cost	Standard OSB with no radiant barrier= \$0.27/SF
Incremental Measure Cost	\$0.06/SF additional for OSB with radiant barrier in new construction ⁴ \$0.90/SF material & installation cost for retrofits ⁵
Measure Life	20 years ¹

Measure Description

Radiation heat transfer inside an attic is more important than conduction heat transfer and equally important as convection heat transfer. Therefore, radiant barriers are designed to block radiant heat exchange between a building roof and the attic space. They are typically comprised of a metallic foil material, usually aluminum. They are generally installed on the interior surface of the roof decking or beneath roof sheathing. Radiant barriers are effective at reducing cooling consumption by reflecting heat away from the attic space of a home.

Baseline Equipment

This measure applies to:

- New construction projects that would not otherwise have a radiant barrier installed on the underside of the roof decking.
- Existing homes that have been retrofit with radiant barrier.

Eligible Equipment

The Reflective Insulation Manufacturers Association International (RIMA) sets voluntary standards for radiant barriers. RIMA defines a radiant barrier as a reflective material facing an open air space that has a low emittance surface as defined by the American Society of Testing and Materials (ASTM), where emittance is 0.10 or less.² Table 1 shows the pertinent specifications.

Installation Requirements

Eligible radiant barriers must meet the efficiency requirements set by the Reflective Insulation Manufacturers Association International (RIMA). The attic must meet the proper ventilation requirements. Home with unvented attics are not eligible for this measure. The duct work for the HVAC system may be located in the unconditioned attic, or in the conditioned interior.

Physical Property	Test Method or Standard	Requirement
Surface Emittance	ASTM C1371	0.1 or less
Water Vapor Transmission	ASTM E96 Procedure A Desiccant Method	0.02 for Vapor Retarder 0.5 or more for perforated products
<i>Surface Burning</i>		
Flame Spread	ASTM E84	25 or less
Smoke Density	ASTM E84	450 or less
Corrosivity	ASTM D3310	Corrosion on less than 2% of the affected surface
Tear Resistance	ASTM D2261	
<i>Adhesive Performance</i>		
Bleeding	Section 10.1 of ASTM C1313	Bleeding or delamination of less than 2% of the surface area
Pliability	Section 10.2 of ASTM C1313	No cracking or delamination
Mold and Mildew	ASTM C1338	No growth when visually examined under 5X magnification

Interior radiation control coatings (IRCCs) are **NOT** eligible. IRCCs emittance ratings are substantially higher than true radiant barriers, and therefore do not reduce heat gain at the same rate as a radiant barrier. IRCCs also have a shorter measure life than true radiant barriers. Therefore, all coating materials and spray application materials are ineligible under the methods described here.

All radiant barriers should be installed according to the RIMA Handbook Section 7.4. However, horizontal installations are not eligible due to the likelihood of dust accumulation and wear and tear, damaging the radiant barrier.²

A radiant barrier cannot be in contact with any other materials on its underside or else it becomes ineffective.

Measure Review

This work paper includes definitions and standards from RIMA International. Energy calculations were performed using *EnergyGauge* software. Some cost information was obtained from a Home Depot retailer in Texas. This measure is not prescribed by either state or federal codes and standards, but it is a new requirement for the prescriptive path of ENERGY STAR 3.0 new homes.

Savings Calculations

Savings values for radiant barrier were calculated by modeling a typical residence with the software package *EnergyGauge USA USRR ZB v. 2.8.05*. This software simulates hourly load data specific to the home model inputs and can be used to perform economic analysis of building energy improvements. *EnergyGauge* was developed by the Florida Solar Energy Center and is approved by the Residential Energy Services Network (RESNET) for energy calculations.³ The modeling inputs used to calculate savings in *EnergyGauge* are listed in Table 2.

Definition of Variables

Table 2: Modeling Inputs for a Typical New Construction Residence		
EnergyGauge Inputs	Baseline New Construction (IECC 2009)	Source
Weather Zone	New Orleans	
square footage	1850	Compared to Arkansas Deemed Savings building models ⁶
number of stories	1	Compared to Arkansas Deemed Savings building models ⁶
Number bedrooms	3	Compared to Arkansas Deemed Savings building models ⁶
Number bathrooms	2	Compared to Arkansas Deemed Savings building models ⁶
Foundation Type	slab-on-grade	Compared to Arkansas Deemed Savings building models ⁶
Roof Type	Hip with medium color composite shingles	CLEARResult assumption
Wall insulation R-value	R-13	IECC 2009
Ceiling insulation R-value	R-30	IECC 2009
Window U-Factor	0.35	IECC 2009
Window SHGC	0.30	IECC 2009
Heating Type	Gas heating with AC, Heat Pump, and Electric strip heat with AC	heating types approved in the ENO Deemed Savings document ⁷
Heating System Efficiency	80 AFUE (gas furnace), 1.0 COP (electric), 7.7 HSPF New Construction (heat pump)	Federal Efficiency Standards (federal standard is Furnace AFUE is 78, however all systems available through retail are at 80)
Cooling Type	Central AC	Assumed majority of home will have central AC
Cooling System Efficiency	SEER 13	Federal Efficiency Standard
Thermostat Settings	78 cooling/68 heating	ACCA/IECC default settings
Water Heating Type	natural gas/electric	for gas heated home, gas water heating assumed, for HP and electric heated homes, electric water heating assumed
Water Heating Efficiency	0.59/0.92	standard baselines for 40 gallon storage units
Infiltration	EnergyGauge Default - Average	CLEARResult assumption
Supply Duct location	attic/interior space	both scenarios were modeled separately
Return Duct location	attic/interior space	both scenarios were modeled separately
Duct Leakage	EnergyGauge Default (assumes 88% efficiency due to duct leaks)	CLEARResult assumption
% of fluorescent lighting	EnergyGauge default applied evenly distributed in 4 cardinal directions	assumes 10%
Orientation		CLEARResult assumption

Table 3: Modeling Inputs for a Typical Existing Residence		
EnergyGauge Inputs	Baseline Existing Home	Source
Weather Zone	New Orleans	
square footage	1850	Compared to Arkansas Deemed Savings building models ⁶
number of stories	1	Compared to Arkansas Deemed Savings building models ⁶
Number bedrooms	3	Compared to Arkansas Deemed Savings building models ⁶
Number bathrooms	2	Compared to Arkansas Deemed Savings building models ⁶
Foundation Type	slab-on-grade	Compared to Arkansas Deemed Savings building models ⁶
Roof Type	Hip with medium color composite shingles	CLEARResult assumption
Wall insulation R-value	R-11	Compared to Arkansas Deemed Savings building models ⁶
Ceiling insulation R-value	R-19	Compared to Arkansas Deemed Savings building models ⁶
Window U-Factor	0.55	assumption for double pane clear glass
Window SHGC	0.60	assumption for double pane clear glass
Heating Type	Gas heating with AC, Heat Pump, and Electric strip heat with AC	heating types approved in the ENO Deemed Savings document ⁷
Heating System Efficiency	80 AFUE (gas furnace), 1.0 COP (electric), 7.2 HSPF New Construction (heat pump)	Assumed efficiencies for existing home systems.
Cooling Type	Central AC	Assumed majority of home will have central AC
Cooling System Efficiency	SEER 11	Assumption based on mix of home ages
Thermostat Settings	78 cooling/68 heating	ACCA/IECC default settings
Water Heating Type	natural gas/electric	for gas heated home, gas water heating assumed, for HP and electric heated homes, electric water heating assumed
Water Heating Efficiency	0.59/0.92	standard baselines for 40 gallon storage units
Infiltration	EnergyGauge Default - Average	CLEARResult assumption
Supply Duct location	attic/interior space	both scenarios were modeled separately
Return Duct location	attic/interior space	both scenarios were modeled separately
Duct Leakage	EnergyGauge Default (assumes 88% efficiency due to duct leaks)	CLEARResult assumption
% of fluorescent lighting	EnergyGauge default applied evenly distributed in 4 cardinal directions	assumes 10%
Orientation		CLEARResult assumption

Estimated Savings

After modeling a typical existing and new construction residence with the characteristics listed above, the same models were simulated again with a radiant barrier. This process was repeated for the different applicable heating types in a home. The savings values were normalized per square foot of roof deck treated with radiant barrier. These values are listed in Table 4 for two different scenarios: ducts located in the unconditioned attic space, and ducts located in the interior conditioned space, both new constructions. Retrofit savings are listed in Table 5.

Table 4: New Construction Savings due to Radiant Barrier in a Typical Residence			
Radiant Barrier - Climate Zone New Orleans, LA (Site Built Home)			
Electric A/C And Heating Type:	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	0.1627	0.0010	0.00011
Electric Heat	0.1831	n/a	0.00011
Heat Pump	0.1707	n/a	0.00011
Ducts Located in Interior Conditioned Space			
Gas Heat	0.1223	0.0010	0.00007
Electric Heat	0.1457	n/a	0.00007
Heat Pump	0.1337	n/a	0.00007

Table 5: Retrofit Savings due to Radiant Barrier in a Typical Existing Residence			
Radiant Barrier - Climate Zone New Orleans, LA (Site Built Home)			
Electric A/C And Heating Type:	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 Interior 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 Smart New Orleans Impact Evaluation
for
Program Year 3**

**Prepared for
Energy New Orleans
by:
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May 16, 2014**

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EXECUTIVE SUMMARY

This report presents the results from the impact evaluation of Energy Smart New Orleans' full Year 3 portfolio of residential, commercial, and industrial efficiency programs. The report was expanded this year to also cover the first 18 months of projects in the Algiers service territory. The impact evaluation consisted of two main components: a complete tracking data analysis from all data in Entergy New Orleans' and Algiers' tracking databases, and a detailed review of project files selected by using stratified random sampling methods on the population of projects in the tracking database. While projects from New Orleans and Algiers were combined for the sake of selecting a sample and deriving a realization rate, they are reported separately in this report. Tables E.1 through E.4 show that the impact evaluation resulted in a realization rate of very close to one in both service territories, indicating that there are very good data verification and quality control procedures in place.

Table E.1: Total kWh Results – New Orleans

Program	Reported kWh Savings	Verified kWh Savings	% of total savings	kWh Realization rate
AC Tune-Up	617,946	617,946	4%	1.00
Res Solutions - Assessments	2,311,821	2,244,763	14%	0.97
Res Solutions - Direct Install	3,186,244	3,186,244	20%	1.00
Energy Star Air Conditioner	229,109	227,754	1%	0.99
CFL Direct Install	2,446,696	2,448,124	15%	1.00
New Homes	45,613	71,925	0%	1.58
Low-Income	498,133	496,747	3%	1.00
Small C&I	2,133,575	2,108,012	13%	0.99
Large C&I	4,820,296	4,601,848	29%	0.95
Solar Hot Water	4,630	4,630	0%	1.00
Total	16,294,063	16,007,993	100%	0.98

Table E.2: Total kW Results – New Orleans

Program	Reported kW Savings	Verified kW Savings	% of total savings	kW Realization rate
AC Tune-Up	317	317	11%	1.00
Residential Solutions	849	822	28%	0.97
Multi-Family Direct Install	294	294	10%	1.00
Energy Star Air Conditioner	79	79	3%	1.00
CFL Direct Install	230	230	8%	1.00
New Homes	15	20	1%	1.33
Low-Income	163	163	5%	1.00
Small C&I	359	348	12%	0.97
Large C&I	696	687	23%	0.99
Solar Hot Water	1	1	0%	1.00
Total	3,003	2,962	100%	0.99

Table E.3: Total kWh Results – Algiers

Program	Reported kWh Savings	Verified kWh Savings	% of total savings	kWh Realization rate
AC Tune-Up	131,854	131,854	4%	1.00
Res Solutions - Assessments	154,434	149,954	5%	0.97
Res Solutions - Direct Install	1,331,255	1,331,255	42%	1.00
Energy Star Air Conditioner	33,214	33,018	1%	0.99
CFL Direct Install	821,238	821,238	26%	1.00
New Homes	n/a	n/a	n/a	n/a
Low-Income	18,272	18,221	1%	1.00
Small C&I	519,145	512,925	16%	0.99
Large C&I	218,945	209,023	7%	0.95
Solar Hot Water	n/a	n/a	n/a	n/a
Total	3,228,358	3,207,488	100%	0.99

Table E.4: Total kW Results – Algiers

Program	Reported kW Savings	Verified kW Savings	% of total savings	kW Realization rate
AC Tune-Up	64	64	13%	1.00
Residential Solutions	62	60	13%	0.97
Multi-Family Direct Install	126	126	26%	1.00
Energy Star Air Conditioner	10	10	2%	1.00
CFL Direct Install	77	77	16%	1.00
New Homes	n/a	n/a	n/a	n/a
Low-Income	8	8	2%	1.00
Small C&I	111	107	22%	0.97
Large C&I	28	28	6%	0.99
Solar Hot Water	n/a	n/a	n/a	n/a
Total	487	481	100%	0.99

Our evaluation also identified several key recommendations to ensure that the high quality of the data continues and that program savings estimates are accurate. Note that several of the suggestions are similar to those given last year. We did notice definite improvement in these points since last year, especially in updating the database to match the results of the inspections, but there were still projects where unclear or incomplete documentation made review difficult. Going forward, we suggest the following:

- Ensure that project documentation includes an invoice where the equipment type and quantity is legible. If the invoice is not an accurate reflection of project conditions, a short memo or note should be included explaining the discrepancies. This is especially important for the C&I projects.
- Include product spec sheets as part of the project documentation.
- Ensure that project documentation is consistent and complete for every project. Incomplete project documentation made it very difficult to perform thorough third-party verification in certain cases. This is especially true for the C&I program, where each lighting project file should include a copy of any calculation worksheets and each non-lighting project should include a memo explaining the savings assumptions and calculations.
- 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 New Orleans' full Year 3 portfolio of residential, commercial, and industrial electric efficiency programs. The report mirrors the evaluations done for Program Years 1 and 2 of the program. For this year of the program, the evaluation also assesses projects completed in the first 18 months in the Algiers service territory. The key objective from this evaluation is to provide verification of the gross energy impacts reported in the tracking database. To this end, the evaluation uses an engineering review of project files from a statistically significant sampling of projects completed during the year. During the file review, the evaluation asks:

- Are the deemed savings calculations applied 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?
- Are the savings calculated from the project files accurately transcribed into the tracking database?

The scope of the evaluation does not include any site visits or participant interviews, and so all evaluation numbers rely on the paper work filed with the evaluated project. In cases where invoices were provided with the project paperwork, it was checked to ensure the specifications of the invoiced equipment match the deemed savings recorded in the tracking database.

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.

PROGRAM DESCRIPTIONS

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

- **Air Conditioner (AC) Tune-Up** - \$75 towards the tune-up of existing residential central air conditioner or heat pump system
- **Residential Solutions** – The residential solutions program contains two components. The energy assessment component gives rebates on energy audits for residential households, as well as any appropriate shell/air-sealing measures identified during the audit. The multi-family direct install component provides no-cost installation of CFLs, low-flow showerheads, and faucet aerators in large multifamily buildings.
- **ENERGY STAR Air Conditioning** – rebates on ENERGY STAR certified room air conditioners, central air conditioners, and heat pumps.
- **CFL Direct Install** – free CFLs installed directly in residences
- **Low Income**– free energy audits, insulation, air sealing, and ENERGY STAR HVAC equipment to low-income households
- **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.
- **Small Commercial and Industrial** – rebates for efficiency projects at small commercial and industrial facilities
- **Large Commercial and Industrial** - rebates for efficiency projects at large commercial and industrial facilities.
- **Solar Hot Water Heating** – Rebates for hot water systems that derive part of their heat from the sun.

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

In general, stratified random sampling was used for each program to select a statistically significant, representative sample of projects for review. Stratified random sampling is a statistical technique that splits 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 in the next section.

This year's evaluation also includes the first 18 months of projects delivered in the Algiers service territory. The programs in Algiers are substantively the same as those run in New Orleans, and include projects in all programs except Energy Efficient New Homes and Solar Hot Water Heating.

For each program with projects in both New Orleans and Algiers, we grouped the projects together before selecting the random sample. If the original random sample did not include any Algiers projects, we discarded the original selection and re-did the sample, until the randomly selected sample included projects from Algiers in roughly the same proportion as the overall population. In this way, we ensure that the realization rates calculated in this evaluation can be validly applied to both the projects done in New Orleans and the projects done in Algiers.

PROGRAM LEVEL RESULTS

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

AC TUNE-UP

Savings data for the AC Tune-up Program were analyzed by installation address and application. Each project achieved a mean savings of 865 kWh. However, this mean is distorted by one very large project, which included tune-ups for 191 air conditioners. Without this outlier, mean savings would be 797 kWh. Table 1 below shows the number of projects and savings for the New Orleans and Algiers service territories.

Table 1: AC Tune-Up Total Projects

	Projects	kWh Saved	Mean kWh	kW Saved	Mean kW
New Orleans	773	617,946	799	317	0.41
Algiers	93	131,854	1,418	64	0.69
Total	866	749,800	866	382	0.44

In order to minimize the number of project files requiring review, stratified random sampling was used. Before final sample selection, the database was reviewed to check for outliers and missing values. There were 17 addresses in the database with zero listed savings; these addresses were associated with an administration fee or an inspection, and were excluded from the population before the strata were selected. 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. Since this program uses a highly deemed approach, there were certain savings values claimed very often among projects. The strata were selected so that these common values were all located within a single stratum.

Table 2: AC Tune-Up Program Strata Description

Sampling Strata	Reported kWh	Reported kW	Projects
1	316,689	175	571
2	247,389	124	254
3	185,722	82	41
TOTAL	749,800	382	866

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

Table 3: AC Tune-up Reviewed Project Information

Sampling Strata	Projects	Reported kWh	Number of Sampled Projects	% of Total Sampled
1	571	316,689	3	0.5%
2	254	247,389	3	1.2%
3	41	185,722	11	26.8%
TOTAL	866	749,800	17	2.0%

Tables 4 and 5 show the results of the quantitative project file review for New Orleans and Algiers. The kWh and kW savings were adjusted for three of the reviewed projects where the quantity in the invoice did not match the quantity used to calculate savings. However, these adjustments cancelled each other out, so the final realization rate is 1.0 for both kWh and kW.

Table 4: AC Tune-up Impact Results – New Orleans

	Reported	Realization Rate	Verified	Relative Precision at 90% confidence level
kWh	617,946	1.0	617,946	1.9%
kW	317	1.0	317	1.8%

Table 5: AC Tune-up Impact Results – Algiers

	Reported	Realization Rate	Verified	Relative Precision at 90% confidence level
kWh	131,854	1.0	131,854	1.9%
kW	64	1.0	64	1.8%

Some general observations from the database and project file review:

- Only three of the 17 reviewed projects resulted in savings adjustments. This demonstrates that savings are tracked relatively consistently and accurately.
- The three adjustments that were made canceled each other, indicating that there are no systematic biases in the savings estimates in the tracking database.
- There were a few projects where the documentation shows that other measures, such as air sealing, were done in the same house as the tune-up. However, the database savings only reflect the tune-up measure. The current realization rate assumes that the savings for the other measures are captured in another program. However, the addresses in question do not appear in the database for the Home Performance with ENERGY STAR or Hard-to-Reach programs. **CLEAResult should verify that savings from these measure are**

appearing somewhere in the total portfolio savings, and should implement a procedure to clearly document how and when savings from multiple measures at the same household are split between programs. If these savings are not included anywhere, the realization rate would rise to well above 1.0.

- Deemed savings estimates are not capacity dependent for this program, while the applications include equipment with capacities varying from 1.5 to 4 tons. **We recommend modifying deemed savings values to be dependent on the capacity of the air conditioner. At a minimum, capacity should be tracked in the database, to enable a comparison between the actual average capacity and the assumptions used in the deemed savings database.**

RESIDENTIAL SOLUTIONS

Energy Assessments

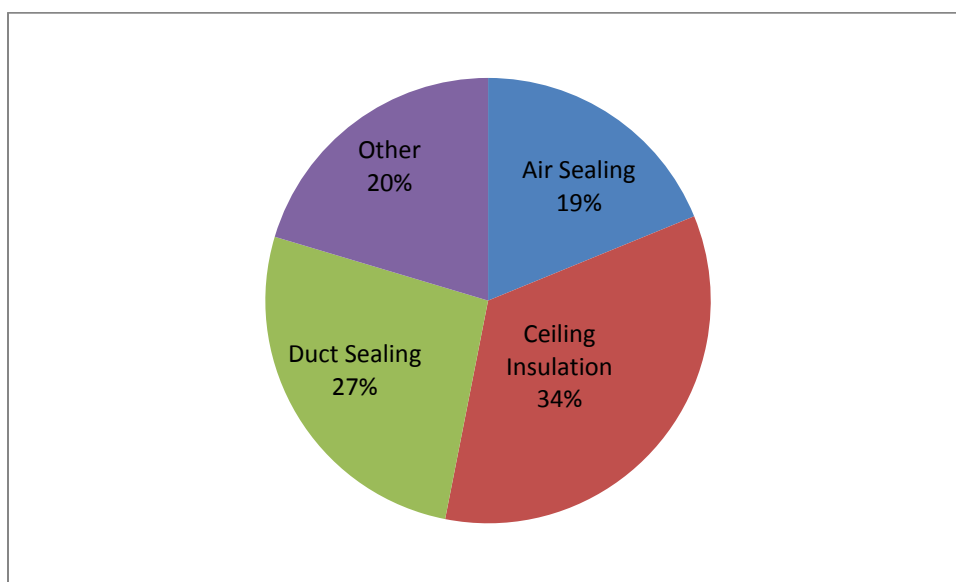
The Residential Solutions Program is broken into two components – energy assessments for single family homes and a direct install component for multi-family homes. Table 6 below shows the number of energy assessments and associated savings for the New Orleans and Algiers service territories.

Table 6: Energy Assessments by Jurisdiction

	Projects	kWh Saved	Mean kWh	kW Saved	Mean kW
New Orleans	682	2,311,821	3,390	847	1.24
Algiers	61	154,434	2,532	62	1.02
Total	743	2,466,254	3,319	910	1.22

As seen in the figure below, the majority of savings for the program consist of ceiling insulation, duct sealing, and air sealing. The other 20% of savings includes floor insulation, wall insulation, domestic hot water DI (aerators and low-flow showerheads), smart strips, radiant barriers, pool pumps, and custom direct install.

Figure 1: Residential Solutions Savings by End Use



In order to minimize the number of project files requiring 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 7 below shows the reported kWh, kW, and number of projects in each sampling stratum.

Table 7: Residential Solutions Program Strata Description

Sampling Strata	Reported kWh	Reported kW	Projects
1	517,030	343	414
2	1,350,467	436	284
3	598,758	132	45
TOTAL	2,466,254	911	743

Next, a sample of projects from each stratum was selected. The number of projects selected from each stratum is dependent on the standard deviation of the reported savings within that stratum. Table 8 gives the sample information.

Table 8: Residential Solutions Reviewed Project Information

Sampling Strata	Projects	Reported kWh	Number of sampled projects	kWh of sampled projects	% of Total Sampled
1	414	517,030	7	12,776	2%
2	284	1,350,467	11	49,896	4%
3	45	598,758	5	81,138	14%
TOTAL	743	2,466,254	22	149,211	6%

Tables 9 and 20 show the results of the quantitative project file review for New Orleans and Algiers.

Table 9: Energy Assessment Impact Results – New Orleans

	Reported	Realization Rate	Verified	Relative Precision at 90% confidence level
kWh	2,311,821	0.97	2,244,763	7.80%
kW	849	0.97	822	5.10%

Table 10: Energy Assessment Impact Results – Algiers

	Reported	Realization Rate	Verified	Relative Precision at 90% confidence level
kWh	154,434	0.97	149,954	7.80%
kW	62	0.97	60	5.10%

Some general observations from the database and project file review:

- The realization rate is under 1.0 due to several instances where houses that had some pre-existing insulation used the deemed savings value assuming no existing insulation.
- The savings in the database for the projects reviewed have been more consistently updated to reflect the post-inspection numbers for this year, than for program years one and two. **We recommend continuing to ensure that the savings in the database reflects the conditions found from the post-inspection.**
- There were very little savings due to direct install measures. **We recommend aggressively promoting CFLs, faucet aerators, and other easy to install measures during the home energy assessments.**
- As in other program years, 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 and/or the tracking database.
- Many projects did not include invoices or inspection forms. **We recommend ensuring that, for all projects that undergo inspection, the inspection form is included in the project documentation, and that all invoices are included.**
- It was often difficult based on the information provided to tell which of the recommend measures were implemented. **We recommend clearly including a single document showing each measure that was implemented, and the**

associated savings, along with the application, invoice, and post-inspection form.

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. Because some of the units visited were for low-income families, 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 621 MWh.

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, and the stipulated hours of operation by room type conformed to industry standards.

Since we did not adjust kWh or kW savings for the multifamily direct install program, the realization rate is 1.0. Tables 11 and 12 show the kWh and kW savings for the Multi-Family DI program for New Orleans and Algiers.

Table 11: Multi-Family DI kWh Impact Results – New Orleans

	Reported	Realization Rate	Verified
kWh	3,186,244	1.0	3,186,244
kW	294	1.0	294

Table 12: Multi-Family DI kWh Impact Results – Algiers

	Reported	Realization Rate	Verified
kWh	1,331,255	1.0	1,331,255
kW	126	1.0	126

Finally, it is not clear from the documentation whether or not the savings estimates include interactive effects. If not, then savings estimates understate the true savings, as the more efficient bulbs reduce the cooling load in summer. **We recommend that, going forward, the contractors or volunteers track whether or not lamps are installed in a conditioned space and include a multiplier to account for HVAC interactive effects.**

Total Residential Solutions Savings

Finally, Tables 13 through 16 show the total savings for the energy assessment measures and component of the Multi-Family Direct Install Initiatives for New Orleans and Algiers.

Table 13: Total Residential Solutions kWh Savings – New Orleans

	Reported Savings	Realization Rate	Verified Savings
Assessments	2,311,821	0.97	2,244,763
Multi-Family	3,186,244	1.00	3,186,244
Total	5,498,065	0.99	5,431,007

Table 14: Total Residential Solutions kW Savings – New Orleans

	Reported Savings	Realization Rate	Verified Savings
Assessments	849	0.97	822
Multi-Family	294	1.00	294
Total	1,143	0.98	1,116

Table 15: Total Residential Solutions kWh Savings – Algiers

	Reported Savings	Realization Rate	Verified Savings
Assessments	154,434	0.97	149,954
Multi-Family	1,331,255	1.00	1,331,255
Total	1,485,689	1.00	1,481,209

Table 16: Total Residential Solutions kW Savings – Algiers

	Reported Savings	Realization Rate	Verified Savings
Assessments	62	0.97	60
Multi-Family	126	1.00	126
Total	189	0.99	187

ENERGY STAR AIR CONDITIONER

There were 366 homes that participated in the ENERGY STAR Air Conditioner Program in 2013, for a total of 262,323 kWh saved annually. Table 17 below gives the breakout of projects and savings between Algiers and New Orleans.

Table 17: ENERGY STAR AC Projects by Jurisdiction

	Projects	kWh Saved	Mean kWh	kW Saved	Mean kW
New Orleans	336	229,109	682	79	0.2
Algiers	30	33,214	1,107	10	0.3
Total	366	262,323	1,789	90	0.2

In order to minimize the number of project files requiring 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 18 below shows the reported kWh, kW, and number of projects in each sampling stratum.

Table 18: ENERGY STAR AC Program Strata Information

Sampling Strata	Reported Gross kWh	Reported Gross kW	Projects
1	83,499	35	277
2	90,071	29	64
3	88,753	26	25
TOTAL	262,323	90	366

Next, a sample of projects from each stratum was selected. The number of projects selected from each stratum is dependent on the standard deviation of the reported savings within that stratum. Table 19 gives the sample information.

Table 19: ENERGY STAR AC Reviewed Project Information

Sampling Strata	Projects	Reported kWh	Number of sampled projects	kWh of sampled projects	% of Total Sampled
1	277	83,499	7	1,737	2%
2	64	90,071	7	9,782	11%
3	25	88,753	10	30,100	34%
TOTAL	366	262,323	24	41,619	16%

Tables 20 and 21 show the results of the quantitative project file review for New Orleans and Algiers.

Table 20: ENERGY STAR AC Impact Results – New Orleans

	Reported	Realization Rate	Verified	Relative Precision at 90% confidence level
kWh	229,109	0.99	227,754	1%
kW	79	1.00	79	n/a

Table 21: ENERGY STAR AC Impact Results – New Orleans

	Reported	Realization Rate	Verified	Relative Precision at 90% confidence level
kWh	33,214	0.99	33,018	1%
kW	10	1.00	10	n/a

Some general observations from the database and project file review:

- The realization rate for kWh is slightly below one because there was one instance where heating savings were claimed for a heat pump, even though the existing system had gas heat. There were no adjustments made to the kW savings.
- We note that the ENERGY STAR specification 3.0 went into effect on October 1, 2013. We therefore could not find several installed products on the list of certified ENERGY STAR equipment, even though they were presumably ENERGY STAR at the time of installation. **We recommend making sure that installed equipment meets current ENERGY STAR specifications by checking against the list maintained by ENERGY STAR, as some product literature may be out of date.**
- **We recommend including spec sheets in the project file, so the equipment can be identified without having to do a web search.**
- Installation Verification or photographs were not performed for every project reviewed.
- In one instance, a Window AC unit was purchased as part of a trade-in event at Lowes. The file for this project contains the information on the type of AC recycled, but nothing about the new unit. In this case, we have no way of determining whether or not the deemed savings values chosen match the actual unit installed. **We recommend including documentation for the AC units purchased during AC trade-ins, and to implement a method to avoid double counting savings from units purchased at trade-ins.**
- The application requires a heat load calculation if the new unit is more than ½ a ton larger than the previous unit. However, there is no field for entering

the previous unit's capacity on the application. **We recommend that a field be added on the application to track the capacity of the existing unit.**

CFL DIRECT INSTALL

The CFL Direct Install Program was evaluated by recalculating the savings for every month of activity in both New Orleans and Algiers, and comparing the resulting savings to the claimed savings. Savings are based on a table which gives deemed savings for CFLs of various wattages. Due to new federal standards, this table changed between the April 2012-March 2013 program year and the April 2013 – March 2014 program year. The evaluation checked to ensure that the correct table was used in all cases. Tables 22 and 23 show the results from the project review for New Orleans and Algiers.

Table 22: CFL Direct Install Impact Results – New Orleans

	Reported	Realization Rate	Verified
kWh	2,446,696	1.00	2,448,124
kW	229.6	1.00	229.8

Table 23: CFL Direct Install Impact Results – Algiers

	Reported	Realization Rate	Verified
kWh	821,238	1.00	821,238
kW	77	1.00	77

Some comments from the review include:

- Savings were sometimes, but inconsistently, calculated for each month, as well as separately for the end of the year. In some cases, the savings values from the end of the year calculation were different than the monthly calculations. In these cases the end of the year reported savings were correct, but having two separate values may create confusion. We recommend ensuring that the savings are calculated correctly each month, and summing these values to keep an ongoing total of program savings.
- Algiers was evaluated for 18 months of activity. For the first 6 months, incorrect deemed values for demand savings were often used for the monthly calculations. The correct values were used in the end-of-year calculations.
- For both Algiers and New Orleans, there were many months where there were no program calculated savings values on the monthly spreadsheets.
- For the New Orleans territory, the realization rate is slightly over one, due to a small amount of 16 watt LEDs installed for which savings were not claimed in the end of the year calculations. Some of the monthly calculations did include savings for the LEDs, but used the same deemed savings value as a 16 watt CFL would use. This understates the savings from the LED. We recommend adding a separate set of deemed savings values for LEDs.

- There were very few LEDs installed. Consider making a more aggressive push for LEDs given their rapidly falling prices.

NEW HOMES

There were 32 homes that participated in the new homes program during Program Year 3 – none of these were located in the Algiers service territory. Total annual savings achieved was 45,613 kWh, for a mean savings of 1,425 kWh per house.

We used stratified random sampling with two tiers to select the sample. 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 two strata, one with projects with savings of under 1,000 kWh and the other with projects with savings over 2,000 kWh (there were no projects that saved between 1,000 and 2,000 kWh). Table 24 below shows the reported kWh, kW, and number of projects in each sampling stratum.

Table 24: New Homes Strata Information

Sampling Strata	Reported kWh	Reported kW	Projects
1	11,134	5.04	17
2	34,479	10.41	15
TOTAL	45,613	15	32

Next, a sample of projects from each stratum was selected. The number of projects selected from each stratum is dependent on the standard deviation of the reported savings within that stratum. Table 25 gives the sample information.

Table 25: New Homes Reviewed Project Information

Sampling Strata	Projects	Reported kWh	Number of sampled projects	kWh of sampled projects	% of Total Sampled
1	17	11,134	2	1,236	11%
2	15	34,479	4	9,406	27%
TOTAL	32	45,613	6	10,642	23%

Table 26 shows the results of the quantitative project file review. The table only includes values for the New Orleans service territory, as there were no projects completed in Algiers.

Table 26: New Homes Impact Results – New Orleans

	Reported Savings	Realization Rate	Verified Savings	Relative Precision at 90% confidence level
kWh	45,613	1.58	71,925	45%
kW	15	1.297517	20	30%

Some general observations from the database and project file review:

- Realization rates are well above 1.0, mainly due to one project which only claimed savings for the windows, when the invoice shows that the home received incentives for windows, an ENERGY STAR heat pump, and an advanced lighting package.
- Other projects used 2,087 kWh saved, whereas Appendix 6 stipulates 2,360 kWh. This difference should be reconciled.
- Uncertainty (relative precision) in the realization rate is higher for this program than for other programs. This reflects the fact that one of the projects had a very large adjustment of savings, and it is hard to know how many other similar outliers would be in the total population.
- The deemed savings values for the advanced lighting package assumes gas furnace heat, while many of the new homes projects have heat pumps. This means that heat pump savings may be overstated due to lighting interactive effects.
- **We recommend that effort should be made to ensure all application material and invoices should be included in the project documentation.**

LOW-INCOME

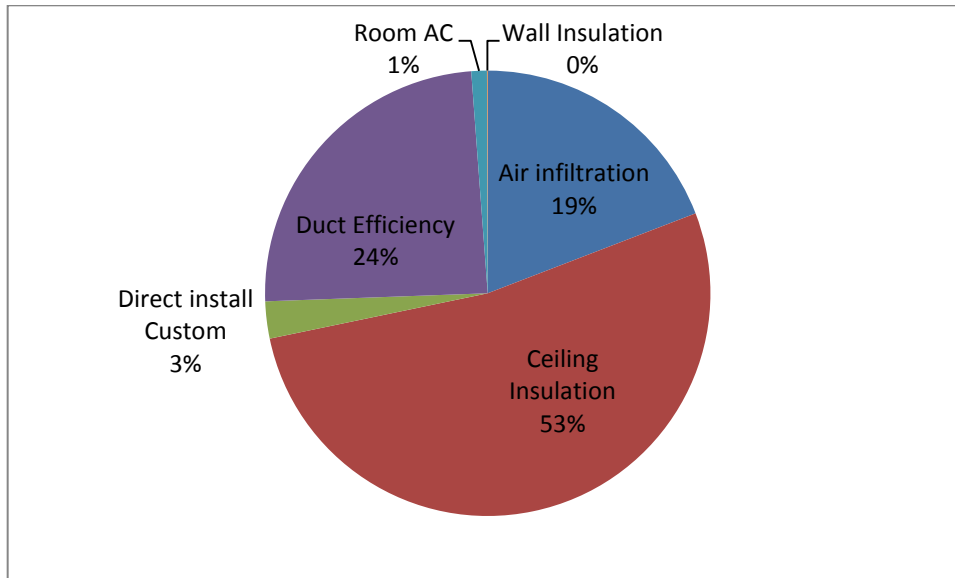
In Program Year 3, there were a total of 114 homes that participated in the Low-Income program. Table 27 below gives the savings and projects from Algiers and New Orleans.

Table 27: Low-Income Projects by Jurisdiction

	Projects	kWh Saved	Mean kWh	kW Saved	Mean kW
New Orleans	97	498,133	5,135	163	1.69
Algiers	17	18,272	1,075	8	0.48
Total	114	516,405	4,530	172	1.51

The figure below gives the savings by measure for the low income program. As seen, ceiling insulation has, by far, the highest level of savings, with almost all the rest coming from air and duct sealing measures.

Figure 2: Low-Income Savings Distribution



For sampling, we split up the projects into three tiers, as shown in Table 28.

Table 28: Low-Income Program Sampling Description

Tier	Reported kWh	Reported kW	Projects
1	167,821	72	71
2	174,588	49	26
3	173,996	51	17
TOTAL	516,405	172	114

Next, a sample of projects was selected from each category. The number of projects selected from each category is dependent on the standard deviation of the reported savings. Table 29 gives the sample information.

Table 29: Low-Income Reviewed Project Information

Tier	Projects	Reported kWh	Number of sampled projects	kWh of sampled projects	% of Total Sampled
1	71	167,821	9	19,248	11%
2	26	174,588	2	11,819	7%
3	17	173,996	3	31,401	18%
TOTAL	114	516,405	14	62,468	12%

Tables 30 and 31 show the results of the quantitative project file review for New Orleans and Algiers.

Table 30: Low-Income Impact Results – New Orleans

	Reported Savings	Realization Rate	Verified Savings	Relative Precision at 90% confidence level
kWh	498,133	0.997	496,747	0.6%
kW	163	0.996	163	0.7%

Table 31: Low-Income Impact Results – Algiers

	Reported Savings	Realization Rate	Verified Savings	Relative Precision at 90% confidence level
kWh	18,272	0.997	18,221	0.6%
kW	8	0.996	8	0.7%

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:

- The results of the review show that the savings in the database are being consistently updated to reflect the post inspection numbers.
- It seems as though there may be cases where CFLS were installed in the initial assessment, but not recorded as savings. **We recommend pushing harder to install CFLs, shower heads, and aerators, and to ensure that the resulting savings are properly recorded in the tracking database.**
- Invoices were consistently included in the project files, making review much easier.

SMALL COMMERCIAL AND INDUSTRIAL

In Program Year 3, the small Commercial and Industrial program consisted almost entirely of lighting projects. Only 3 non-lighting measures were installed: one HVAC project, one attic insulation, and one “other”. All of these were in the New Orleans service territory; all Algiers projects were lighting. Table 32 below gives the breakout of projects between New Orleans and Algiers.

Table 32: Small Commercial Projects by Jurisdiction

	Projects	kWh Saved	Mean kWh	kW Saved	Mean kW
New Orleans	87	2,133,575	24,524	359	4
Algiers	15	519,145	34,610	111	7
Total	102	2,652,720	26,007	470	5

For sampling, we split up the projects into three tiers, as shown in Table 33.

Table 33: Small C&I Program Strata Description

Strata	Reported Gross kWh	Reported Gross kW	Projects
1	482,180	97	63
2	1,003,403	195	31
3	1,167,137	179	8
Total	2,652,720	470	102

Next, a sample of projects was selected from each category. The number of projects selected from each category is dependent on the standard deviation of the reported savings. Table 34 gives the sample information.

Table 34: C&I Program Reviewed Project Information

Sampling Strata	Projects	Reported kWh	Number of sampled projects	kWh of sampled projects	% of Total Sampled
1	63	482,180	2	29,756	6%
2	31	1,003,403	4	122,949	12%
3	8	1,167,137	4	526,448	45%
TOTAL	102	2,652,720	10	679,153	26%

Tables 35 and 36 show the results of the quantitative project file review for New Orleans and Algiers.

Table 35: C&I Impact Results – New Orleans

	Reported	Realization Rate	Verified	Relative Precision at 90% confidence level
kWh	2,133,575	0.99	2,108,012	3.3%
kW	359	0.97	348	4.6%

Table 36: C&I Impact Results – Algiers

	Reported	Realization Rate	Verified	Relative Precision at 90% confidence level
kWh	519,145	0.99	512,925	3.3%
kW	111	0.97	107	4.6%

Some general observations from the database and project file review:

- There were several cases where the available project information (i.e., invoice, inspection report, photos) was not detailed enough to verify the inputs to the savings calculator. For example, an invoice might show that the customer purchased CFLs without indicating the wattage. Or, similarly, the inspection photos might show the wattage of only one type of bulb where multiple bulbs of different wattage were installed.
- To ease future review and increase transparency, we recommend ensuring that the product spec sheets are included in the project files, and that invoices show both the type and quantity of bulbs ordered. If there is a valid reason for significant differences between the invoice and the savings calculator, a short memo or note should be included that describes the reasons for the discrepancies. Final, an excel version of the final lighting calculator should be included in the project file.

LARGE COMMERCIAL AND INDUSTRIAL

In Program Year 3, there were no non-lighting projects in the Large Commercial and Industrial Program. There was only one large C&I project in the Algiers jurisdiction, with 218,845 kWh in annual savings. There were 18 projects in the New Orleans territory, for a total of 4,820,296 kWh or a mean of 267,794 kWh per project.

Due to the small population of projects in the program, we did not stratify the projects for the purposes of sample selection. Instead, we used simple random sampling to select the projects to be evaluated. Table 37 below gives the sampling information.

Table 37: Large C&I Sample Information

Projects	Reported kWh	Number of sampled projects	kWh of sampled projects	% of Total Sampled
19	5,039,241.00	8	1682120	33%

Tables 38 and 39 give the quantitative results of the review for New Orleans and Algiers.

Table 38: Large C&I Impact Results – New Orleans

	Reported	Realization Rate	Verified	Relative Precision at 90% confidence level
kWh	4,820,296	0.95	4,601,848	4.9%
kW	696	0.99	687	1.1%

Table 39: Large C&I Impact Results – Algiers

	Reported	Realization Rate	Verified	Relative Precision at 90% confidence level
kWh	218,945	0.95	209,023	4.9%
kW	28	0.99	28	1.1%

In general, it was very difficult to review large C&I projects given the level of documentation provided. However, the adjustments we were able to make include:

- In some cases, invoices were given on a room by room basis, without including the types of fixtures. For these projects, it was impossible to verify that the savings calculator used fixture types that match the invoices.
- In other cases, there were large discrepancies between the invoice and the final savings calculator. While it is expected that the building owner would purchase some extra bulbs for backup or to take advantage of bulk pricing, this explanation does not suffice for the discrepancies seen. For example, the table below presents the fixture counts by lamp type from both the final calculator and the invoice for an example large C&I lighting project. As shown, the savings calculator contained too many of certain types of fixtures compared to the invoice, and too few of others. The column on right shows how we changed the fixture quantities in the savings calculator to better fit the invoice. The actual installed fixture counts are most likely different, but the updated estimate matches the invoice much more closely than the savings in the tracking database.

	Savings Calc.	Invoice	Updated
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	Quantity	Quantity	Calculator
7 watt LED	400	196	213
9 watt LED	116	304	303
12 watt LED	845	774	776
14 watt LED	1701	1794	1770
17 watt LED	128	131	128

- In one other case, the invoice was too different than the savings calculator to even guess at the right fixture quantities. The table below shows the fixture type and quantities for the savings calculator and invoice for this project.

Fixture	Savings Calc. Quantity	Invoice Quantity
13 watt CFL	2	6
16 watt CFL	232	0
50 watt induction	4	0
80 watt induction	3	0
17 watt T8	0	30
25 watt T8	0	30
28 watt T8	423	780
2 watt LED	46	0
3 watt LED	0	37
4 watt LED	4	0
10 watt LED	0	60
13 watt LED	0	270
18 watt LED	61	6
Delamping	15	n/a

- There were two instances in which the calculator used the wrong building type, resulting in extra hours of operation. If the tool user was simply selecting a building type with operating hours approximately equal to those provided by the customer, the custom hours should be entered in the tool as a new building type with appropriate documentation/substantiation. In one of these cases, we were later provided a memo documenting that the hours of operation in the facility were larger than for the building type default. In this case, we left the original hours of operation. In the other case, we adjusted the savings to match the appropriate building type.

In order to make the review process easier in the future, we suggest:

- Include lighting spec sheets in the project file, so it is clear which bulbs were installed.
- Make sure that the fixture types and quantities used in the final calculator match those used in the invoice. If there is a valid reason for them not to

match, include a brief memo or note in the project file explaining the discrepancy.

- Make sure to include excel versions of the lighting calculator in every project file.
- If lighting hours of operation do not match the building type default in the lighting calculator, enter a custom building type and include appropriate documentation, instead of just selecting the building type with the closest operating hours.
- Make sure that every project file has an invoice, and that invoice shows the quantity and type of lighting equipment purchased.
- Ensure that lifetime savings for T12 retrofits are appropriate, considering the new federal standards².

SOLAR HOT WATER HEATING

In program year 2, there were also two solar hot water heating projects in the New Orleans territory, and none in the Algiers service territory. The two projects achieved a total of 4,630 kWh and 0.84 kW of annual savings. Since there were only two projects we looked at the documentation for both of them. We found that both projects were clearly documented and correctly used the deemed savings. As shown in Table 29, the realization rate is 1.0 for both kWh and kW.

Table 40: Solar Hot Water Impact Results – New Orleans

	Reported	Realization Rate	Verified
kWh	4,630	1.00	4,630
kW	0.84	1.00	0.84

² *Federal Register*, 74 FR 34080 (July 14, 2009)

<http://www.regulations.gov/#!documentDetail;D=EERE-2006-STD-0131-0005>

CONCLUSION

TOTAL RESULTS

Tables 41 through 44 show that realization rates for all programs in both the New Orleans and the Algiers service territory were very close to one, with total realization rates for kWh and kW of just below one. This indicates that, in general, CLEAResult accurately calculated and reported deemed savings.

Table 41: Total kWh Results – New Orleans

Program	Reported kWh Savings	Verified kWh Savings	% of total savings	kWh Realization rate
AC Tune-Up	617,946	617,946	4%	1.00
Res Solutions - Assessments	2,311,821	2,244,763	14%	0.97
Res Solutions - Direct Install	3,186,244	3,186,244	20%	1.00
Energy Star Air Conditioner	229,109	227,754	1%	0.99
CFL Direct Install	2,446,696	2,448,124	15%	1.00
New Homes	45,613	71,925	0%	1.58
Low-Income	498,133	496,747	3%	1.00
Small C&I	2,133,575	2,108,012	13%	0.99
Large C&I	4,820,296	4,601,848	29%	0.95
Solar Hot Water	4,630	4,630	0%	1.00
Total	16,294,063	16,007,993	100%	0.98

Table 42: Total kW Results – New Orleans

Program	Reported kW Savings	Verified kW Savings	% of total savings	kW Realization rate
AC Tune-Up	317	317	11%	1.00
Residential Solutions	849	822	28%	0.97
Multi-Family Direct Install	294	294	10%	1.00
Energy Star Air Conditioner	79	79	3%	1.00
CFL Direct Install	230	230	8%	1.00
New Homes	15	20	1%	1.33
Low-Income	163	163	5%	1.00
Small C&I	359	348	12%	0.97
Large C&I	696	687	23%	0.99
Solar Hot Water	1	1	0%	1.00
Total	3,003	2,962	100%	0.99

Table 43: Total kWh Results – Algiers

Program	Reported kWh Savings	Verified kWh Savings	% of total savings	kWh Realization rate
AC Tune-Up	131,854	131,854	4%	1.00
Res Solutions - Assessments	154,434	149,954	5%	0.97
Res Solutions - Direct Install	1,331,255	1,331,255	42%	1.00
Energy Star Air Conditioner	33,214	33,018	1%	0.99
CFL Direct Install	821,238	821,238	26%	1.00
New Homes	n/a	n/a	n/a	n/a
Low-Income	18,272	18,221	1%	1.00
Small C&I	519,145	512,925	16%	0.99
Large C&I	218,945	209,023	7%	0.95
Solar Hot Water	n/a	n/a	n/a	n/a
Total	3,228,358	3,207,488	100%	0.99

Table 44: Total kW Results – Algiers

Program	Reported kW Savings	Verified kW Savings	% of total savings	kW Realization rate
AC Tune-Up	64	64	13%	1.00
Residential Solutions	62	60	13%	0.97
Multi-Family Direct Install	126	126	26%	1.00
Energy Star Air Conditioner	10	10	2%	1.00
CFL Direct Install	77	77	16%	1.00
New Homes	n/a	n/a	n/a	n/a
Low-Income	8	8	2%	1.00
Small C&I	111	107	22%	0.97
Large C&I	28	28	6%	0.99
Solar Hot Water	n/a	n/a	n/a	n/a
Total	487	481	100%	0.99

CONCLUSIONS AND NEXT STEPS

The realization rate of close to one 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 project documentation includes an invoice where the equipment type and quantity is legible. If the invoice is not an accurate reflection of project conditions, a short memo or note should be included explaining the discrepancies. This is especially important for the C&I projects
- Include product spec sheets as part of the project documentation.
- Ensure that the project savings information is updated based on post-inspection verification information.
- Ensure that project documentation is consistent and complete for every project. Incomplete project documentation made it very difficult to perform thorough third-party verification in certain cases. This is especially true for the C&I program, where each lighting project file should include a copy of any calculation worksheets and each non-lighting project should include a memo explaining the savings assumptions and calculations.
- Consider adding a factor representing HVAC interactive effects for residential savings calculations.

Despite the above caveats, it is clear that after three program years, CLEAResult is accurately using the deemed savings for its projects and is maintaining a good and up-to-date database. We believe that Energy Smart stakeholders should 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, especially after the above recommendations have been implemented. Therefore, it may be appropriate to conduct a less thorough review of the project files in the future and instead focus evaluation resources on specific program areas that represent large fractions of overall savings and/or are highly uncertain. These evaluation areas may include:

- On-site verification to ensure that projects are being installed to the correct specifications.
- Evaluate specific savings assumptions in the deemed savings algorithms that have a high degree of uncertainty or that impact a large portion of portfolio savings.
- A process evaluation looking at how to improve program processes and procedures, as opposed to impacts.
- Review of install rates and savings for the CFL Giveaway program.

Measure Life

The effective life for this measure is 20 years.¹

Measure Cost

Since the most cost-effective application for radiant barriers is in new construction, the measure cost was established from real pricing of OSB roof decking at Home Depot. A normal 4 ft x 8 ft section of standard OSB costs \$8.67, while the same size piece of OSB with a radiant barrier laminated onto one side costs \$10.47⁴. This is an incremental cost slightly less than \$0.06/square foot of roof decking. Retrofit costs include both materials and installation. These are predicted to be \$0.90/square foot per RS Means Cost Data⁵.

Evaluation Parameters

The most appropriate evaluation protocol for this measure is verification of proper installation coupled with assignment of estimated energy savings.

Examples of Qualifying Equipment

RIMA International has established a Product Verification Program for radiant barriers that satisfy their standards. A third-party accredited laboratory tests each product, and a list of approved products are available on the RIMA website at:
<http://www.rimainternational.org/index.php/verify/>

References

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