**Entergy New Orleans, Inc.**
1600 Perdido Street, Bldg #505
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**Gary E. Huntley**
Vice President,
Regulatory and Governmental Affairs
ghuntle@entergy.com

July 10, 2015

***Via Hand Delivery***

Ms. Lora Johnson
Clerk of Council
Council of the City of New Orleans
Room 1E09, City Hall
1300 Perdido Street
New Orleans, LA 70112

***Re: Filing of Entergy New Orleans, Inc.'s Energy Smart Annual Report for Program Year 4 (Resolutions R-11-52, R-14-122, R-15-15; UD-08-02)***

Dear Ms. Johnson:

On February 3, 2011, the Council of the City of New Orleans ("Council") adopted Resolution R-11-52 that approved Entergy New Orleans, Inc.'s ("ENO") selection of CLEAResult as the Third Party Administrator for the Council-approved Energy Smart Programs. Council Resolution R-11-52 required annual reports to be filed annual reports with the Council. Council Resolutions R-14-122 and R-15-15 extended the Energy Smart program in its then-current state.

On behalf of CLEAResult, ENO submits the enclosed original and three copies of the Energy Smart annual report for the period of April 1, 2014 to March 31, 2015. Should you have any questions regarding this filing, please contact my office at (504) 670-3680.

Sincerely,

Gary E. Huntley

cc: All Councilmembers
Council Utilities Regulatory Office
Clinton A. Vince, Esq
Presley Reed, Esq
Walter J. Wilkerson, Esq
Joseph A. Vumbaco, PE
Erroll Smith, CPA
Ken Pailet, CPA

# Annual report

2014

**Prepared for Entergy New Orleans, Inc. and Entergy Louisiana, LLC**

1600 Perdido St.
New Orleans, LA 70112

June 2015

EnergySmart
A New Orleans Program

Entergy
THE POWER OF PEOPLE®

# Executive Summary

The fourth year for the Entergy Smart New Orleans Program demonstrated once again that residents and business owners recognize energy efficiency as a valuable resource for managing their energy consumption. The culmination of the fourth program year (PY4) has now brought energy efficiency to just over 35,000 homes in Orleans Parish since the program's inception in 2011.

With yet another successful year, the Energy Smart program continued to grow by offering new services and piloting new methodologies for helping Orleans Parish residents save energy. The School Kits and Education program provided over 1,300 6th grade students with energy education as well as energy saving measures for them to install in their homes with their parents. The pilot of the CoolSaver A/C Tune-up program proved very successful with over 500 tune ups in its inaugural year. Energy Smart ran a promotion in December 2014 and March 2015 through email marketing and advertisements in the *Gambit*, leading to the highest installation rate of energy efficient advanced power strips in Orleans Parish to date. Finally, the Assisted Home Performance with ENERGY STAR program weatherized more homes for low income Orleans Parish residents than it had in any other program year.

Both the Small and Large Commercial Solutions programs again yielded resounding success. Incentive funds for the Large Commercial program were reserved a short three weeks after the beginning of the program year. Small businesses continued to use the program to help offset their operating expenses through the installation of energy efficient lighting, which typically provided a very short payback. This means the energy and dollar savings realized through the installation of efficient lighting makes the project pay for itself in just under two years on average, providing more disposable income for small business owners.

The increased outreach budget resulted in more Orleans Parish residents knowing that the Energy Smart program was there to serve them by providing an educated and accredited contractor network to assist them with identifying and installing energy efficient measures in their homes and businesses.

Overall, this was a landmark year for the Energy Smart program, as it demonstrated the ability to continue to deliver residents of Orleans Parish the education, expertise and support needed to make energy efficiency a readily-accessible and easy-to-use resource.

## ANNUAL REPORT OVERVIEW

This report provides a summary of activities conducted in PY4 of the Energy Smart Programs, from April 1, 2014 to March 31, 2015. Data provided reflects performance in kWh and incentive amounts (including raw vs. goal numbers) 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
- Small Commercial Solutions
- Large Commercial Solutions

Also included are marketing summaries, customer satisfaction surveys and a look ahead to the next program year.


| | TARGET | ACTUAL | % OF GOAL |
|---|---|---|---|
| **NEW ORLEANS** | | | |
| ELECTRIC SAVINGS (KWH) | 17,138,155 | 16,449,016 | 96.0% |
| INCENTIVE BUDGET | $2,598,298 | $2,259,627 | 87.0% |
| **ALGIERS** | | | |
| ELECTRIC SAVINGS (KWH) | 2,070,333 | 2,020,644 | 97.6% |
| INCENTIVE BUDGET | $242,790 | $155,568 | 64.1% |

# Programs Overview

The Energy Smart programs offer a range of energy-saving options for Entergy New Orleans and Entergy Louisiana customers in New Orleans. Most residents are eligible to participate, including homeowners, renters, business owners and contractors. The program is delivered in partnership with local contractors, who receive training and support from the program staff to deliver high quality services to customers.

*"The Energy Smart program is great. It allows your home to run more efficiently, and also helps reduce your electric bill."*

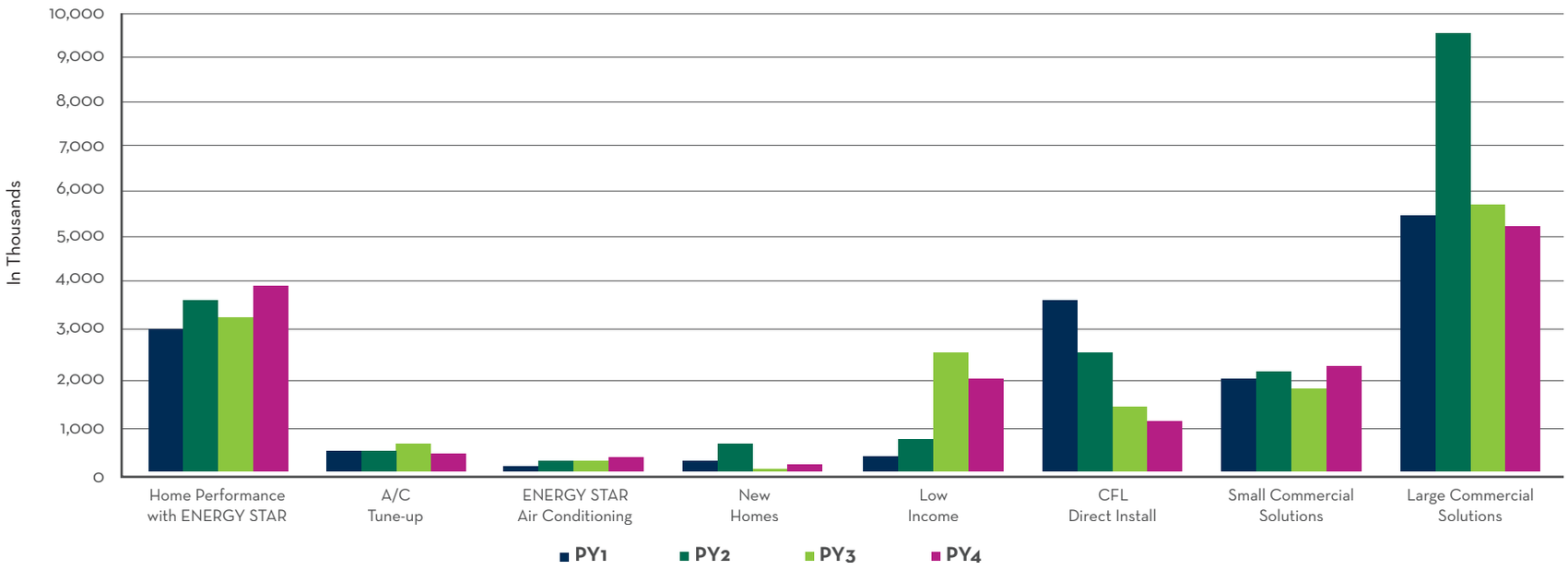
# ENTERGY NEW ORLEANS SAVINGS AND PARTICIPATION

| | EXTENSION SAVING GOALS | | YTD | | | | COMPLETED YTD | |
|---|---|---|---|---|---|---|---|---|
| PROGRAM NAME | KW | KWH | KW | KWH | PARTICIPANTS | MEASURES | KW | KWH |
| HOME PERFORMANCE WITH ENERGY STAR | 1,361 | 4,039,652 | 1,186 | 4,445,224 | 4,350 | 39,761 | 87.1% | 110.0% |
| ENERGY STAR AIR CONDITIONING | 115 | 389,773 | 79 | 237,416 | 224 | 260 | 68.7% | 60.9% |
| A/C TUNE-UP | 534 | 969,536 | 143 | 279,772 | 132 | 879 | 26.8% | 28.9% |
| NEW HOMES | 38 | 177,491 | 36 | 112,562 | 65 | 80 | 94.7% | 63.4% |
| CFL DIRECT INSTALL | 263 | 1,817,351 | 97 | 1,205,662 | 2,165 | 46,277 | 36.9% | 66.3% |
| INCOME QUALIFIED | 225 | 912,750 | 525 | 1,825,848 | 1,012 | 10,984 | 233.3% | 200.4% |
| SOLAR WATER HEATER PILOT | 4 | 27,191 | - | - | - | - | - | - |
| SMALL COMMERCIAL SOLUTIONS | 385 | 2,666,423 | 498 | 2,519,153 | 72 | 73 | 129.4% | 94.5% |
| LARGE COMMERCIAL SOLUTIONS | 945 | 6,138,592 | 831 | 5,823,379 | 23 | 23 | 87.9% | 94.9% |
| **TOTALS** | **3,870** | **17,138,155** | **3,395** | **16,449,016** | **8,034** | **98,337** | **87.7%** | **96.0%** |

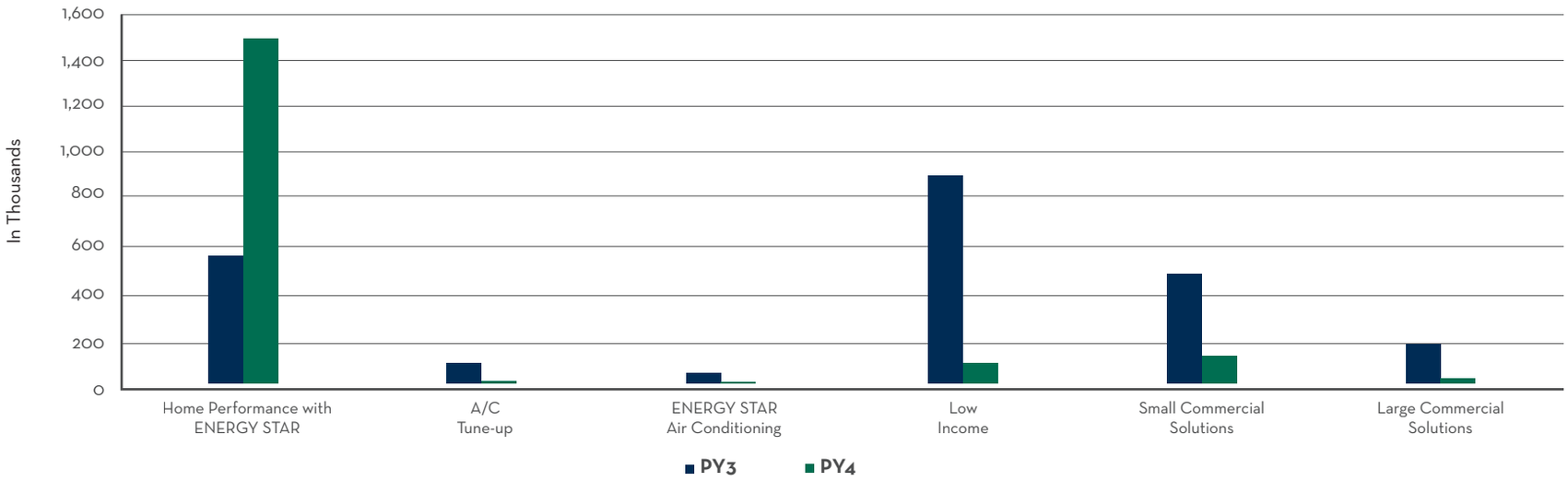
# ENTERGY LOUISIANA SAVINGS AND PARTICIPATION

| | EXTENSION SAVING GOALS | | YTD | | | COMPLETED YTD |
|---|---|---|---|---|---|---|
| PROGRAM NAME | KWH | KW | KWH | PARTICIPANTS | MEASURES | KWH |
| HOME PERFORMANCE WITH ENERGY STAR | 394,704 | 253 | 1,470,226 | 1,439 | 19,394 | 372.5% |
| ENERGY STAR AIR CONDITIONING | 70,026 | 9 | 26,675 | 13 | 16 | 38.1% |
| A/C TUNE-UP | 80,094 | 2 | 3,008 | 5 | 6 | 3.8% |
| NEW HOMES | 17,725 | - | - | - | - | - |
| CFL DIRECT INSTALL | 733,032 | 13 | 164,915 | 240 | 6,487 | 22.5% |
| INCOME QUALIFIED | 62,692 | 18 | 115,564 | 132 | 1,997 | 184.3% |
| SOLAR WATER HEATER PILOT | 9,783 | - | - | - | - | - |
| SMALL COMMERCIAL SOLUTIONS | 272,090 | 38 | 215,680 | 9 | 9 | 79.3% |
| LARGE COMMERCIAL SOLUTIONS | 430,187 | 2 | 24,576 | 1 | 1 | 5.7% |
| **TOTALS** | **2,070,333** | **335** | **2,020,644** | **1,839** | **27,910** | **97.6%** |

## kWh Totals by Program - Entergy New Orleans



## kWh Totals by Program - Entergy Louisiana




## CARBON EMISSIONS

Energy Smart Programs reduced carbon emissions in the atmosphere by roughly 103 million pounds.

That's the equivalent of:

**2,000,000**
trees planted **or**

**10,000**
cars taken off the road **or**

**6,000**
homes powered for one year

| PROGRAM | $CO^2$ REDUCTION (LBS), NEW ORLEANS | $CO^2$ REDUCTION (LBS), ALGIERS | TOTAL |
|---|---|---|---|
| HOME PERFORMANCE WITH ENERGY STAR | 24,893,254 | 8,233,266 | **33,126,520** |
| ENERGY STAR AIR CONDITIONING | 1,329,530 | 149,380 | **1,478,910** |
| A/C TUNE-UP | 1,566,723 | 16,845 | **1,583,568** |
| NEW HOMES | 630,347 | - | **630,347** |
| CFL DIRECT INSTALL | 6,751,707 | 923,524 | **7,675,231** |
| LOW INCOME | 10,224,749 | 647,158 | **10,871,907** |
| SOLAR WATER HEATER PILOT | - | - | **-** |
| SMALL COMMERCIAL SOLUTIONS | 14,107,257 | 1,207,808 | **15,315,065** |
| LARGE COMMERCIAL SOLUTIONS | 32,610,922 | 137,626 | **32,748,548** |
| **TOTAL** | **92,114,490** | **11,315,606** | **103,430,096** |

# Home Performance with ENERGY STAR

The Home Performance with ENERGY STAR (HPwES) Program is a national program administered by the Department of Energy in conjunction with the EPA. Energy Smart is a sponsor member of the HPwES Program, meaning that participating contractors who utilize the HPwES method for making homes more energy efficient are able to leverage the nationally recognized ENERGY STAR brand. Homeowners who participate in the HPwES 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, such as an old heating or cooling system or insufficient insulation in attics and draftiness, HPwES helps homeowners understand how improvements throughout the home work together to achieve energy savings and increased comfort. 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.

The total savings that went into the HPwES program during PY4 came from four sources:

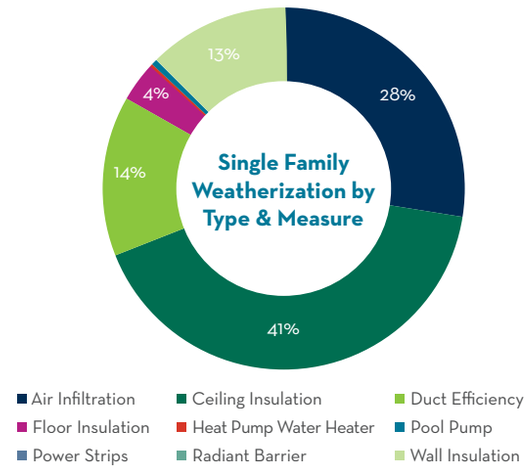
1. Single Family Weatherization: An energy assessment followed by weatherization measures. The pie chart to the right indicates the types and frequencies of measures used.

2. Coolsaver℠ Tune-up Pilot: This enhanced A/C tune-up pilot program realized close to 1 million kWh worth of savings for both Eastbank and Westbank residents. Four contractors participated in this pilot program.

3. Multi-Family Direct Install: Multi-family apartments in Orleans Parish were retrofitted with energy-saving CFL bulbs, faucet aerators and showerheads. This free program is one of the few ways the Energy Smart program can be utilized by renters, who don't typically participate in energy efficiency programs.

4. Techniart Online Sale: Energy Smart's online promotions in December 2014 and March 2015 allowed New Orleans residents to purchase an advanced power strip, CFLs and LED lightbulbs at a discounted rate of only $10.

While this program met its goal for the year, it was done through the addition of the Coolsaver tune up pilot, multi-family direct install and the Techniart online promotion. This is the same trend as the last 3 years, where program activity was driven partially though single family weatherization of homes but largely through Energy Smart staff driven multi-family direct install savings.

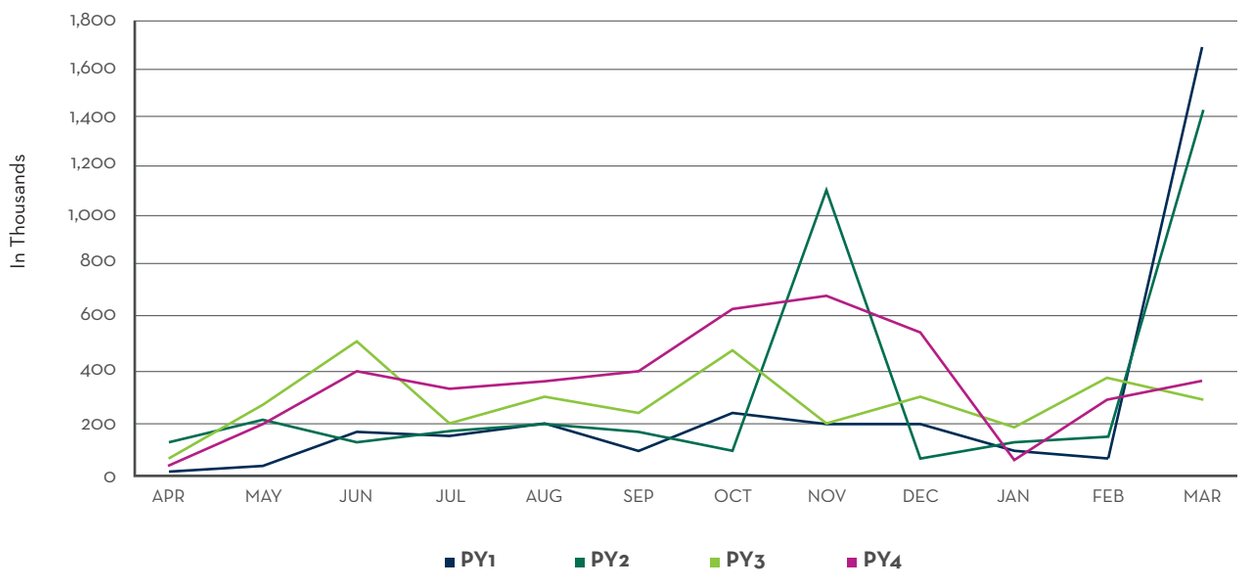


*"I really love all the work they did to my house. I would gladly recommend them to others."*

# ENTERGY NEW ORLEANS

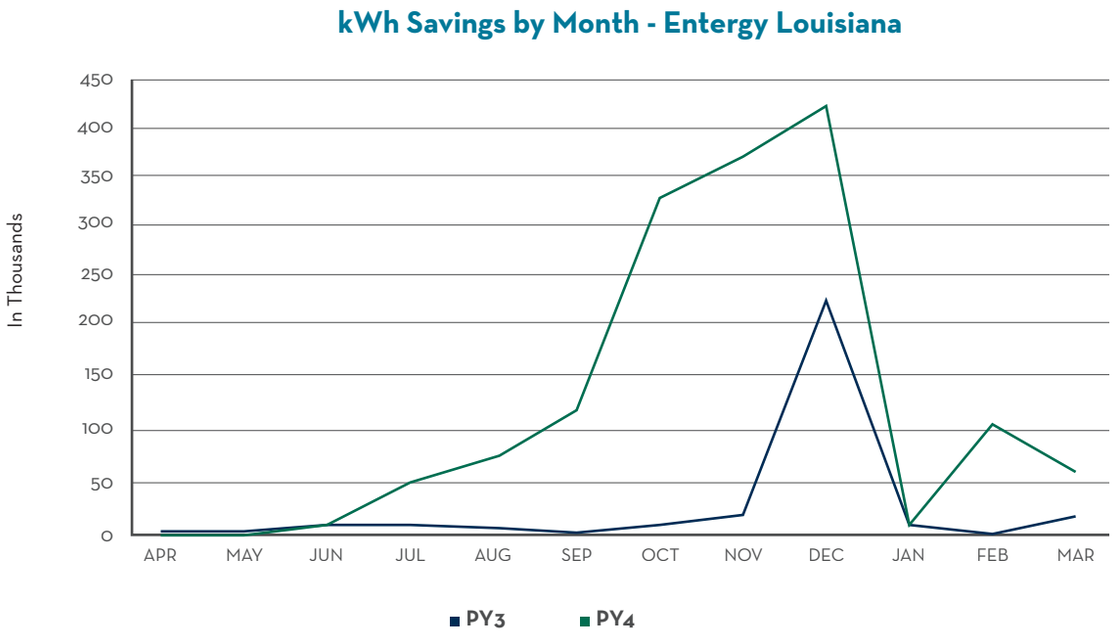
| | TARGET | ACTUAL | % OF GOAL |
|---|---|---|---|
| ELECTRIC SAVINGS (KWH) | 4,039,652 | 4,445,224 | 110.0% |
| INCENTIVE BUDGET | $599,663 | $599,734 | 100% |

## kWh Savings by Month - Entergy New Orleans



# ENTERGY LOUISIANA

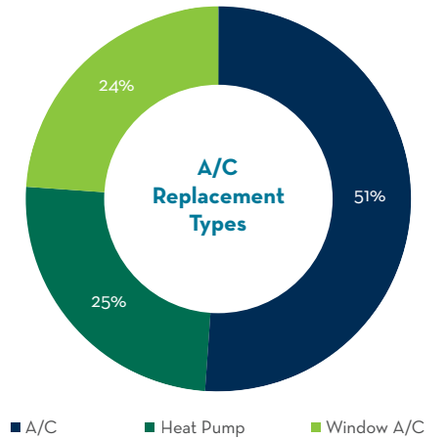
| | TARGET | ACTUAL | % OF GOAL |
|---|---|---|---|
| ELECTRIC SAVINGS (KWH) | 394,704 | 1,470,226 | 372.5% |
| INCENTIVE BUDGET | $74,667 | $96,525 | 129.0% |



# ENERGY STAR Central A/C

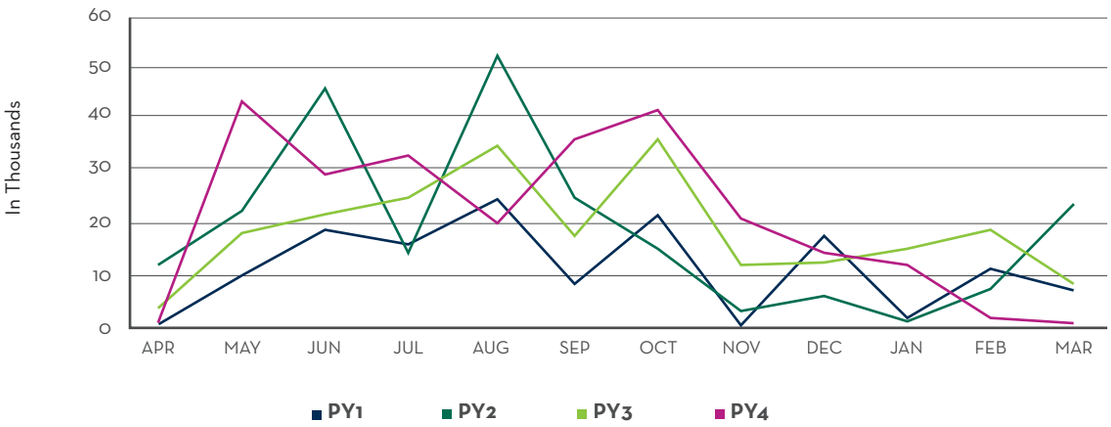
The Energy Smart Program provides rebates for the purchase and installation of energy-efficient ENERGY STAR central air conditioners, heat pumps and window A/C units. Any residential Entergy customer in Orleans Parish is eligible to receive rebates for ENERGY STAR rated units installed by Energy Smart participating local contractors or purchased in a retail store.

The ENERGY STAR Central Air Conditioning Program had its best performing year to date. With a higher level of activity from both A/Cs and heat-pumps, focusing on driving participation from central A/C replacements brought a 16% increase in kWh savings in PY4. Outreach by Energy Smart staff to educate contractors on how to utilize the incentive to close deals on more efficient A/Cs has led to contractors embracing the program.

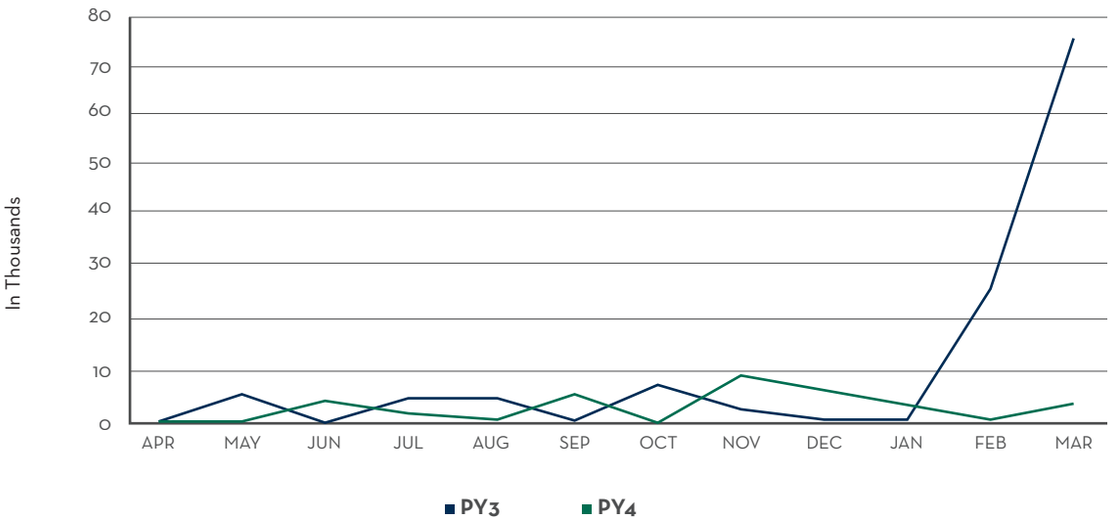



| | TARGET | ACTUAL | % OF GOAL |
|---|---|---|---|
| **NEW ORLEANS** | | | |
| ELECTRIC SAVINGS (KWH) | 389,773 | 237,416 | 60.9% |
| INCENTIVE BUDGET | $87,239 | $59,230 | 68.0% |
| **LOUISIANA** | | | |
| ELECTRIC SAVINGS (KWH) | 70,026 | 26,675 | 38.1% |
| INCENTIVE BUDGET | $13,667 | $8,170 | 60.0% |

## kWh Savings by Month - Entergy New Orleans




## kWh Savings by Month - Entergy Louisiana

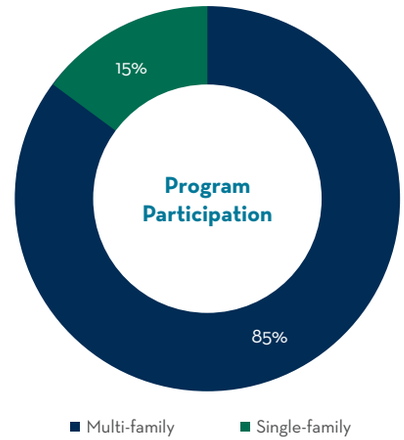


# High Performance A/C Tune-up

Energy Smart provides a discount for high-performance air conditioning tune-ups to increase a home's comfort while reducing monthly energy bills. Any residential Entergy 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:

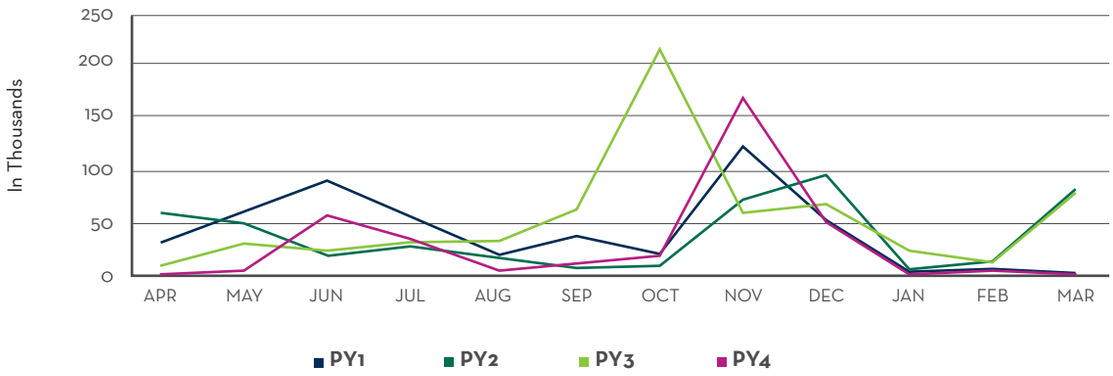
- Examine central system for functionality and possible problems
- Check compressor contacts and capacitors
- Clean outdoor condenser coil
- Inspect indoor evaporator coil and blower
- Precisely adjust the refrigerant charge by calculating superheat and subcooling temperatures
- Report any necessary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

The program saw single family A/C tune-ups participation dip in PY4 because of the CoolSaver pilot, which delivered more cost-effective savings to homeowners than the A/C tune-up. The majority of participation in this program (85%) came from Energy Smart staff identifying and convincing multi-family property owners to have an A/C tune-up performed for their tenants.

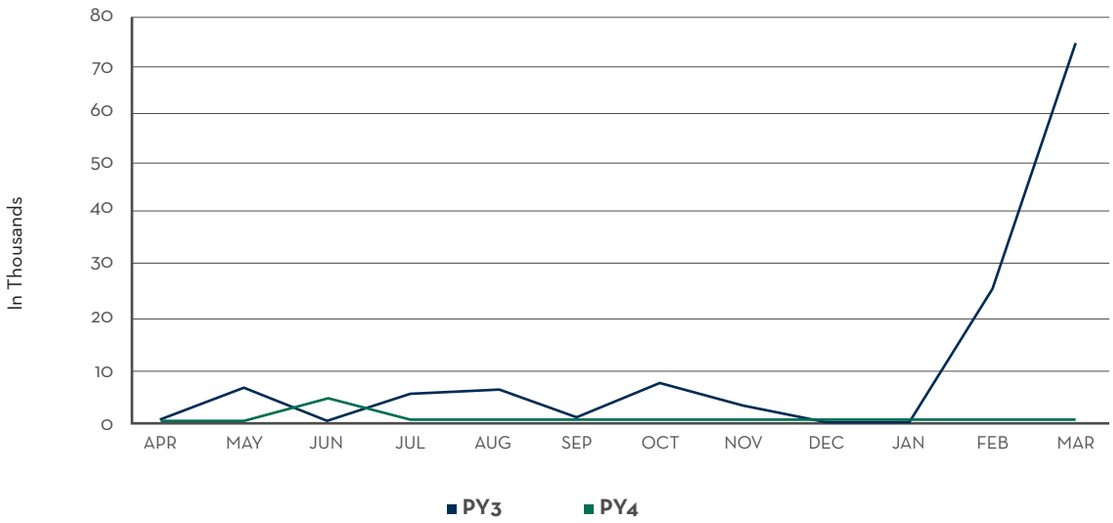



| | TARGET | ACTUAL | % OF GOAL |
|---|---|---|---|
| **NEW ORLEANS** | | | |
| ELECTRIC SAVINGS (KWH) | 969,536 | 279,772 | 28.9% |
| INCENTIVE BUDGET | $145,106 | $45,315 | 31.0% |
| **LOUISIANA** | | | |
| ELECTRIC SAVINGS (KWH) | 80,094 | 3,008 | 3.8% |
| INCENTIVE BUDGET | $13,667 | $455 | 3.0% |

## kWh Savings by Month - Entergy New Orleans




## kWh Savings by Month - Entergy Louisiana

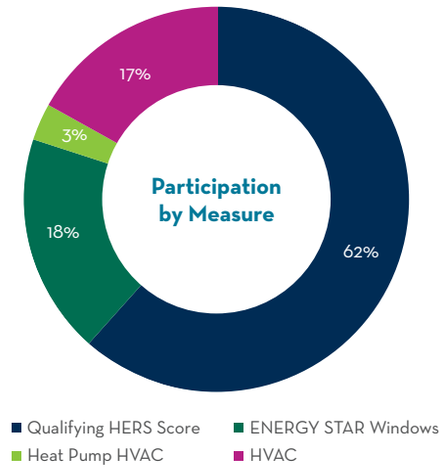


# Energy Efficient New Homes

Energy Smart provides an incentive to new home builders to offset the cost of making their new builds more energy efficient. Contractors can participate in two ways: through a Home Energy Rating System (HERS) Score or through the installation of single-measure energy efficient items.

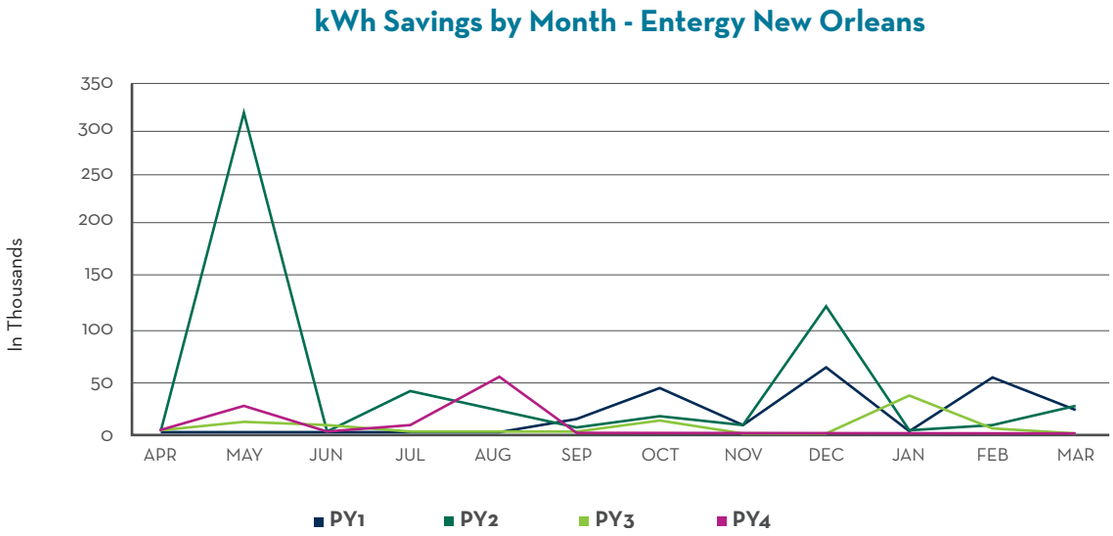
All builders and developers building new homes or qualifying rebuilds in Orleans Parish are eligible to participate. Homeowners interested in owning an energy efficient home must contact one of the participating builders to construct, rebuild or purchase their energy-efficient home.

The Energy Efficient New Homes Program has struggled with activity since program inception. As in years past, the building of a public housing project brought the most activity into the program, but the lack of available space in Orleans Parish has limited participation. Participation was higher in PY4 versus PY3 for the Eastbank, with zero participation in Algiers since program inception.



# ENTERGY NEW ORLEANS

| | TARGET | ACTUAL | % OF GOAL |
|---|---|---|---|
| ELECTRIC SAVINGS (KWH) | 177,491 | 112,562 | 63.4% |
| INCENTIVE BUDGET | $32,603 | $20,968 | 64.0% |



# Compact Fluorescent Bulbs

ENERGY STAR qualified compact fluorescent light bulbs (CFLs) use about 75 percent less energy than incandescents, 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.

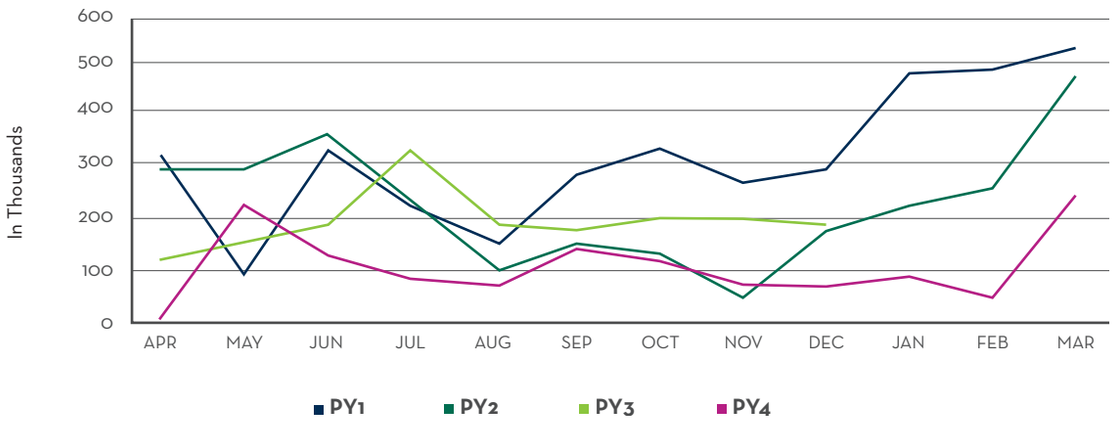
Energy Smart partners with Green Light New Orleans to provide customers with energy-efficient CFLs. Any residential Entergy customer in Orleans Parish is eligible to have energy-efficient CFLs installed in their home.

This program saw a decrease in savings over PY4 due to two factors. First, the number of participants in the program dropped by 25%, while the number of bulbs installed dropped by 24%. Despite Energy Smart's investment in a door hanger campaign in the spring of 2015, participation was not as high as in years past. In addition, the federally mandated phase-out of incandescent bulbs has brought about a decline in the amount of savings which can be claimed through the installation of CFL bulbs.

While the cost of Light Emitting Diode (LED) bulbs continues to drop, the point at which they will be cost-effective for a direct install program of this scale will likely not occur until 2017 or beyond. In PY3, Energy Smart worked with Green Light New Orleans to start installing small-based CFLs, which has helped increase participation but still not to the levels at which the program began in 2011.

| | TARGET | ACTUAL | % OF GOAL |
|---|---|---|---|
| **NEW ORLEANS** | | | |
| ELECTRIC SAVINGS (KWH) | 1,817,351 | 1,205,662 | 66.3% |
| INCENTIVE BUDGET | $254,429 | $169,680 | 67.0% |
| **LOUISIANA** | | | |
| ELECTRIC SAVINGS (KWH) | 733,032 | 164,915 | 22.5% |
| INCENTIVE BUDGET | $33,333 | $16,954 | 51.0% |

## kWh Savings by Month - Entergy New Orleans

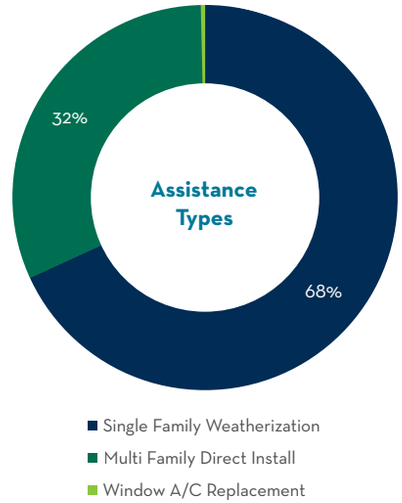


# Assisted Home Performance with ENERGY STAR

The Assisted Home Performance with Energy Star (AHPwES) Program had an unprecedented year, weatherizing more single family homes than in any other program year. While PY3 focused heavily on providing multi-family renters with energy savings benefits, PY4 provided savings to single family homeowners, the majority of which were elderly New Orleanians on fixed incomes. In addition, the majority of the work done for the AHPwES program was performed by minority and female owned participating contractors.

All services provided through this program are at no cost to the participants. All participants must do is provide documentation proving required income eligibility.

Single Family weatherization work includes an energy assessment followed by air sealing, duct sealing and insulation. Should a participating contractor find repair work that needs to be done to the home in order to prepare it for weatherization work, they contact Energy Smart staff who approves the repair work. More than $30,000 worth of home repair work was done free of charge for participants.

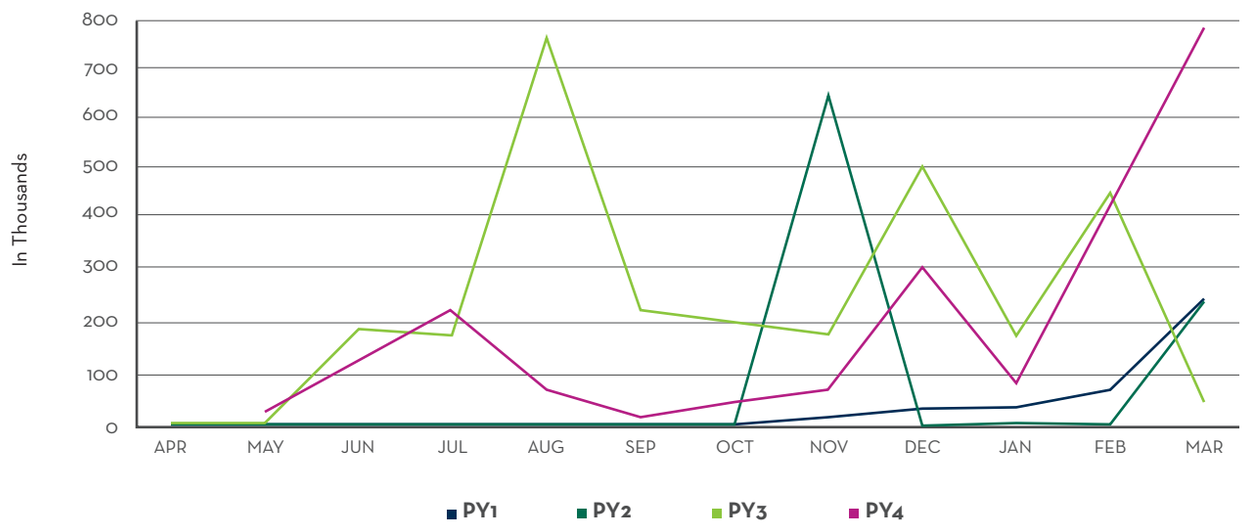


*"This blessing is one that I need desperately because I'm an unemployed widow. Thank you one and all. I am so pleased!"*

# ENTERGY NEW ORLEANS

| | TARGET | ACTUAL | % OF GOAL |
|---|---|---|---|
| ELECTRIC SAVINGS (KWH) | 912,750 | 1,825,848 | 200% |
| INCENTIVE BUDGET | $619,853 | $541,451 | 87% |

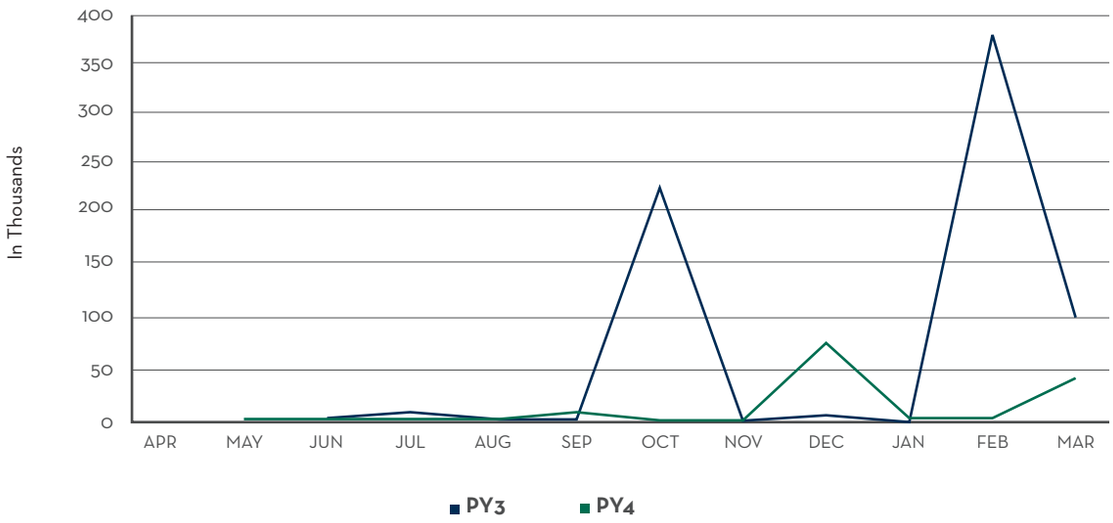
## kWh Savings by Month - Entergy New Orleans



# ENTERGY LOUISIANA

| | TARGET | ACTUAL | % OF GOAL |
|---|---|---|---|
| ELECTRIC SAVINGS (KWH) | 62,692 | 115,564 | 184.3% |
| INCENTIVE BUDGET | $25,867 | $6,824 | 26.0% |

## kWh Savings by Month - Entergy Louisiana



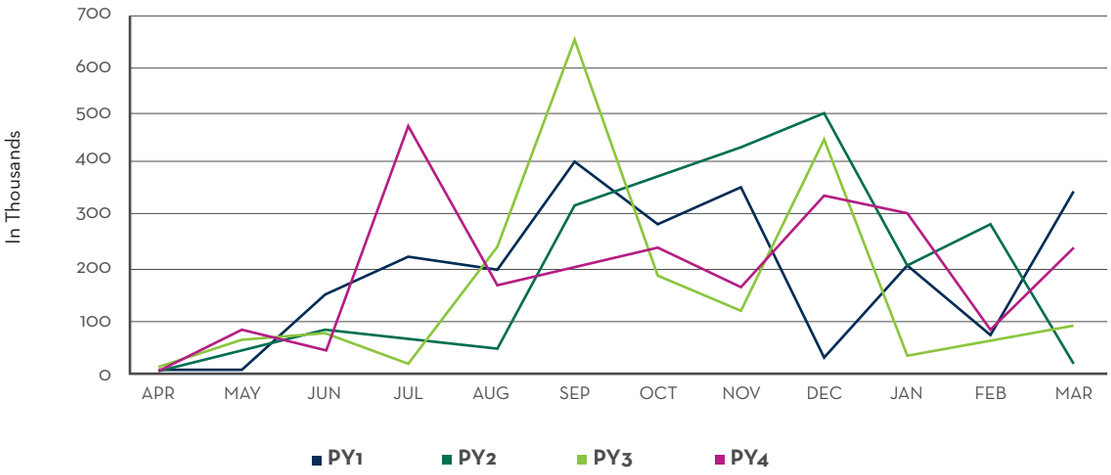
# Small Commercial Solutions

The Small Commercial Solutions Program is 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.

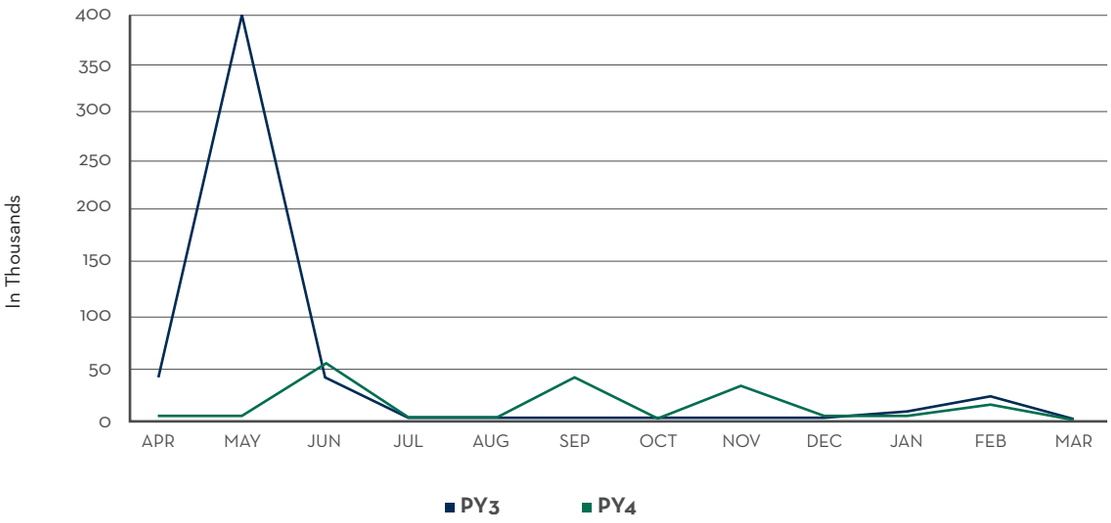
For the fourth year in a row, the majority of Small Commercial program participants installed more efficient lighting. In most cases, these lighting projects, combined with the incentive, yield business owners a return on their investment in less than two years. For those participating businesses, energy savings enable them to invest in the company's growth or enjoy a higher profit margin.

| | TARGET | ACTUAL | % OF GOAL |
|---|---|---|---|
| **NEW ORLEANS** | | | |
| ELECTRIC SAVINGS (KWH) | 2,666,423 | 2,519,153 | 94.5% |
| INCENTIVE BUDGET | $333,033 | $303,944 | 91% |
| **LOUISIANA** | | | |
| ELECTRIC SAVINGS (KWH) | 272,090 | 215,680 | 79.3% |
| INCENTIVE BUDGET | $34,000 | $26,014 | 77% |

## kWh Savings by Month - Entergy New Orleans




## kWh Savings by Month - Entergy Louisiana



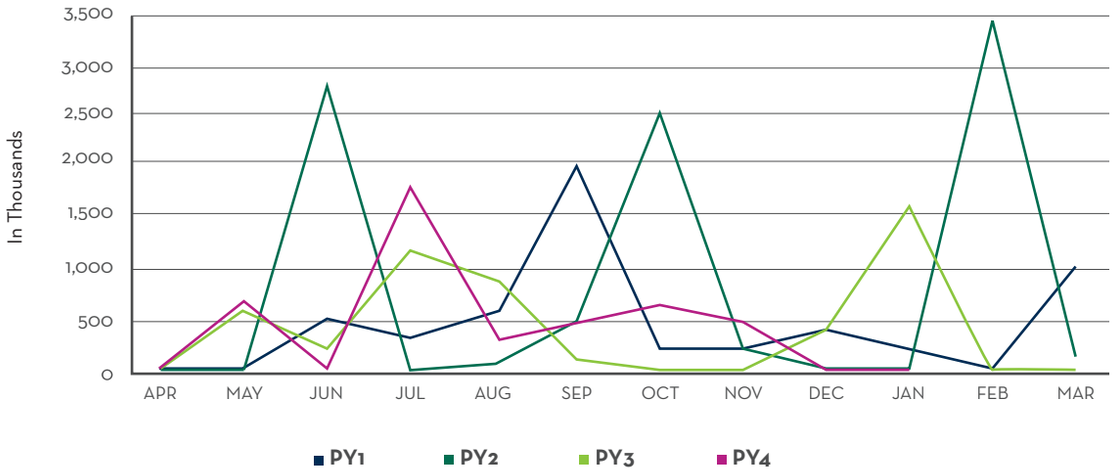
# Large Commercial & Industrial Solutions

The Large Commercial & Industrial (C&I) Solutions Program provides assistance and financial incentives for the installation of certain energy-efficiency measures that reduce energy use in large C&I 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.

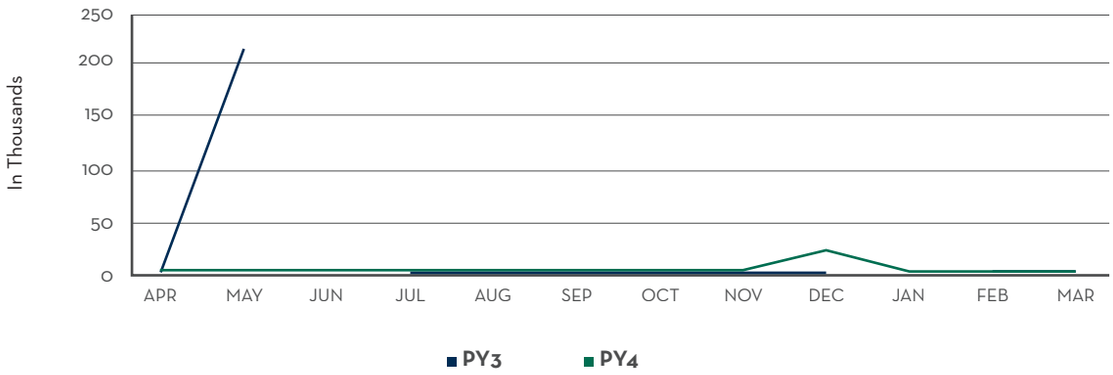
As in years past, dollars in the Large Commercial program were reserved for projects in less than one month. One third of program participation was related or attributed to A/C measures, including in room A/C controls for a hotel and several boiler replacements.

| | TARGET | ACTUAL | % OF GOAL |
|---|---|---|---|
| **NEW ORLEANS** | | | |
| ELECTRIC SAVINGS (KWH) | 6,138,592 | 5,823,379 | 94.9% |
| INCENTIVE BUDGET | $517,132 | $519,304 | 100.0% |
| **LOUISIANA** | | | |
| ELECTRIC SAVINGS (KWH) | 430,187 | 24,576 | 5.7% |
| INCENTIVE BUDGET | $41,157 | $626 | 2.0% |

## kWh Savings by Month - Entergy New Orleans




## kWh Savings by Month - Entergy Louisiana



# Participating Contractors

| CONTRACTOR | PHONE | EMAIL/WEBSITE | HVAC | INSULATION | CONSULTANT | COOLSAVER |
|---|---|---|---|---|---|---|
| A & K Construction | 985-688-5567 | ajnelton82@yahoo.com | | | X | |
| AFJ Mechanical LLC | 504-264-5949 | afjmechanical@yahoo.com | X | | | X |
| Air One Heating & Cooling | 504-888-6702 | airone1996@hotmail.com | X | | | X |
| Authentic Air | 504-421-2647 | authenticairllc.com | X | | | X |
| Big Star Conservation | 817-479-6527 | bigstarconservation@yahoo.com | | X | | |
| Bryans United A/C & Heating | 504-368-3297 | cbares@bryansunited.com | X | | | X |
| Burkhardt Air Conditioning | 504-277-7520 | burkhardtsair.com | X | | | X |
| Cold Air Now! | 504-44402233 | thomas@coldairnow247.com | X | | | X |
| Comfort Engineered Systems, Inc. | 504-602-6648 | info@com4t.com | X | | | X |
| Core USA | 504-298-9556 | info@coreusa.org | | X | X | |
| Crescent Refrigeration, Inc. | 504-739-4010 | crescentrefrigerationinc.com | X | X | | X |
| Dell Tech Air, LLC | 504-473-7203 | delltechair@yahoo.com | X | | | X |
| Diversified Energy | 504-258-5687 | diversifiede.com | | | X | |
| Envirogreen | 504-273-1077 | envirogreeninsulation.com | | X | | |
| Express A/C & Heat (Kenny Zimmer) | 504-669-7249 | kzexpress.ac@gmail.com | X | | | X |
| Fontenot Insulation | 504-834-4222 | fontenot-insulation@cox.net | | X | | |
| GBOB Enterprises | 504-393-9062 | gbobent@earthlink.net | X | | | X |
| Green Medal Energy | 469-628-5176 | greenmedalenergy.com | | | X | |

| CONTRACTOR | PHONE | EMAIL/WEBSITE | HVAC | INSULATION | CONSULTANT | COOLSAVER |
|---|---|---|---|---|---|---|
| Help Air Conditioning & Heating | 504-733-5888 | helpserviceco.com | X | | | X |
| In-tech Insulation and Consulting | 504-482-8850 | intechinsulation.com | | X | X | |
| Louisiana Home Performance, LLC | 985-919-4594 | msbowen@ louisianahomeperformance.com | X | X | X | X |
| Louisiana Home Specialists | 504-278-8811 | lahsllc.com | | X | | |
| Metro A/C & Heating Services | 504-341-9186 | phil@metroacandheat.com | X | | | X |
| Mr. Green Jeans | 504-861-4544 | mrgreenj.com | | X | X | |
| Nash Heating & A/C | 504-835-4440 | nashac.com | | X | | X |
| National Air | 504-341-2822 | maria@nationalairllc.com | X | | | X |
| Pullen A/C, Inc. | 504-883-1106 | david@pullenac.com | X | | | X |
| Rebirth Energy Solutions | 504-684-4580 | rebirthenergysolutions.com | | X | X | |
| Retro-Fitz | 504-250-9487 | retro-fitz.com | | X | X | |
| Riverview Construction, LLC | 504-324-1810 | riverviewccs.com | X | X | X | X |
| South Coast Solar | 504-529-7869 | southcoastsolar.com | | X | X | |
| Sunlight Contractors, LLC (DBA Dr. Energy Saver NOLA) | 504-222-2082 | info@sunlightcontractors.com | | X | X | |
| Surgis Heating & A/C | 504-469-4232 | surgisac.com | X | | | X |
| Taylor & Tyler | 504-367-9530 | eric@taylortaylerac.com | X | | | X |
| Wilserv | 985-809-7962 | wilserv.info | | X | X | |

# Quality Assurance

| Entergy New Orleans | Entergy Louisiana |
| --- | --- |
| **95** A/C Tune-up inspections | **2** A/C Tune-up inspections |
| **18** ENERGY STAR A/C inspections | **4** ENERGY STAR A/C inspections |
| **130** Low Income inspections | **7** Low Income inspections |
| **553** Residential Solutions inspections | **131** Residential Solutions inspections |
| **12** New Homes inspections | **9** Small Commercial inspections |
| **72** Small Commercial inspections | **1** Large Commercial inspection |
| **23** Large Commercial inspections | |

# Budget Transfers

## ENTERGY NEW ORLEANS

| PROGRAM | ORIGINAL BUDGET | PY3 ROLLOVER | DEPOSITS | TRANSFERS | DEPOSITS + PY3 ROLLOVER + TRANSFERS | EXPENDED | INCENTIVE ACCOUNT BALANCE | TOTAL INCENTIVE BALANCE |
|---|---|---|---|---|---|---|---|---|
| Residential Solutions | $599,663 | $7,159.91 | $540,000 | $52,574.16 | $599,734.07 | $599,734.07 | - | $59,663.00 |
| ENERGY STAR A/C | $87,239 | - | $65,000 | - | $65,000.00 | $59,230.00 | $5,770.00 | $28,009.00 |
| A/C Tune-up | $145,106 | - | $105,000 | ($52,574.16) | $52,425.84 | $45,315.00 | $7,110.84 | $47,216.84 |
| CFL Direct Install | $254,429 | - | $185,000 | - | $185,000.00 | $169,680.20 | $15,319.80 | $84,748.80 |
| New Homes | $32,603 | - | $20,000 | $968.24 | $20,968.24 | $20,968.24 | - | $12,603.00 |
| Low Income | $619,853 | - | $550,000 | - | $550,000.00 | $541,451.27 | $8,548.73 | $78,401.73 |
| Solar Water Heater | $9,240 | $10,558.94 | $3,000 | ($968.24) | $12,590.70 | - | $12,590.70 | $18,830.70 |
| Small Commercial Solutions | $333,033 | $5,700.40 | $333,033 | - | $338,733.40 | $303,943.78 | $34,789.62 | $34,789.62 |
| Large Commercial Solutions | $517,132 | $5,838.20 | $517,132 | - | $522,970.20 | $519,304.27 | $3,665.93 | $3,665.93 |
| **TOTAL** | **$2,598,298** | **$29,257.45** | **$2,318,165.00** | **-** | **$2,347,422.45** | **$2,259,626.83** | **$87,795.62** | **$367,928.62** |

## ENTERGY LOUISIANA

| PROGRAM | ORIGINAL BUDGET | ROLLOVER (FIRST 18 MONTHS) | DEPOSITS | TRANSFERS | DEPOSITS + PY3 ROLLOVER + TRANSFERS | EXPENDED | INCENTIVE ACCOUNT BALANCE | TOTAL INCENTIVE BALANCE |
|---|---|---|---|---|---|---|---|---|
| Residential Solutions | $74,666.67 | - | $74,667 | $21,858.51 | $96,525.18 | $96,525.18 | - | - |
| ENERGY STAR A/C | $13,666.67 | $2,942.75 | $13,667 | ($7,679.34) | $3,930.08 | $8,170.00 | $760.08 | $760.08 |
| A/C Tune-up | $13,666.67 | $967.50 | $13,667 | ($14,179.17) | $455.00 | $455.00 | - | - |
| CFL Direct Install | $33,333.33 | - | $17,000 | - | $17,000 | $16,954.50 | $45.60 | $16,378.93 |
| New Homes | $3,100 | $1,125.00 | - | - | $1,125.00 | - | $1,125.00 | $4,225.00 |
| Low Income | $25,866.67 | - | $16,000 | - | $16,000 | $6,824.02 | $9,175.98 | $19,042.65 |
| Solar Water Heater | $3,333.33 | $1,400.00 | - | - | $1,400 | - | $1,400 | $4,733.33 |
| Small Commercial Solutions | $34,000.00 | - | $21,500 | $4,514 | $26,013.51 | $26,013.51 | - | $12,500.00 |
| Large Commercial Solutions | $41,157.00 | $36,031.60 | $20,000 | ($4,514) | $51,518.09 | $626.00 | $50,892.09 | $72,049.09 |
| **TOTAL** | **$242,790** | **$42,466.85** | **$176,500.01** | **-** | **$218,966.86** | **$155,568.11** | **$63,398.75** | **$129,689.07** |

# Marketing

## Overview

After several years of successful implementation in Orleans Parish, the Energy Smart program has gained name recognition in the community, as well as a full slate of marketing tools. During the past year, the program's marketing focus was on exploring innovative techniques for reaching customers and optimizing existing materials. The maturity of the program and the diversity of its outreach arms meant the team connected with new audiences and provided savings in novel ways.

During PY4, the team also continued to provide consistent messaging by using approved branding and incorporating co-branded materials to advance the professionalism and legitimacy of collateral.

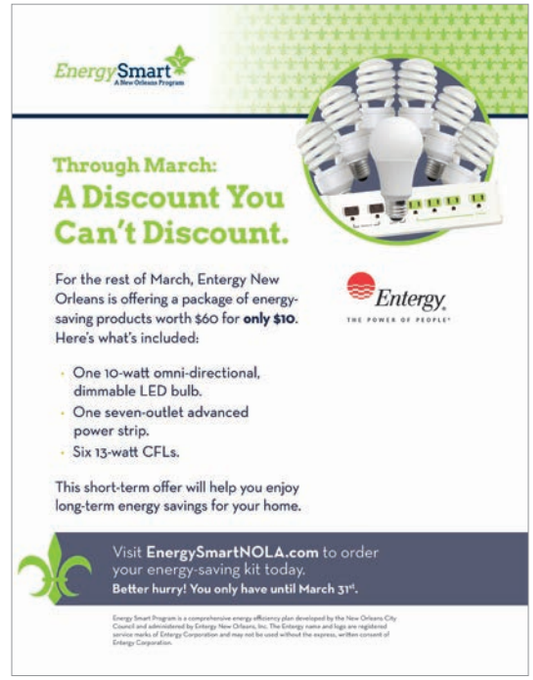
## Point of Purchase Lighting & Appliance Campaign

In 2014, Energy Smart ramped up the lighting program to include appliances, an effort assisted by a highly effective online campaign promoting sales of an energy efficiency kit. The kits, which included one LED, six CFL bulbs and an advanced power strip – a $60 value – were offered to customers in Orleans Parish for $10 through a website portal linked to EnergySmartNOLA.com.

Promotions included a *Times-Picayune* insert, a *Gambit* insert and e-newsletter, an article referring customers to the Entergy New Orleans product store in the Entergy Solutions e-newsletter, and five Energy Smart e-newsletters on the topic.

The summary of the campaign is listed below:

| | MAR | DEC | TOTAL |
|---|---|---|---|
| KITS PURCHASED | 324 | 781 | 1,105 |
| KWH | 85,508 | 208,527 | 295,035 |
| KW | 8.04 | 19.37 | 27.40 |



## Global Green/NOLA Wise Community Outreach

Through its partnership with Global Green's NOLA Wise program, Energy Smart continued outreach and education activities to Orleans Parish residents and businesses through presentations, tabling, office visits, social media and canvassing. The NOLA Wise team completed 34 presentations, 65 tabling events, three major events (detailed below), and 23 canvassing locations. Over 2,502 residents and businesses in Orleans parish received direct information on Energy Smart through these outreach channels.

1. Energy Smart and NOLA Wise held a major outreach event at the New Orleans Earth Fest on April 19, 2014. Energy Smart and NOLA Wise staff organized displays, manned tables and presented "Are you Energy Smarter than a 6th Grader?" at the Energy Smart Corner of the Earth Fest.

2. NOLA Wise coordinated another "Energy Corner" at the PRC Sellabration event on Saturday, September 13, 2014. NOLA Wise staff tabled and presented at the event, and partnered with the LA Mobile House, a mobile exhibit showing energy efficiency measures and Energy Smart incentives.

3. NOLA Wise held a Green Renovation Showcase at one of the homes on the Central City Historic Home tour on November 15, 2014. The home was featured mid-renovation, and NOLA Wise highlighted Energy Smart rebates on various measures implemented in the home.

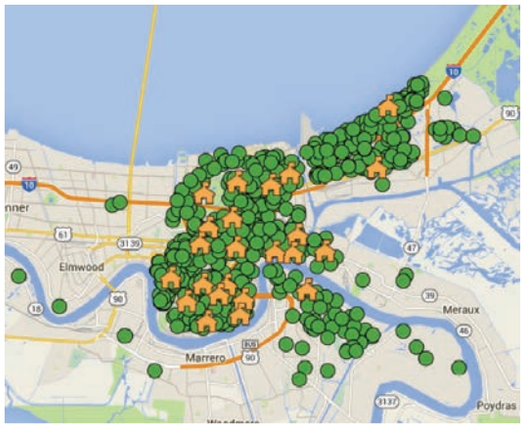
See below for a breakdown of event participation by Energy Smart and NOLA Wise staff throughout the year.

| | A | | B | | C | | D | | E | | YTD | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | # | ATTEND | # | ATTEND | # | ATTEND | # | ATTEND | # | ATTEND | # | ATTEND |
| PRESENTATION | 6 | 117 | 9 | 133 | 9 | 175 | 4 | 95 | 6 | 80 | 34 | 600 |
| TABLING | 11 | 191 | 21 | 403 | 17 | 326 | 11 | 230 | 5 | 154 | 65 | 1,304 |
| EVENT | - | - | 3 | 170 | - | - | - | - | - | - | 3 | 170 |
| CANVASSING | - | - | 4 | 22 | 8 | 285 | 5 | 50 | 6 | 71 | 23 | 428 |
| **TOTAL** | **17** | **308** | **37** | **728** | **34** | **786** | **20** | **375** | **17** | **305** | **125** | **2,502** |

## Global Green/NOLA Wise Schools Outreach

Global Green and NOLA Wise, under the leadership of the Energy Smart team, implemented the "Be Energy Smart" schools program, reaching 1,321 students for the combined 2013-2014 (April – May) and 2014-2015 (August 2014 – March 2015) school years. Seventeen schools participated (some participated in both school years), and over 160,000 kWh in savings were reported for energy kit installations. *The New Orleans Advocate* reported on the program in an article on May 14, 2014.

The geographic distribution of schools and students served is below.




Schools participating in the program include:

1. Audubon Charter School
2. Esperanza Charter School
3. KIPP Believe College Prep
4. Kipp McDonogh 15 School for Creative Arts
5. Lusher Charter School
6. Edward Hynes Charter School
7. Arise Academy
8. Lake Forest Elementary Charter School
9. Arthur Ashe Charter School
10. Langston Hughes Academy Charter
11. Sci Tech Academy
12. Schaumburg Elementary School
13. Akili Academy of New Orleans
14. Gentilly Terrace Elementary School
15. International School of Louisiana
16. Harriet Tubman Elementary School
17. John Dibert at Phyllis Wheatley

*"The relevancy this program gives is amazing - especially when students get to know how their actions can affect global warming."*

**-NICK ANSELMO,**
**Sci Tech Academy**

## Website Traffic

Total website visits to EnergySmartNOLA.com for the program year were 10,329 sessions, or 861 per month on average. The most active quarter was the third quarter, when there were 4,526 total for the quarter, or 1,506 monthly on average. This result is higher than previous quarters, as the month of December had 2,785 sessions, due to promotion of the energy efficient lighting and appliance product sales (as described on page 33).

## Information Center

The Energy Smart Information Center (ESIC), where customers can ask questions about the program directly to program staff, was located in Q1 at the Entergy Customer Care Center on Jeff Davis and Canal streets. For Q2 and Q3, it was moved to the Hubbell Library Branch in Algiers. In January 2015, the ESIC was moved from the Hubbell Library Branch to the Entergy Customer Care Center in Algiers. The Information Center was manned on Wednesdays, from 9 a.m. – 1 p.m.. After February 2015, it was removed from the customer care center and a new location will be determined.

## LifeCity Partnership

LifeCity, a local organization that works to make social and environmental impact profitable for business, continued to promote Energy Smart at events. In May 2014, LifeCity recognized CLEAResult as the winner of their "Best All Around" award for sustainable business in the Office category. CLEAResult also received an award for a recycled chandelier showerhead project using showerheads removed from the multi-family direct install program.

## Newsletters & E-blasts

Energy Smart employs newsletters and e-blasts as a cost-effective method of reaching a wide range of constituents and amplifying messages in the community. Partnerships with various groups allow the program to leverage several mailing lists to communicate across multiple platforms. Newsletters and e-blasts were delivered by Energy Smart directly, as well as by Entergy New Orleans, NOLA Wise, neighborhood associations, and paid services. The topics, outlets and subscribers for the year's newsletters/e-blasts are listed below.

| DATE | ORGANIZATION | SUBSCRIBERS | TOPIC |
|---|---|---|---|
| 5/13/14 | NW | 4,760 | Ponchartrain Park N.A. |
| 8/13/14 | NW | 4,760 | Be Energy Smart workshop & schools program |
| 9/11/14 | NW | 4,760 | Energy Smart Corner at the PRC Sellebration |
| 10/17/14 | UTNA | 1,700 | Home Performance with ENERGY STAR |
| 10/20/14 | NW | 4,760 | Solar water heat & heat pump rebates |
| 11/1/14 | Bocage | 460 | Energy Smart |
| 11/20/14 | NW | 4,760 | Promoting events |
| 12/15/14, 12/13/14, 12/29/14 & 12/30/14 | Energy Smart E-blast | 10,000 | Kit: "A Discount you can't Discount" |
| 12/17/14 | Energy Smart Update | 10,000 | Newsletter articles on kit, insulation, A/C replacement & lighting |
| 12/16/14 & 12/18/14 | Gambit E-blast | 24,000 | Kit: "A Discount you can't Discount" |
| 1/23/15 | Energy Smart | Solutions Plus | Energy Smart distributes energy-saving kits to local schools |
| 2/10/15 & 2/12/15 | Energy Smart E-blast | 10,000 | Schools & HPwES |
| 2/19/15 | Energy Smart | Solutions Plus | Schools & HPwES |
| 3/16/15 & 3/31/15 | Energy Smart E-blast | 10,000 | Energy kit promotion (6 e-blasts) |
| 3/17/15, 3/19/15 & 3/26/15 | Gambit E-blast | 24,000 | Energy kit promotion (3 e-blasts) |

## Earned Media

Spring 2014 was an active media period, due to Entergy New Orleans and Energy Smart being named by the Environmental Protection Agency as the Energy Star Partner of the Year, a prestigious honor that carries national recognition.

In addition, Program Manager Alex Scott was interviewed for the local TV show "Money Talks," which aired on WLAE-TV 32 and WHNO-TV 20 for the month of March.

This page and the following include a listing of program media appearances, as well as media clips.

| DATE | ORGANIZATION | TOPIC | LINK |
|---|---|---|---|
| 4/3/14 | EPA | ENERGY STAR Award | http://yosemite.epa.gov/opa/admpress.nsf/0/f65aba732487bfed-85257caf0062b8a4 |
| 4/3/14 | Entergy | ENERGY STAR Award | http://www.entergy.com/news_room/newsrelease.aspx?NR_ID=2895 |
| 4/4/14 | NOLA.com | ENERGY STAR Award | http://www.nola.com/business/index.ssf/2014/04/entergy_new_orle-ans_gets_nod_f.html |
| 5/14/14 | New Orleans Advocate | Schools Program | http://www.theneworleansadvocate.com/community/crescentci-ty/9066911-171/energy-smart-students-take-lessons |
| 5/15/14 | LifeCity PR | Energy Efficiency Award | https://www.facebook.com/photo.php?fbid=811226415572486&set=a.811226358905825.107374185 7.190677207627413&type=1&theater |
| 5/15/14 | LifeCity PR | Showerhead chandelier | https://www.facebook.com/photo.php?fbid=811226415572486&set=a.811226358905825.107374185 7.190677207627413&type=1&theater |

nola.com
Everything New Orleans

**Entergy New Orleans gets nod from EPA for energy efficiency efforts**

entergy-workers_1024.jpg
Entergy lineworkers in 2009. *(NOLA.com | The Times-Picayune archive)*
**Jennifer Larino, NOLA.com | The Times-Picayune** By **Jennifer Larino, NOLA.com | The Times-Picayune**
**Email the author | Follow on Twitter**
on April 04, 2014 at 3:53 PM, updated April 04, 2014 at 3:58 PM

The U.S. **Environmental Protection Agency** is recognizing local electricity provider **Entergy New Orleans** for its efforts to better manage how much energy its operations and customers use.

The EPA on Thursday (April 3) awarded its Energy Star Partner of the Year award to the utility, praising a focus on "strategically and comprehensively managing their energy use."

Entergy New Orleans, the local subsidiary of New Orleans-based Entergy Corp., serves about 165,000 customers across Orleans Parish, excluding Algiers.

The award is tied to the EPA's **Energy Star** program, which among other initiatives helps businesses and homeowners identify and purchase energy efficient air conditioning units, water heaters and other products using the signature blue and white Energy Star label.

The recognition comes as the first $11 million phase of the **Energy Smart** program, developed by the New Orleans City Council and administered by Entergy New Orleans, winds down.

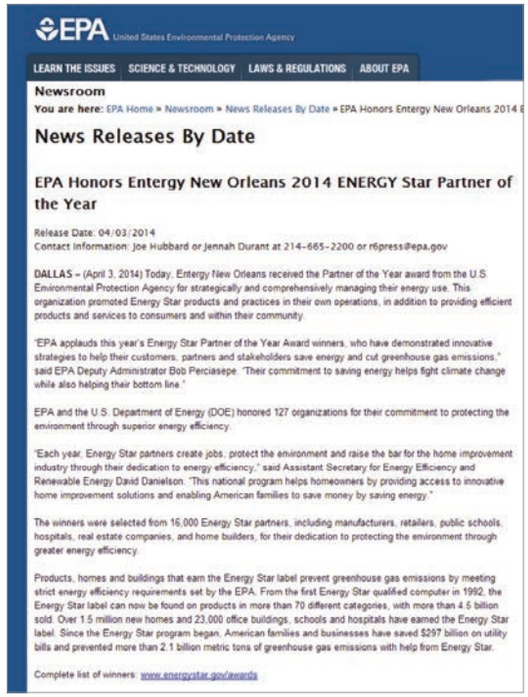
The program, launched in April 2011, provided in-home energy audits for customers and gave cash incentives to those making improvements to curb power use.

The three-year program ended March 31. Entergy New Orleans spokeswoman Yolanda Pollard said Entergy will need approval from the New Orleans City Council in order to move forward. Customers can still request home audits through the program, however.

In a **statement**, EPA Deputy Administrator Bob Perciasepe said Entergy New Orleans has "demonstrated innovative strategies to help their customers, partners and stakeholders save energy and cut greenhouse gas emissions."

"Their commitment to saving energy helps fight climate change while also helping their bottom line."

The EPA honored a total of 127 organizations for their energy efficiency efforts. Honorees were selected from 16,000 Energy Star partners, including manufacturers, retailers, public schools, hospitals, real estate companies and home builders.



EPA United States Environmental Protection Agency

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You are here: EPA Home » Newsroom » News Releases By Date » EPA Honors Entergy New Orleans 2014 E

## News Releases By Date

### EPA Honors Entergy New Orleans 2014 ENERGY Star Partner of the Year

Release Date: 04/03/2014
Contact Information: Joe Hubbard or Jennah Durant at 214-665-2200 or r6press@epa.gov

DALLAS – (April 3, 2014) Today, Entergy New Orleans received the Partner of the Year award from the U.S. Environmental Protection Agency for strategically and comprehensively managing their energy use. This organization promoted Energy Star products and practices in their own operations, in addition to providing efficient products and services to consumers and within their community.

"EPA applauds this year's Energy Star Partner of the Year Award winners, who have demonstrated innovative strategies to help their customers, partners and stakeholders save energy and cut greenhouse gas emissions," said EPA Deputy Administrator Bob Perciasepe. "Their commitment to saving energy helps fight climate change while also helping their bottom line."

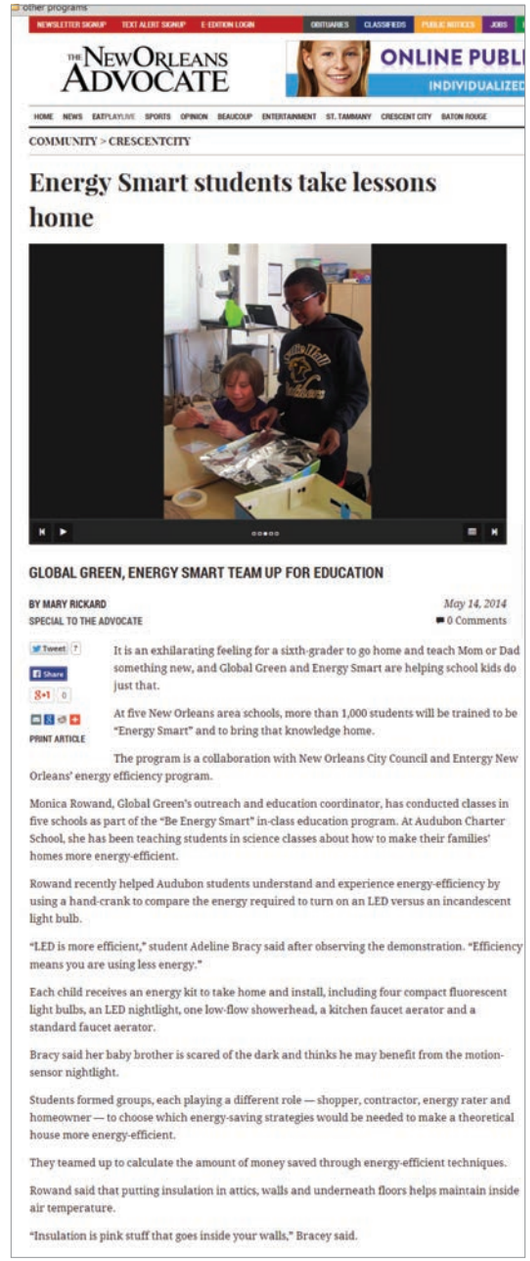
EPA and the U.S. Department of Energy (DOE) honored 127 organizations for their commitment to protecting the environment through superior energy efficiency.

"Each year, Energy Star partners create jobs, protect the environment and raise the bar for the home improvement industry through their dedication to energy efficiency," said Assistant Secretary for Energy Efficiency and Renewable Energy David Danielson. "This national program helps homeowners by providing access to innovative home improvement solutions and enabling American families to save money by saving energy."

The winners were selected from 16,000 Energy Star partners, including manufacturers, retailers, public schools, hospitals, real estate companies, and home builders, for their dedication to protecting the environment through greater energy efficiency.

Products, homes and buildings that earn the Energy Star label prevent greenhouse gas emissions by meeting strict energy efficiency requirements set by the EPA. From the first Energy Star qualified computer in 1992, the Energy Star label can now be found on products in more than 70 different categories, with more than 4.5 billion sold. Over 1.5 million new homes and 23,000 office buildings, schools and hospitals have earned the Energy Star label. Since the Energy Star program began, American families and businesses have saved $297 billion on utility bills and prevented more than 2.1 billion metric tons of greenhouse gas emissions with help from Energy Star.

Complete list of winners: www.energystar.gov/awards



other programs

NEWSLETTER SIGNUP | TEXT ALERT SIGNUP | E-EDITION LOGIN | OBITUARIES | CLASSIFIEDS | PUBLIC NOTICES | JOBS

The New Orleans Advocate

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HOME | NEWS | EATPLAYLIVE | SPORTS | OPINION | BEAUCOUP | ENTERTAINMENT | ST. TAMMANY | CRESCENT CITY | BATON ROUGE

COMMUNITY > CRESCENTCITY

## Energy Smart students take lessons home

### GLOBAL GREEN, ENERGY SMART TEAM UP FOR EDUCATION

BY MARY RICKARD
SPECIAL TO THE ADVOCATE

*May 14, 2014*
0 Comments

Tweet | Share | +1 | PRINT ARTICLE

It is an exhilarating feeling for a sixth-grader to go home and teach Mom or Dad something new, and Global Green and Energy Smart are helping school kids do just that.

At five New Orleans area schools, more than 1,000 students will be trained to be "Energy Smart" and to bring that knowledge home.

The program is a collaboration with New Orleans City Council and Entergy New Orleans' energy efficiency program.

Monica Rowand, Global Green's outreach and education coordinator, has conducted classes in five schools as part of the "Be Energy Smart" in-class education program. At Audubon Charter School, she has been teaching students in science classes about how to make their families' homes more energy-efficient.

Rowand recently helped Audubon students understand and experience energy-efficiency by using a hand-crank to compare the energy required to turn on an LED versus an incandescent light bulb.

"LED is more efficient," student Adeline Bracy said after observing the demonstration. "Efficiency means you are using less energy."

Each child receives an energy kit to take home and install, including four compact fluorescent light bulbs, an LED nightlight, one low-flow showerhead, a kitchen faucet aerator and a standard faucet aerator.

Bracy said her baby brother is scared of the dark and thinks he may benefit from the motion-sensor nightlight.

Students formed groups, each playing a different role — shopper, contractor, energy rater and homeowner — to choose which energy-saving strategies would be needed to make a theoretical house more energy-efficient.

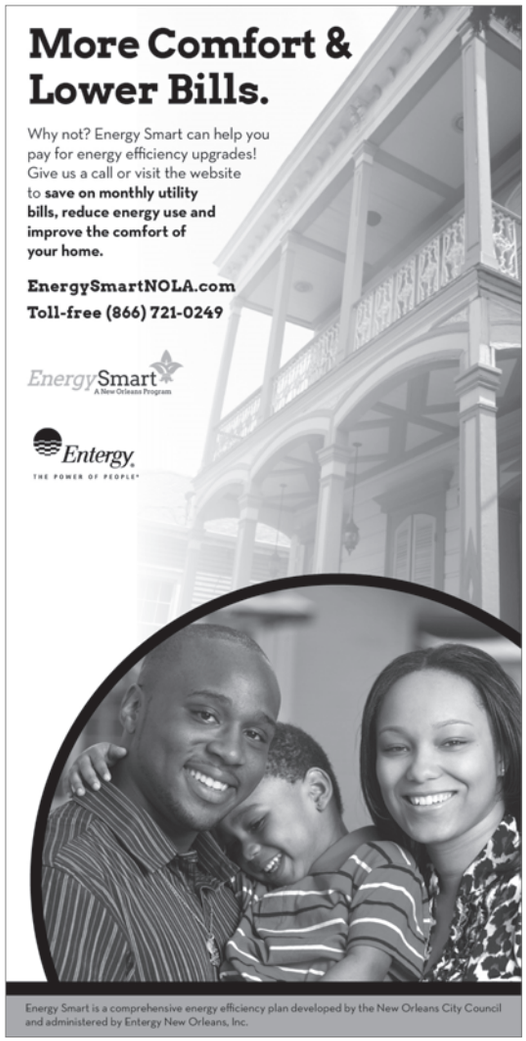
They teamed up to calculate the amount of money saved through energy-efficient techniques.

Rowand said that putting insulation in attics, walls and underneath floors helps maintain inside air temperature.

"Insulation is pink stuff that goes inside your walls," Bracey said.

## Paid Media

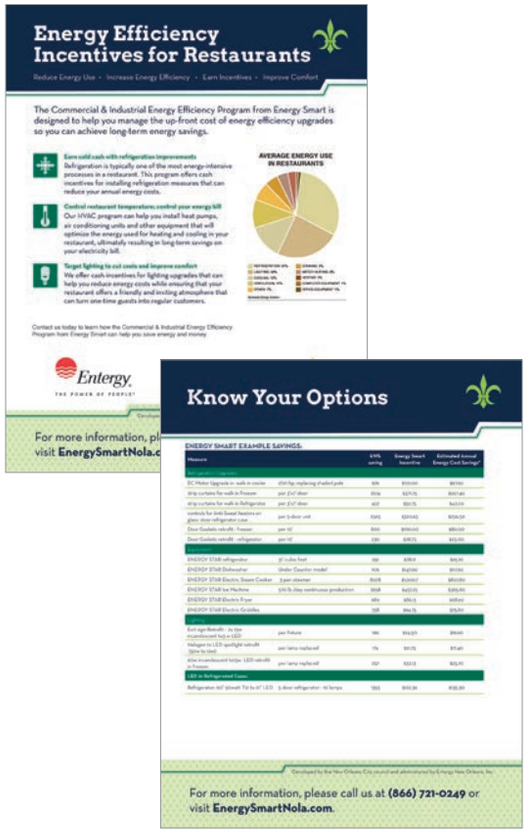
Energy Smart's paid media capitalized on a small and geographically concentrated media market to focus its efforts on print, church outreach and door hangers, supplemented by some radio. The media outlets and impressions throughout the year are listed to the right.

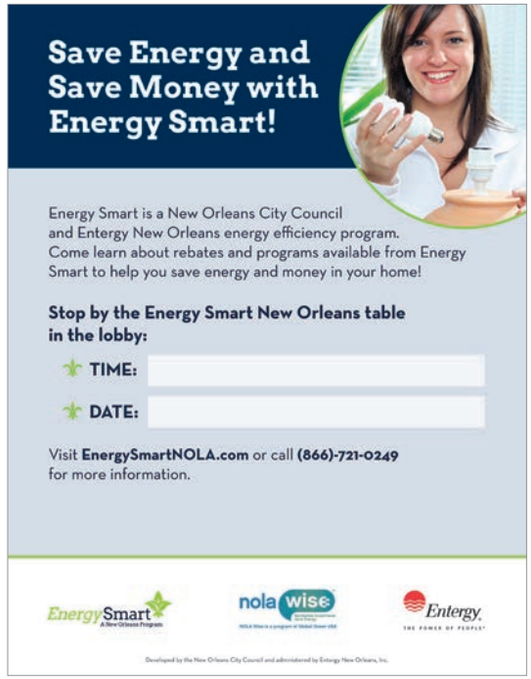



| MEDIA OUTLET | DESCRIPTION/ DETAILS | IMPACT |
|---|---|---|
| **PRINT** | | |
| *The Times-Picayune* | 1 black & white ad | 140,000 paid subscribers for Wednesday & Friday Inside Out; 163,000 paid subscribers for Sunday; 312,000 total distribution (including non-subscribers); insert magazine placement |
| *Gambit Weekly* | 6 full-color 1/4 page ads | 40,000 weekly distributions |
| **RADIO** | | |
| Old School 106.7/Cumulus | Old School March package | 88,500 cumulative |
| Rock 92.3/Cumulus | Rock 92.3 March package | 57,200 cumulative |
| **ONLINE** | | |
| neworleanstribune.com | 2 e-blasts throughout the year for specific events | Per e-blast: 10,000 subscribers |
| UptownMessenger.com | 3 months throughout the year | 165,300 pageviews (ad impressions) & 45,600 unique viewers per month |
| Brylski | 6 e-blasts throughout the year/ 3 per blast | 10,000 subscribers per 3-blast |
| **OUTDOOR** | | |
| Flyer distribution to churches | Doorhangers | 12,000 printed & distributed (targeted in Algiers) |
| Bus/mobile advertising | 10 bus tails for 2 staggered months | 5,715,000 impressions per month |

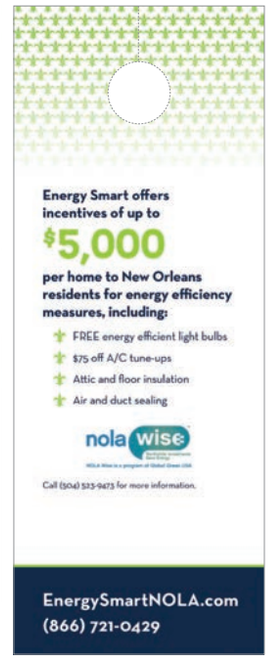
## Collateral

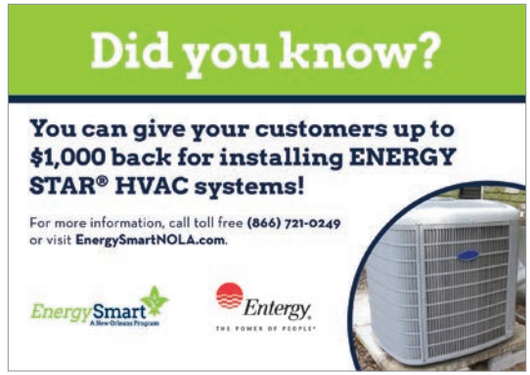
Because Energy Smart is a mature program, there was not a great need to develop new collateral. However, as new needs were identified and program offerings changed, new collateral was developed. This page contains samples of program materials from the past year.

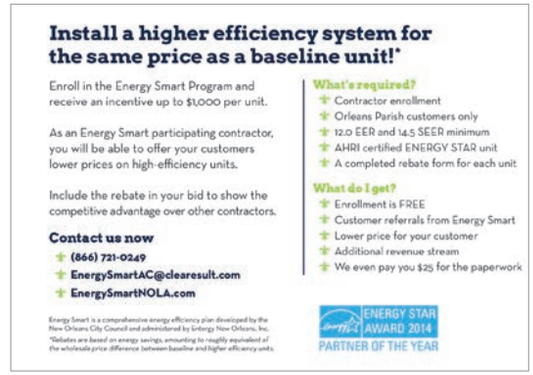






# Customer Satisfaction

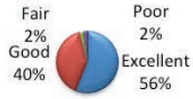
## ENTERGY NEW ORLEANS

| SURVEY # | SURVEY PROGRAM | YTD PARTICIPANTS (MAY '14) | SURVEYS REQ FOR 85%/10% | SURVEYS RECEIVED YTD | NOTES |
|---|---|---|---|---|---|
| 1 | Residential Energy Solutions | 1,312 | 50 | 52 | Goal met |
| 2 | A/C Tune-up | 77 | 32 | 31 | Goal met (one survey was a duplicate) |
| 4 | Residential CFL | 1,243 | 50 | 50 | Goal met |
| 6A | ENERGY STAR A/C | 70 | 31 | 31 | Goal met |
| 6B | ENERGY STAR Window A/C | 128 | 38 | 41 | Goal met |
| 7 | Room A/C Unit Replacement | 14 | 12 | 12 | Goal met |
| 8 | New Homes | 1 | 1 | 1 | Goal met |
| 9 | Weatherization Ready | 222 | 43 | 43 | Goal met |

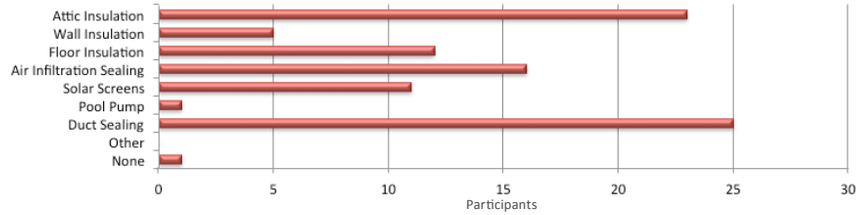
### Residential Energy Solutions Program

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


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



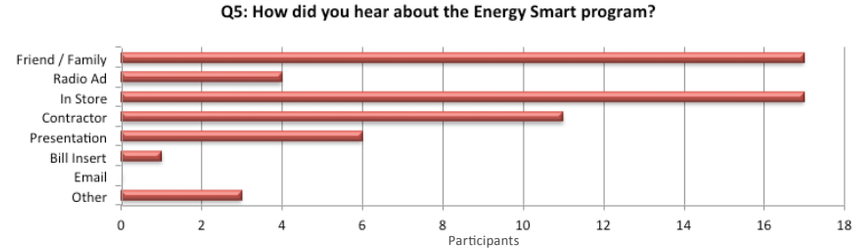

**Q1d: What measure(s) did you or do you plan to implement within 60 days for the assessment?**




**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?**

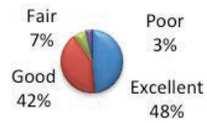



**Q6: Have you taken advantage of other Energy Smart programs?**

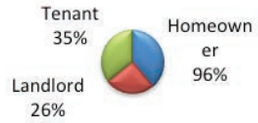
## High Performance A/C Tune-up Program

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

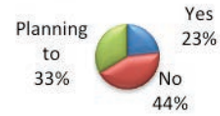

**Q2: How do you rate the value of the Energy Smart tune-up?**



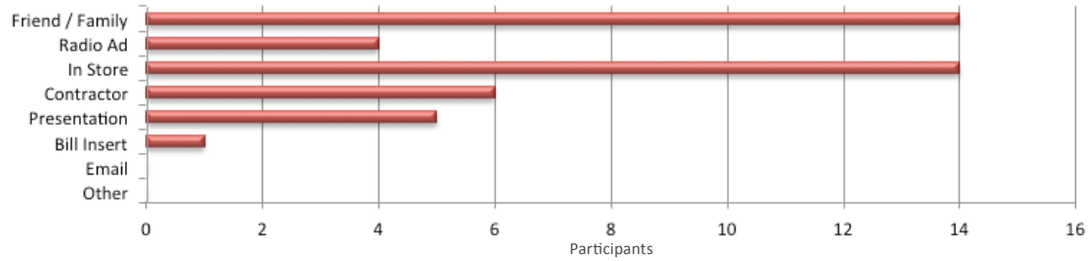

**Q3: Are you the homeowner, landlord, or tenant?**




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




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



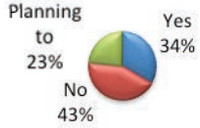
## ENERGY STAR A/C Program

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

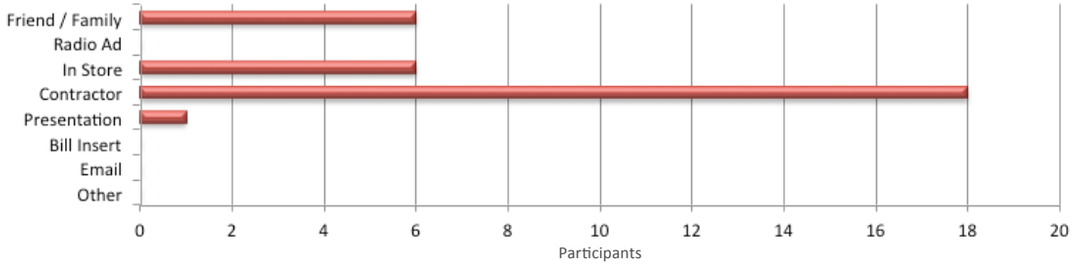

**Q2: How do you rate the value of the Energy Star Central A/C Program?**


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


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




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

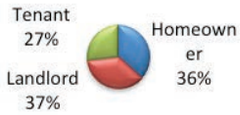


## ENERGY STAR Window A/C Program

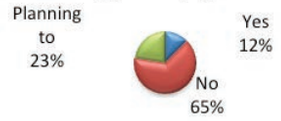
**Q1: How do you rate your overall experience with the Window A/C Program?**


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

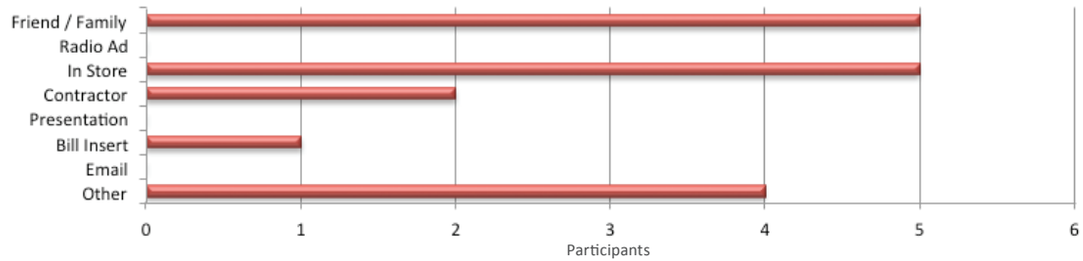

**Q3: Are you the homeowner, landlord, or tenant?**




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

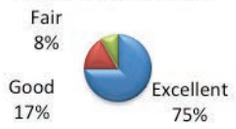



**Q5: How did you hear about the Energy Smart program?**



## Room A/C Replacement Program

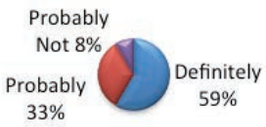
**Q1b: How do you rate your experience with the energy consultant?**



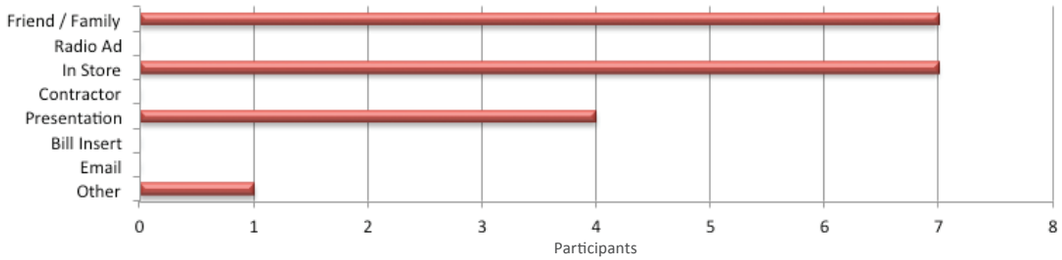

**Q3: How do you rate the value of the Energy Smart Room A/C Replacement?**


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

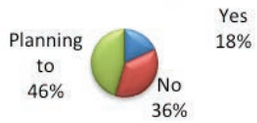

**Q5: Would you recommend the Energy Smart program to others?**




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




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



## Weatherization Ready Program

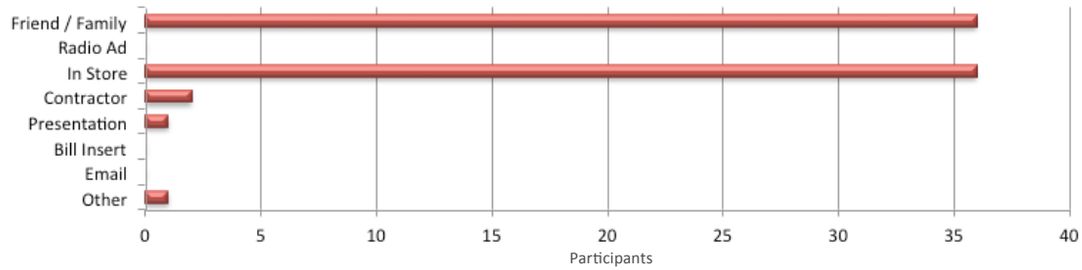
**Q1b: How do you rate your experience with the contractor?**


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

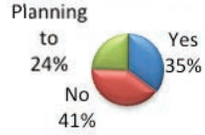

**Q3: Are you the homeowner, landlord, or tenant?**


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


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

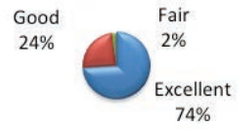



**Q6: Have you taken advantage of other Energy Smart programs?**



## Residential CFL Program

**Q1b: How do you rate your experience with the Green Light N.O. volunteers?**

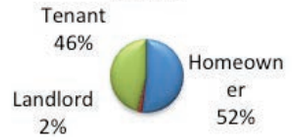



**Q1b: How would you rate the ease of contacting Green Light N.O. and scheduling an appointment?**


**Q2a: How would rate the overall value of your CFL installation?**

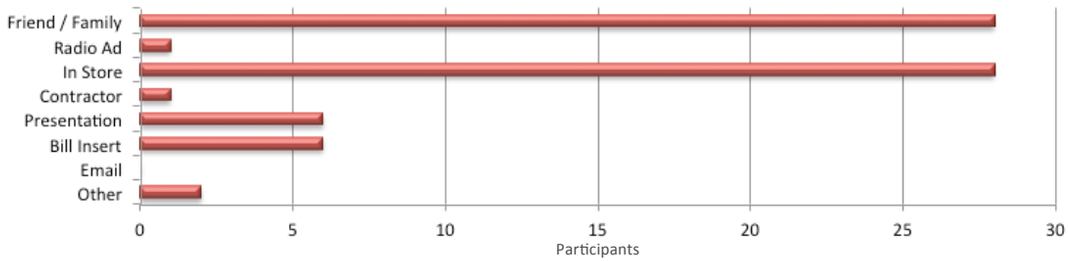

**Q2b: How would you rate you level of satisfaction with the CFL bulbs that were installed?**


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




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

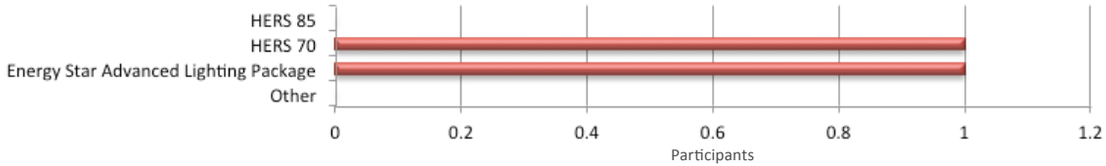

**Q5: How did you hear about the Energy Smart program?**




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

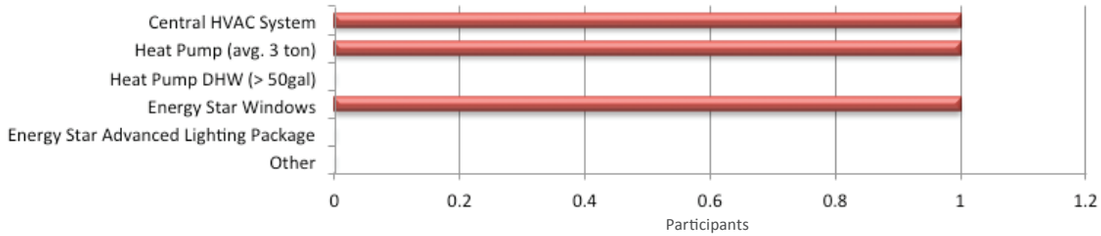
## Energy Efficient New Homes Program

**Q1a: Which performance measures did you implement?**



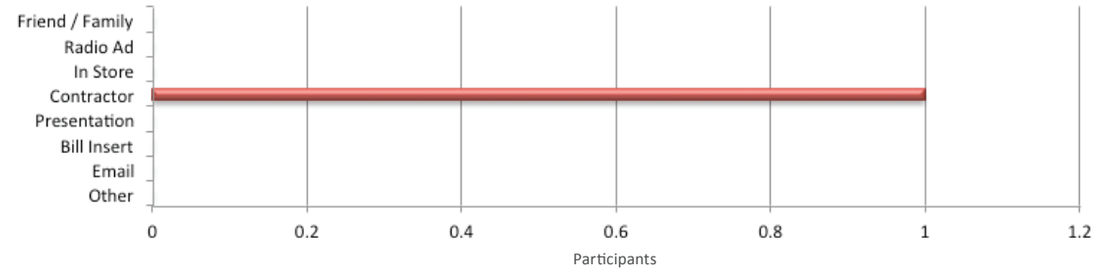

**Q2: How do you rate the value of the Energy Efficient New Homes Program?**


**Q1b: Which prescriptive measures did you implement?**




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


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




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

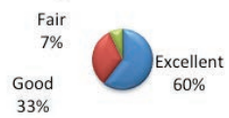
# ENTERGY LOUISIANA

| SURVEY # | SURVEY PROGRAM | YTD PARTICIPANTS (APR '14) | SURVEYS REQ FOR 85%/10% | SURVEYS RECEIVED YTD | NOTES |
|---|---|---|---|---|---|
| 1 | Residential Energy Solutions | 222 | 43 | 43 | Goal met |
| 2 | A/C Tune-up | 5 | 5 | 5 | Goal met |
| 4 | Residential CFL | 43 | 24 | 43 | Goal met |
| 6A | ENERGY STAR A/C | 10 | 9 | 10 | Goal met |
| 6B | ENERGY STAR Window A/C | 3 | 3 | 3 | Goal met |
| 7 | Room A/C Unit Replacement | 2 | 2 | 2 | Goal met |
| 9 | Weatherization Ready | 1 | 1 | 0 | Could not reach |

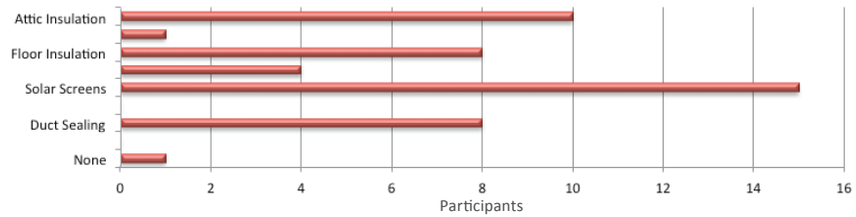
## Residential Energy Solutions Program

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

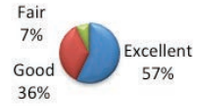

**Q1c: How do you rate the value of the Energy Smart assessment?**



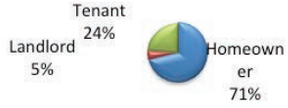

**Q1d: What measure(s) did you or do you plan to implement within 60 days for the assessment?**



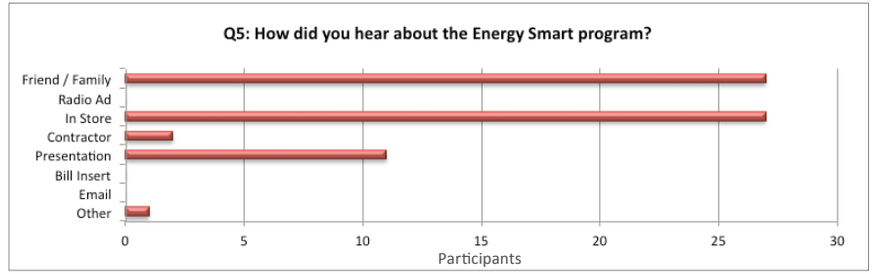

**Q2b: What was the contractor's overall level of professionalism?**



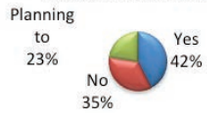

**Q3: Are you the homeowner, landlord, or tenant?**




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




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

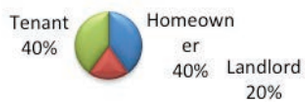


## High Performance A/C Tune-up Program

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

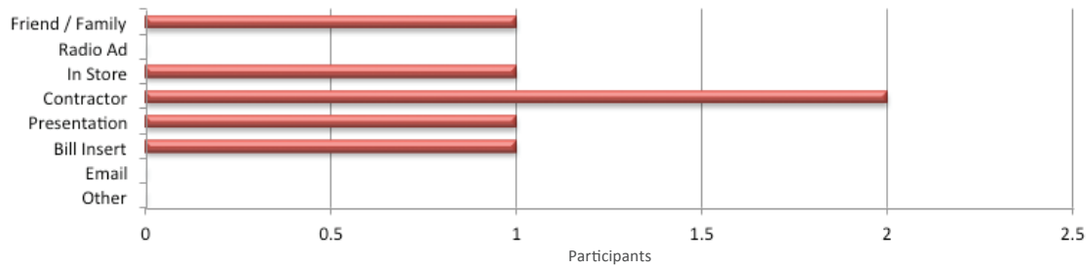

**Q2: How do you rate the value of the Energy Smart tune-up?**


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




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


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



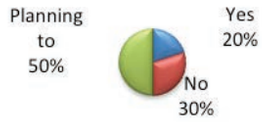
## ENERGY STAR A/C Program

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

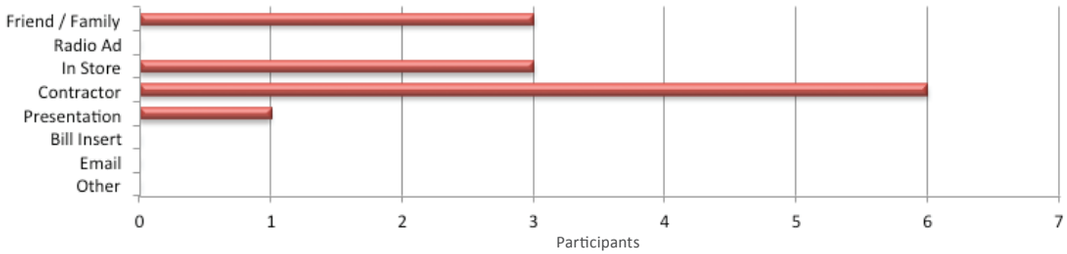

**Q2: How do you rate the value of the Energy Star Central A/C Program?**


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


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




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



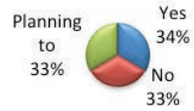
## ENERGY STAR Window A/C Program

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

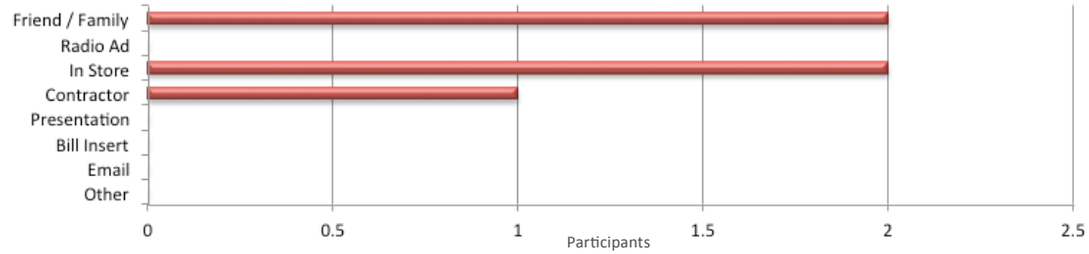

**Q2: How do you rate the value of the Energy Star Window A/C Program?**


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


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




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



## Room A/C Replacement Program

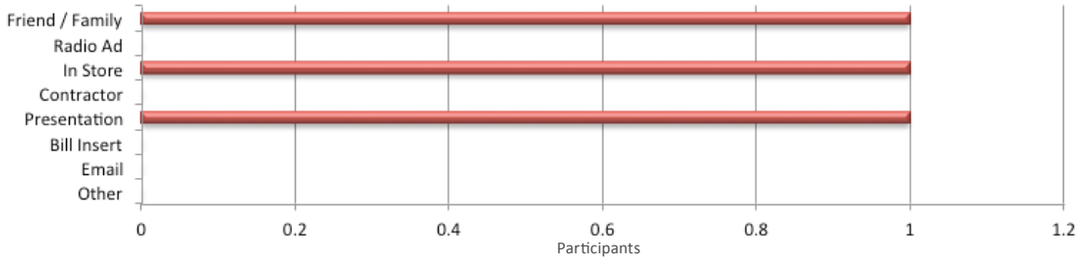
**Q1b: How do you rate your experience with the energy consultant?**


**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?**



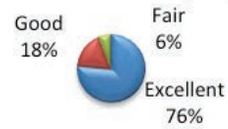

**Q5: Would you recommend the Energy Smart program to others?**


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

## Weatherization Ready Program

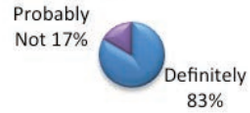
**Q1b: How do you rate your experience with the contractor?**


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

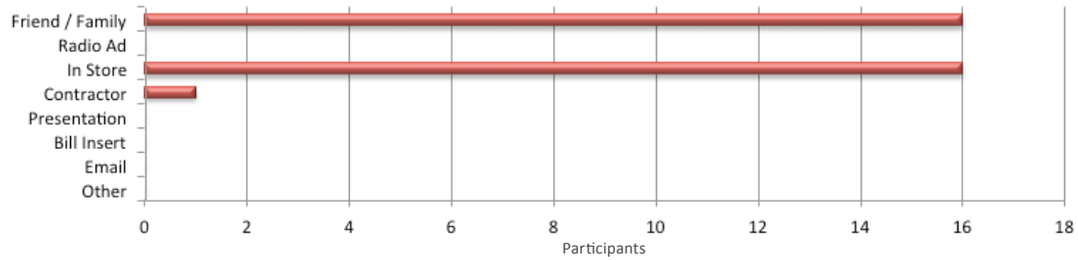



**Q3: Are you the homeowner, landlord, or tenant?**


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




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

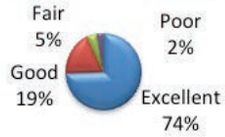



**Q6: Have you taken advantage of other Energy Smart programs?**

## Residential CFL Program

**Q1b: How do you rate your experience with the Green Light N.O. volunteers?**

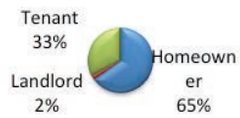

**Q1b: How would you rate the ease of contacting Green Light N.O. and scheduling an appointment?**




**Q2a: How would rate the overall value of your CFL installation?**

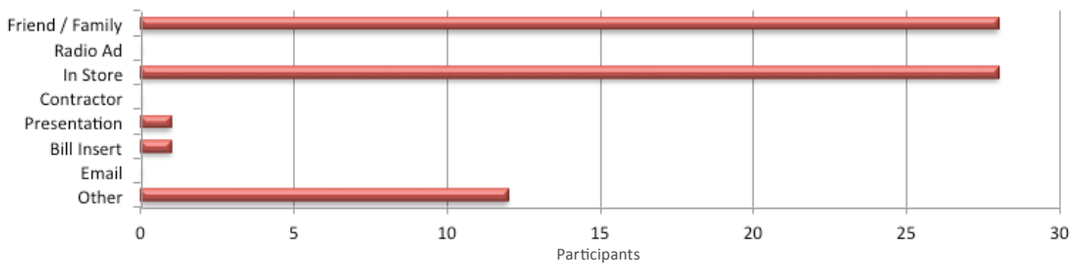

**Q2b: How would you rate you level of satisfaction with the CFL bulbs that were installed?**


**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?**

# Looking Ahead

The first four years of the Energy Smart program have proven to be a great success. Due to this success and the market intelligence gathered on what Orleans Parish residents and business owners are looking for, year five will bring a series of changes to ensure the Energy Smart program continues its legacy of success.

Changes will include:

1. More funding for the Large and Small Commercial Solutions Programs: Each of these programs have proven to be successful with the majority of funding reserved early in the program year. More funding will be added so more businesses can take advantage of the program.

2. Higher goals & more funding for the A/C Tune-Up Program: Piloting the CoolSaver tune-up program in year four demonstrated a delivery model for A/C tune-ups which would deliver more energy savings at a more cost-effective rate for Orleans Parish residents. The success of this pilot has laid the groundwork for growing this program to achieve more and reach more single-family homeowners to help drive down the high cost of summer cooling bills.

3. Sustained high funding for the Assisted Home Performance with ENERGY STAR Program (AHPwES): The huge boost in funding given to the AHPwES program in the last quarter of PY4 presented a big challenge to CLEAResult in finding enough projects in three short months. However, the resourcefulness of a few participating contractors led to an enormous amount of work getting done in a short period of time. By continuing to work with these participating contractors and partnering with local agencies to help assist those in need, the AHPwES program will be able to sustain the excellent level of program delivery it has been providing to Orleans Parish residents who need the help the most.

4. Adding a retail buydown program: To date, Energy Smart has seen limited success in the "downstream" delivery model of providing post-purchase rebates on energy efficient equipment in stores. Year 5 will deliver a "midstream" delivery model for retail purchases, meaning Orleans Parish residents can realize instant savings on energy efficient items in stores through incentives that mark down the shelf price. This will also allow the program to reach a larger audience in a more efficient manner.

***"I've referred this program to many people, and will still tell more."***

# Program Contacts

| NAME | TITLE | PROGRAM(S) |
|---|---|---|
| Jerrel Gustafson | Director | All Programs |
| Alexander Scott | Senior Program Manager | All Programs |
| Camille Pollan | Marketing Account Manager | All Programs |
| Jon Phelps | Program Manager | All Programs |
| Leanne Boudreaux | Senior Program Consultant | All Programs |
| Brandie Smith | Program Coordinator | All Programs |
| Darian Harris | Program Coordinator | All Programs |
| Jason Castillion | Program Specialist | CoolSaver |
| Mike Robinson | Program Specialist | CoolSaver |
| Atom Davis | Program Specialist | HPwES |
| Matt Killen | Program Consultant | HPwES |
| David Magee | Program Consultant | Small & Large Commercial Solutions |
| Marcus Rozbitksy | Program Coordinator | Small & Large Commercial Solutions |
| Ricky Lafleur | Program Consultant | Small & Large Commercial Solutions |
| Priyadarshan Zambre | Energy Engineer | Small & Large Commercial Solutions |
| Bridget Joseph | Program Consultant | Lighting & Appliance |
| Linda Baynham | Program Consultant | Schools & Multifamily |
| Caryn Rodgers | Outreach Consultant | Bright Moments Community Outreach |

# Appendices

**A** Modifications to the commercial & residential unitary equipment deemed savings

**B** Supporting documentation from Texas filing addressing T12 baselines

**C** Program evaluation

# 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 the section titled Early Retirement Texas PUCT petition[2].

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 the 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 a 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 years[1], 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.



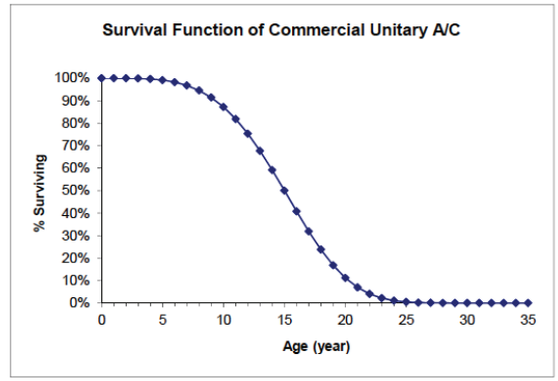



Figure 1 - Survival Function of Commercial Unitary Equipment[3]

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.

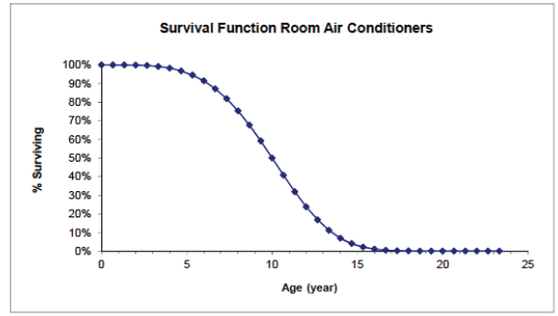



Figure 2 - Survival Function of Room Air Conditioners

Figure 3 - Survival Function of Packaged Chillers was based on data obtained from ASHRAE[4]. 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.

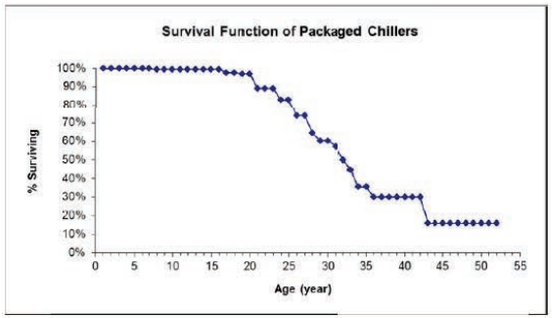



Figure 3 - Survival Function of Packaged Chillers[4]

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



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 |

**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**

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

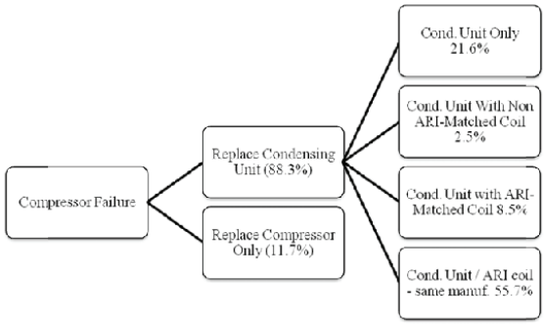
**Equation 2**

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

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 adjustment 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:

$SEER_{Base}$ = ($SEER_{CompressorRepl}$) x (Actual%CompressorRepl) +

($SEER_{CondenserRepl}$) x (Actual%CondenserRepl) +

($SEER_{SystemRepl}$) x (Actual%SystemRepl)

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

SEERBase = 9.5 x 11.7% + 11.05 x 24.1% + 13.5 x 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 have changed throughout the various federal standards 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

IEERadj = EER + 0.2 (Cooling capacity ≥ 65k and < 240k Btu/h)

IEERadj = EER + 0.1 (Cooling capacity ≥ 240k Btu/h)

Unitary Heat Pump Equipment

IEERadj = EER + 0.2 (Cooling capacity ≥ 65k and < 135k Btu/h)

IEERadj = EER + 0.1 (Cooling capacity ≥ 135k 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 the 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 calculated 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**

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

**Equation 4**

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

**Equation 5**

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

#### *Cooling Capacity (≥ 65k Btu/h)*

**Equation 6**

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

**Equation 7**

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

**Equation 8**

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

Where (reference Table 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.

| | |
|---|---|
| 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 x 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".



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

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

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

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

Where (reference Table 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".



### Air and Water Cooled Packaged Chillers

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

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

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.

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



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

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

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

## Table 4 - Efficiency Levels for Unitary Air Conditioning Equipment

| | Manuf. Year[g] | Split System < 65,000 Btu/h | | | Package System < 65k Btu/h | | | All Systems ≥ 65k and < 135K Btu/h[c] | | | All Systems ≥ 135k and < 240k Btu/h[c] | | | All Systems ≥ 240k and < 760k Btu/h[c] | | | All Systems > 760k Btu/h[c] | | | 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[e] | EER | IEER or IPLV | IEERadj[e] | |
| BASELINE EFFICIENCIES | 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[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--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[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] |
| | 2009[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] |
| | 2010[b] | 10.7 | 13 | 12.44 | 10.7 | 13 | 12.44 | 11.0 | 11.2 IEER | 11.2 | 10.8 | 11.0 IEER | 11.0 | 9.8 | 9.9 IEER | 9.9 | 9.5 | 9.6 IEER | 9.6 | Federal Standard/ASHRAE 90.1-2007 (as of 1/1/2010)[b] |
| | 2011[b] | 10.7 | 13 | 12.44 | 10.7 | 13 | 12.44 | 11.0 | 11.2 IEER | 11.2 | 10.8 | 11.0 IEER | 11.0 | 9.8 | 9.9 IEER | 9.9 | 9.5 | 9.6 IEER | 9.6 | Federal Standard/ASHRAE 90.1-2007 (as of 1/1/2010)[b] |
| | 2012[b] | 10.7 | 13 | 12.44 | 10.7 | 13 | 12.44 | 11.0 | 11.2 IEER | 11.2 | 10.8 | 11.0 IEER | 11.0 | 9.8 | 9.9 IEER | 9.9 | 9.5 | 9.6 IEER | 9.6 | Federal Standard/ASHRAE 90.1-2007 (as of 1/1/2010)[b] |
| | ROB[b] | 10.7 | 13 | 12.44 | 10.7 | 13 | 12.44 | 11.0 | 11.2 IEER | 11.2 | 10.8 | 11.0 IEER | 11.0 | 9.8 | 9.9 IEER | 9.9 | 9.5 | 9.6 IEER | 9.6 | Federal Standard/ASHRAE 90.1-2007 (as of 1/1/2010)[b] |
| | NC | 11.1 | 13 | 13 | 11.1 | 13 | 13 | 11.0 | 11.2 IEER | 11.2 | 10.8 | 11.0 IEER | 11.0 | 9.8 | 9.9 IEER | 9.9 | 9.5 | 9.6 IEER | 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 IEER | 13.8 | 12.0 | 13.0 IEER | 13.0 | 10.6 | 12.1 IEER | 12.1 | 10.2 | 11.4 IEER | 11.4 | 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.

g. For split-dx equipment manufactured year is 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 and < 135K Btu/h[c] | | | | All Systems ≥ 135k and < 240k Btu/h[c] | | | | All Systems ≥ 240k Btu/h[c] | | | | Applicable Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | EER[a] | SEER | SEERadj[b] | HSPF | EER[a] | SEER | SEERadj[b] | HSPF | EER | IEER or IPLV | IEERadj[d] | COP[f] | EER | IEER or IPLV | IEERadj[e] | COP[f] | EER | IEER or IPLV | IEERadj[e] | COP[f] | |
| BASELINE EFFICIENCIES | 1990 | 9.0 | 10 | 10 | 6.8 | 8.8 | 9.7 | 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 | 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 | 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 | 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 | 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 | 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 | 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 | 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 | 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 | 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 | 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 |
| | 2001 | 9.0 | 10 | 10 | 6.8 | 8.8 | 9.7 | 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 |
| | 2002 | 9.0 | 10 | 10 | 6.8 | 8.8 | 9.7 | 9.7 | 6.6 | 9.9 | 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 | 9.7 | 6.6 | 9.9 | 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 | 9.7 | 6.6 | 9.9 | 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 | 9.7 | 6.6 | 9.9 | 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[h] | 10.7 | 13 | 12.44 | 7.7 | 10.7 | 13 | 12.44 | 7.7 | 9.9 | n/a | 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[h] | 10.7 | 13 | 12.44 | 7.7 | 10.7 | 13 | 12.44 | 7.7 | 9.9 | n/a | 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] |
| | 2008[h] | 10.7 | 13 | 12.44 | 7.7 | 10.7 | 13 | 12.44 | 7.7 | 9.9 | n/a | 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[h] | 10.7 | 13 | 12.44 | 7.7 | 10.7 | 13 | 12.44 | 7.7 | 9.9 | n/a | 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[h] | 10.7 | 13 | 12.44 | 7.7 | 10.7 | 13 | 12.44 | 7.7 | 10.8 | 11.0 IEER | 11.0 | 3.3 | 10.4 | 10.5 IEER | 10.5 | 3.2 | 9.3 | 9.4 IEER | 9.4 | 3.2 | Federal Standard/ASHRAE 90.1-2007 (as of 1/1/2010)[b] |
| | 2011[h] | 10.7 | 13 | 12.44 | 7.7 | 10.7 | 13 | 12.44 | 7.7 | 10.8 | 11.0 IEER | 11 | 3.3 | 10.4 | 10.5 IEER | 10.5 | 3.2 | 9.3 | 9.4 IEER | 9.4 | 3.2 | Federal Standard/ASHRAE 90.1-2007 (as of 1/1/2010)[b] |
| | 2012[h] | 10.7 | 13 | 12.44 | 7.7 | 10.7 | 13 | 12.44 | 7.7 | 10.8 | 11.0 IEER | 11 | 3.3 | 10.4 | 10.5 IEER | 10.5 | 3.2 | 9.3 | 9.4 IEER | 9.4 | 3.2 | Federal Standard/ASHRAE 90.1-2007 (as of 1/1/2010)[b] |
| | ROB[b] | 10.7 | 13 | 12.44 | 7.7 | 10.7 | 13 | 12.44 | 7.7 | 10.8 | 11.0 IEER | 11 | 3.3 | 10.4 | 10.5 IEER | 10.5 | 3.2 | 9.3 | 9.4 IEER | 9.4 | 3.2 | Federal Standard/ASHRAE 90.1-2007 (as of 1/1/2010)[b] |
| | New Construction | 11.1 | 13 | 13 | 7.7 | 11.1 | 13 | 13 | 7.7 | 10.8 | 11.0 IEER | 11 | 3.3 | 10.4 | 10.5 IEER | 10.5 | 3.2 | 9.3 | 9.4 IEER | 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 | 15 | 8.5 | 11.1 | 12.1 IEER | 12.1 | 3.4 | 10.7 | 11.7 IEER | 11.7 | 3.2 | 10.1 | 10.7 IEER | 10.7 | 3.2 | CEE Tier 2[g] |

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 < 135k Btu/h an adjusted IEER (IEERadj = EER + 0.2).

e. Equipment manufactured prior to 2010 and with capacities ≥ 135k Btu/h an adjusted IEER (IEERadj = 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 | EER | COP | |
| BASELINE EFFICIENCIES | 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 than15,000, 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 | |
| | | EER | EER | EER | EER | EER | EER | COP | COP | COP | |
| BASELINE EFFICIENCIES | 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 (HP), With Louvered Sides | | With Reverse Cycle (HP), 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 | |
| | | EER | EER | EER | EER | EER | EER | EER | EER | EER | EER | EER | EER | EER | |
| BASELINE EFFICIENCIES | 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 | 8.0 | 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 | 8.0 | 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 | 8.0 | 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 |
| | 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 Efficien | | 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 | |
| BASELINE EFFICIENCIES | 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 | | | | | | | | | | | | Applicable Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | <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 | |
| BASELINE EFFICIENCIES | 1972 - 1990 | 3.80 | 3.90 | COP | 3.80 | 3.90 | COP | 4.20 | 4.50 | COP | 5.20 | 5.3a | COP | ASHRAE 90.1--1989 |
| | 1991 | 3.80 | 3.90 | COP | 3.80 | 3.90 | COP | 4.20 | 4.50 | COP | 5.20 | 5.3a | COP | ASHRAE 90.1--1989 |
| | 1992 | 3.80 | 3.90 | COP | 3.80 | 3.90 | COP | 4.20 | 4.50 | COP | 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 | COP | 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 | COP | 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 | COP | 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 | COP | 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 | COP | 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 | COP | 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 | 3.80 | 3.90 | COP | 3.80 | 3.90 | COP | ASHRAE 90.1--1999 |
| | 2000 | 3.80 | 3.90 | COP | 3.80 | 3.90 | COP | 3.80 | 3.90 | COP | 3.80 | 3.90 | COP | ASHRAE 90.1--1999 |
| | 2001 | 3.80 | 3.90 | COP | 3.80 | 3.90 | COP | 3.80 | 3.90 | COP | 3.80 | 3.90 | COP | ASHRAE 90.1--1999 |
| | 2002 | 4.20 | 4.65 | COP | 4.20 | 4.65 | COP | 4.20 | 4.65 | COP | 4.20 | 4.65 | COP | 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 | COP | 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 | COP | ASHRAE 90.1--2004 |
| | 2005 | 4.20 | 5.05 | COP | 4.20 | 5.05 | COP | 4.20 | 5.05 | COP | 4.20 | 5.05 | COP | ASHRAE 90.1--2004 |
| | 2006 | 4.20 | 5.05 | COP | 4.20 | 5.05 | COP | 4.20 | 5.05 | COP | 4.20 | 5.05 | COP | 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 | COP | 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 | COP | 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 | COP | 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 | COP | 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 | COP | 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 | COP | 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 | COP | 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 | 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 | Path A - kW/ton | 0.620 | 0.540 | 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 | Path B - kW/ton | 0.639 | 0.490 | Path B - kW/ton | |

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 | IPLV | Rating | Full | IPLV | Rating | Full | IPLV | Rating | Full | IPLV | Rating | |
| BASELINE EFFICIENCIES | 1972 - 1990 | 3.80 | 3.90 | COP | 3.80 | 3.90 | COP | 4.20 | 4.50 | COP | 5.20 | 5.3a | COP | ASHRAE 90.1--1989 |
| | 1991 | 3.80 | 3.90 | COP | 3.80 | 3.90 | COP | 4.20 | 4.50 | COP | 5.20 | 5.3a | COP | ASHRAE 90.1--1989 |
| | 1992 | 3.80 | 3.90 | COP | 3.80 | 3.90 | COP | 4.20 | 4.50 | COP | 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 | COP | 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 | COP | 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 | COP | 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 | COP | 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 | COP | 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 | COP | 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 | COP | 5.20 | 5.30 | COP | ASHRAE 90.1--1999 |
| | 2000 | 3.80 | 3.90 | COP | 3.80 | 3.90 | COP | 4.20 | 4.50 | COP | 5.20 | 5.30 | COP | ASHRAE 90.1--1999 |
| | 2001 | 3.80 | 3.90 | COP | 3.80 | 3.90 | COP | 4.20 | 4.50 | COP | 5.20 | 5.30 | COP | ASHRAE 90.1--1999 |
| | 2002 | 3.80 | 3.90 | COP | 4.45 | 4.50 | COP | 4.90 | 4.95 | COP | 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 | COP | 5.50 | 5.60 | COP | ASHRAE 90.1--1999 (as of 10/29/2001) |
| | 2004 | 4.45 | 4.50 | COP | 4.45 | 5.20 | COP | 4.90 | 5.60 | COP | 5.50 | 6.15 | COP | ASHRAE 90.1--2004 |
| | 2005 | 4.45 | 5.20 | COP | 4.45 | 5.20 | COP | 4.90 | 5.60 | COP | 5.50 | 6.15 | COP | ASHRAE 90.1--2004 |
| | 2006 | 4.45 | 5.20 | COP | 4.45 | 5.20 | COP | 4.90 | 5.60 | COP | 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 | COP | 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 | COP | 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 | COP | 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 | COP | 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 | COP | 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 | COP | 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 | COP | 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 | COP | 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 | Path A - kW/ton | 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 | Path B - kW/ton | 0.64 | 0.49 | Path B - kW/ton | |
| | | | | | | | | | | | | | | |
| | | 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 | | | | | | | | | | | | |

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

- **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.



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.

...

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

## 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" spreadsheet[5] 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.

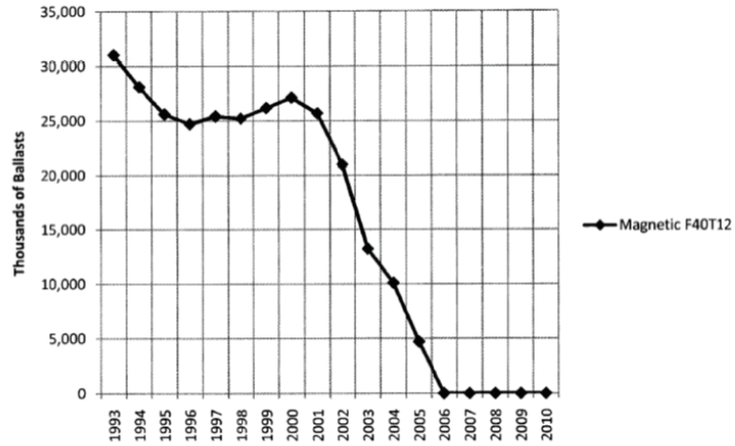
Data from these sources were combined to determine the number of magnetic F40T12 ballast sales from 1993 through 2010. The difference between the total magnetic ballast and the F40T12 magnetic ballast was calculated for 1993 through 1997. For a conservative estimate of magnetic F40T12 remaining life, 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 |
|---|---|---|
| Lighting Measures: Develop strategy to account for baseline shift due to new federal standards - T12 Linear Fluorescent Lamp and Ballast Rules | CLEAResult developed a modified estimated useful life (EUL) of 8.0 years to account for the diminishing 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.<br><br>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.<br><br>See Attachment B for a more detailed explanation of this approach from the Texas filing. | All Commercial Lighting Measures |

## Screenshots from Commercial Lighting Calculator:

- 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) (Total) | Energy Saved (kWh) (Total) |
| 1 | 1 | Office 1 | Office | Refrigerated Case (33 to 41°F) | f44svs | F48T12/VHO Fluorescent, [4] 48", STD VHO lamps [484 Watt/Unit] | 10 | 0 | None | f44ll | 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 | f44svs | F48T12/VHO Fluorescent, [4] 48", STD VHO lamps [484 Watt/Unit] | 10 | 0 | None | f44rlu | 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 | f44svs | F48T12/VHO Fluorescent, [4] 48", STD VHO lamps [484 Watt/Unit] | 10 | 0 | None | 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 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 |
| f44irlu | 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 |

## Table 1 (cont.): Commercial HVAC Recommendations

| Optimal Energy's Deemed Savings Recommendations | CLEAResult Action | Affected Measures |
|---|---|---|
| Add a systematic approach for dealing with early retirement retrofits | 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.<br><br>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.<br><br>For early retirement (ER) projects the measure's energy savings will be calculated by considering the project to have two separate components:<br><br>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<br><br>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.<br><br>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.<br><br>Weighted ER Measure Savings (kWh) = $(kWh_{ER} \times RUL + kWh_{ROB} \times (EUL-RUL)) / EUL$<br><br>Where:<br>$kWh_{ER}$ = Early Retirement (ER) Energy Savings<br>$kWh_{ROB}$ = Replace on Burnout (ROB) Energy Savings<br>Remaining Useful Life (RUL)<br>Estimated Useful Life (EUL) | All Commercial HVAC measures |

| | | |
|---|---|---|
| | 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 CLEAResult'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.<br><br>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).<br>http://www.cee1.org/files/CEE_CommHVAC_UnitarySpec2012.pdf<br><br>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. | Commercial Unitary AC and HP |
| Commercial HVAC measures: find documentation for coincidence factor of 1.0, or use 0.8. | CLEAResult 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 |
|---|---|
| | **Project Type** |
| Application 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 |
| EFLH Cooling | 2584 hrs |
| EUL (yrs) | 15 yrs |
| Equipment Age (yrs) | 8 yrs |
| RUL | 7.30 yrs |
| 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

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

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

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

## Early Retirement Energy Savings (kWh) Calculations

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

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

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

**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[d] | Split System < 65,000 Btu/h | | | Applicable Standard | |
|---|---|---|---|---|---|---|
| | | EER[a] | SEER | SEERadj[b] | | |
| BASELINE EFFICIENCIES | 2005 | 9.0 | 10 | 10 | ASHRAE 90.1--2004 | ← ER Old EER & ER Old SEER |
| | 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] | ← ROB Old EER & ROB Old SEER |
| | 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] | ← Min. Efficiency Based on CEE Tier2 See Attachment A-19 |

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 |
|---|---|---|
| Solar Screen: Update baseline SHGC assumption | 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) | Solar Screens |

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 Gain 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

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

| | Quality Control |
|---|---|
| **Post-Installation Inspections (QC)** | ▪ All installed measures will be verified by CLEAResult staff to ensure they meet the Best Practice Standards<br>▪ If Air Infiltration or Duct Sealing improvements are made, a final Blower Door or Duct Blaster test is required to measure improvement. If the contractor performing the work is also performing the post test, CLEAResult must be notified prior to test so that a CLEAResult representative will be present<br>▪ Energy Consultant will be accompanied by CLEAResult staff on all scheduled home energy assessments until it is determined that assessments are performed according to program standards |
| **QA Inspection Metric General** | ▪ 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.<br>▪ Minor Violation: The Quality Assurance Specialist will determine the impact of failing these measures and the schedule for their resolution. |
| **QA Inspection Metric-Duct & Air Sealing** | ▪ Major Violation Examples (not all inclusive)<br>▪ Starting vs. finished air leakage rate: Verification reveals a discrepancy of >20%.<br>▪ Minimum Ventilation Rate (MVR): Failure to identify correct MVR or to take the proper action in the event of the MVR not being met.<br>▪ Duct sealing or air sealing materials: Use of improper sealing materials.<br>▪ Combustion Safety Test (CST): Not performing the CST or failing to take proper action on the results.<br>▪ Minor Violations (none) |

### DUCT EFFICIENCY IMPROVEMENTS

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.

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.

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.

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 BPI, HERS, or any other nationally recognized standard.

**Installation Standards**

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 cast" type mastic or equivalent with reinforcing mesh is also acceptable.
2. Foil tapes, including UL 181 A-P 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.

**Duct Efficiency Measure Air Flow Requirements**

| 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 |

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

| Optimal Energy's Deemed Savings Recommendations | CLEAResult Action | Affected Measures |
|---|---|---|
| Document sources for all assumptions in deemed savings document. If based on modeling, include a description of all modeling inputs in an appendix. | 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".<br><br>CLEAResult believes the existing documentation to be sufficient, given the savings values are "in-line" with industry accepted values<br><br>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. | Ceiling Insulation, Wall Insulation, Floor Insulation, ENERGY STAR Windows, Air Infiltration, Solar Screens, Duct Efficiency Improvement |
| Include O&M and gas savings in deemed savings document | While both O&M and gas savings are counted in Total Resource Cost (TRC) tests in other jurisdictions, Entergy New Orleans' programs focus on electric benefits. As a result, measure costs used in TRC analysis should "net out" both O&M and gas savings to the extent that both resources play a part in participant decisions. CLEAResult has not adjusted the deemed savings document to calculate O&M and gas savings impacts. | All Measures |
| Add information necessary to calculate TRC | When conducting a cost-effectiveness review, CLEAResult researches and assigns measure costs based upon publicly-available and vetted industry sources. CLEAResult will document its assumptions and can add measure cost information where appropriate to the deemed savings document as cost-effectiveness results are determined. | All Measures |

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

**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 CLEAResult

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 GPM[2].

### Eligible Equipment

The flow rate required for the Entergy New Orleans Residential Solutions program of qualifying showerheads is 2.0 GPM or less[1].

### 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.

Water (Gallons/Unit) = (2.5 – 2) × 7.81 × 1 × 2.18 × 365 / 1 = 3,107

Energy (kWh/Unit) = (2.5 – 2) × 7.81 × 1 × 2.18 × 365 × (105 – 65) × 8.33 / (1 × 3412 × 0.98) = 310

Demand (kW/Unit) = (2.5 – 2) × 7.81 × 1 × 2.18 × 0.03 × (105 – 74.2) × 8.33 / (1 × 3412 × 0.98) = 0.020

### Measure Life

The effective life for this measure is 10 years[3].

### Measure Cost

The cost of a new low-flow showerhead is estimated at $7.15[10].

### 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?_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] 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 GPM[2].

### Eligible Equipment

The flow rate required for the Entergy New Orleans Residential Solutions program of qualifying low-flow aerator is 1.5 GPM[1].

### 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] |

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:

Water (Gallons/Unit) = (2.2 – 1.5) × 3 × 2.18 × 365 = 1,671

Energy (kWh/Unit) = (2.2 – 1.5) × 3 × 2.18 × 365 × (105 – 65) × 8.33 / (3412 × 0.98) = 167

Demand (kW/Unit) = (2.2 – 1.5) × 3 × 2.18 × 0.047 × (105 – 74.2) × 8.33 / (3412 × 0.98) = 0.017

### Measure Life

The effective life for this measure is 10 years[3].

### Measure Cost

A new low flow aerator will be estimated at $3.41[10].

### 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] CLEAResult 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 GPM[2].

### Eligible Equipment

The flow rate required for the Entergy New Orleans Residential Solutions program of qualifying low-flow aerator is 1.0 GPM[1].

### Savings Calculations

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

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

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

Demand (kW/Unit) = $(F_B - F_P) \times U \times P \times C \times (T_H - T_P) \times C_H / (S \times C_E \times Eff)$ 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:

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

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

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 years[3].

**Measure Cost**

A new low flow aerator will be estimated at $2.41[10].

**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] CLEAResult 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 CLEAResult

May 31, 2012

Authors:
Steve McMinn
Rebecca Troutfetter



**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]<br>Standard 60 watt incandescent = $1.25/lamp [2] |
| Incremental Measure Cost | $4/lamp for material and labor for 9 watt CFLs [2]<br>$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) watts[4].

**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 Savings[6].

**Savings Calculations**

Savings values for CFLs were calculated using the following equations:

kWh savings = (base wattage – change wattage)*Annual Hours of Operation / 1000

kW Savings = (base wattage – change wattage)/1000 * 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 Type[5]**

| 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 lamp[2]. The standard price for 40 watt globe lights (for bathroom applications) was $1.00 per lamp[2]. The installed cost for material and labor for the 13 watt (60 watt equivalent) CFL lamps was $2.30[2]. The installed cost for material and labor the 9 watt (40 watt equivalent) CFL lamps was $4.00[2].

### 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 Savings[7] 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.

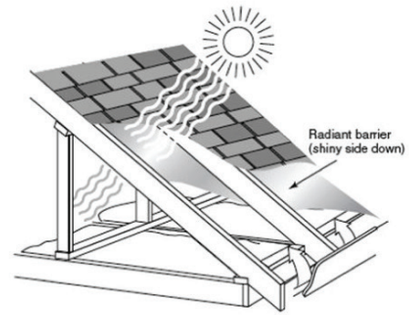
The creation of these Work Papers involved reviewing Technical Reference Manuals (TRMs), case-studies, industry reports, energy codes and standards (IECC), ENERGY STAR, other utility program data, DEER cost information and other such references. The difference in annual energy usage, with and without 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: Dropyourenergybill.com

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

Source: Universal Forest Products

SAVINGS FORRESIDENTIAL 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 constuction[4]<br>$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.

**Table 1: RIMA Required Standards for Radiant Barriers**

| 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<br>0.5 or more for perforated products |
| *Surface Burning* | | |
| 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 | |
| *Adhesive Performance* | | |
| 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 *EnergyGuage* 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 *EnergyGuage 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 *EnergyGuage* 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 | CLEAResult 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 is78, 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 | CLEAResult 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) | CLEAResult assumption |
| % of fluorescent lighting | EnergyGauge default applied | assumes 10% |
| Orientation | evenly distributed in 4 cardinal directions | CLEAResult 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 | CLEAResult 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 | CLEAResult 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) | CLEAResult assumption |
| % of fluorescent lighting | EnergyGauge default applied | assumes 10% |
| Orientation | evenly distributed in 4 cardinal directions | CLEAResult 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 |

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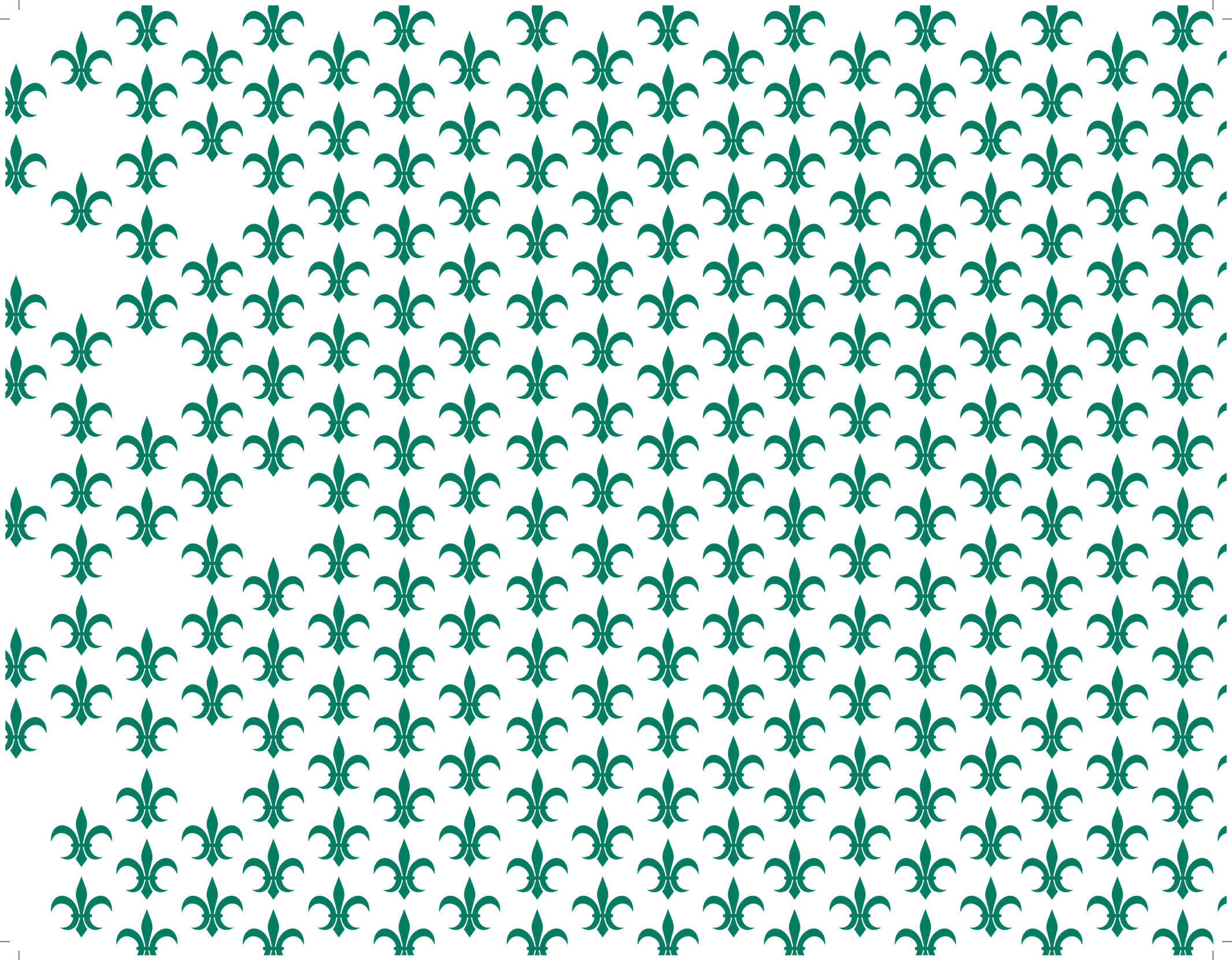

Optimal ENERGY *Integrated Energy Resources*

# Energy Smart New Orleans Impact Evaluation

# for

# Program Year 4

**Prepared for**

**Entergy New Orleans**

**by:**

**Optimal Energy, Inc.**

**May 28, 2015**

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# Tables

# EXECUTIVE SUMMARY

This report presents the results from the impact evaluation of Energy Smart New Orleans' full Year 4 portfolio of residential, commercial, and industrial efficiency programs. The report also includes projects performed by Entergy Louisiana in the Algiers service territory. The impact evaluation consisted of two main components: a complete analysis of 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 purpose 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 100 percent in both service territories, indicating that there are very good data verification and quality control procedures in place.

**Table E.1: Energy Savings Realization Rate – New Orleans**

| Program | Reported kWh Savings | Verified kWh Savings | kWh Realization rate |
|---|---|---|---|
| AC Tune-Up | 343,232 | 279,772 | 82% |
| CoolSaver | 690,825 | 690,825 | 100% |
| Res Solutions -Assessments | 2,119,506 | 2,058,026 | 97% |
| Res Solutions - Direct Install | 1,272,462 | 1,272,462 | 100% |
| Energy Star Air Conditioner | 249,004 | 237,416 | 95% |
| CFL Direct Install | 1,205,662 | 1,205,662 | 100% |
| New Homes | 123,196 | 112,562 | 91% |
| Hard-to-Reach Assessments | 1,270,722 | 1,237,906 | 97% |
| Hard-to-Reach Direct Install | 587,942 | 587,942 | 100% |
| Small C&I | 2,534,151 | 2,519,153 | 99% |
| Large C&I | 5,893,214 | 5,823,379 | 99% |
| Energy Savings Kits | 160,916 | 160,916 | 100% |
| Online Store | 262,995 | 262,995 | 100% |
| Total | 16,713,826 | 16,449,016 | 98% |

**Table E.2: Demand Savings Realization Rate – New Orleans**

| Program | Reported kW Savings | Verified kW Savings | kW Realization rate |
|---|---|---|---|
| AC Tune-Up | 169 | 143 | 85% |
| CoolSaver | 251 | 251 | 100% |
| Res Solutions -Assessments | 802 | 779 | 97% |
| Res Solutions - Direct Install | 132 | 132 | 100% |
| Energy Star Air Conditioner | 80 | 79 | 99% |
| CFL Direct Install | 97 | 97 | 100% |
| New Homes | 41 | 36 | 89% |
| Hard-to-Reach Assessments | 491 | 476 | 97% |
| Hard-to-Reach Direct Install | 49 | 49 | 100% |
| Small C&I | 490 | 498 | 102% |
| Large C&I | 846 | 831 | 98% |
| Energy Savings Kits | 0 | 0 | n/a |
| Online Store | 24 | 24 | 100% |
| Total | 3,472 | 3,396 | 98% |

**Table E.3: Energy Savings Realization Rate – Algiers**

| Program | Reported kWh Savings | Verified kWh Savings | kWh Realization rate |
|---|---|---|---|
| AC Tune-Up | 3,690 | 3,008 | 82% |
| CoolSaver | 283,819 | 283,819 | 100% |
| Res Solutions -Assessments | 113,066 | 109,787 | 97% |
| Res Solutions - Direct Install | 1,044,580 | 1,044,580 | 100% |
| Energy Star Air Conditioner | 27,977 | 26,675 | 95% |
| CFL Direct Install | 164,915 | 164,915 | 100% |
| New Homes | 0 | 0 | n/a |
| Hard-to-Reach Assessments | 7,209 | 7,023 | 97% |
| Hard-to-Reach Direct Install | 108,541 | 108,541 | 100% |
| Small C&I | 216,964 | 215,680 | 99% |
| Large C&I | 24,871 | 24,576 | 99% |
| Energy Savings Kits | 0 | 0 | n/a |
| Online Store | 32,040 | 32,040 | 100% |
| Total | 2,027,673 | 2,020,644 | 100% |

**Table E.4: Demand Savings Realization Rate – Algiers**

| Program | Reported kW Savings | Verified kW Savings | kW Realization rate |
|---|---|---|---|
| AC Tune-Up | 2 | 2 | 85% |
| CoolSaver | 101 | 101 | 100% |
| Res Solutions -Assessments | 64 | 63 | 97% |
| Res Solutions - Direct Install | 86 | 86 | 100% |
| Energy Star Air Conditioner | 9 | 9 | 99% |
| CFL Direct Install | 13 | 13 | 100% |
| New Homes | 0 | 0 | n/a |
| Hard-to-Reach Assessments | 4 | 4 | 97% |
| Hard-to-Reach Direct Install | 14 | 14 | 100% |
| Small C&I | 37 | 38 | 102% |
| Large C&I | 2 | 2 | 98% |
| Energy Savings Kits | 0 | 0 | n/a |
| Online Store | 3 | 3 | 100% |
| Total | 336 | 334 | 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. Going forward, we suggest the following:

- Begin using a code compliant baseline for existing incandescent lighting that are not currently compliant with code. Use an average savings for T12 retrofits based on the assumption that the building owner would have to change out the lamps in the future.
- Do not rebate equipment that does not meet code.
- Clearly indicate in the project files which measures are being installed. This is particularly important in the energy assessments.
- Clearly track savings from each multi-family direct install project, and ensure that the project paper work is clearly linked to its respective database entry.
- Ensure that all AC-tune ups in the database are properly accounted for in the project paperwork.
- 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.

# INTRODUCTION

## EVALUATION OBJECTIVES

This report presents the results from the impact evaluation of Energy Smart New Orleans' full Year 4 portfolio of residential, commercial, and industrial electric efficiency programs. The report mirrors the evaluations performed for Program Years 1-3 of the program. For this year of the program, the evaluation also assessed projects completed in the Algiers service territory. The key objective for this evaluation was to provide verification of the gross energy impacts reported in the tracking database. To this end, the evaluation used 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?
- Do the equipment numbers and types match those shown in the project 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 did not include any site visits or participant interviews, and so all evaluation values rely on the paper work filed with the evaluated project. In cases where invoices were provided with the project paperwork, these were checked to ensure that 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, with older equipment being less efficient than current code.

## PROGRAM DESCRIPTIONS

This evaluation covered Energy Smart's portfolio of programs that ran during the current program year. These programs are:

- Air Conditioner (AC) & CoolSaver Tune-Up - $50 towards the tune-up of existing residential central air conditioner or heat pump system. During the latter part of the program year, this was transitioned to the CoolSaver program, which gives a $175 incentive for a more comprehensive tune-up which includes filter cleaning, refrigerant charge correction, and other activities, as well as standard measurement of EER to ensure savings.
- 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.
- Energy Savings Kits – This program involved distributing an energy savings kit to children at 23 schools around the New Orleans metro area. Each kit contains 4 CFLs, a kitchen aerator, a bathroom aerator, and an LED night light. The savings estimates are based on self-reported install rates from the schools. The scope of this evaluation did not include an investigation on the accuracy of this self-reported install rate data; however, it is likely that these numbers are higher than the actual install rate.
- Online Store – This program consists of packages ordered from an online store. The packages consist of one LED, six CFLs, and one advanced power strip. Although it was not in the scope of the project to evaluate this program, savings estimates are included in the database for reference.

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. In general, deemed savings were used based on the approved deemed savings documents. However, in some cases, it was unable to be determined where the savings estimates are coming from. These cases will be discussed in greater detail under the appropriate programs.

## 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 included 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 ensured 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 AND COOLSAVER

Savings data for the AC Tune-up Program were analyzed by installation address and application. Each project achieved a mean savings of 2,608 kWh. However, this mean is distorted by a few very large projects which included tune-ups for many air conditioners in a single housing development or multi-family facility. 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 | 128 | 343,232 | 2,682 | 169 | 1.32 |
| Algiers | 5 | 3,690 | 738 | 2 | 0.42 |
| Total | 133 | 346,922 | 2,608 | 171 | 1.28 |

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. Since this program uses a deemed approach with a single savings value for every tune-up regardless of AC size or efficiency, 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 | 68,303 | 39 | 113 |
| 2 | 25,835 | 13 | 15 |
| 3 | 252,784 | 119 | 5 |
| Total | 346,922 | 171 | 133 |

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 | Sample Size | % of Total Number Sampled |
|---|---|---|---|---|
| 1 | 113 | 68,303 | 4 | 4% |
| 2 | 15 | 25,835 | 4 | 27% |
| 3 | 5 | 252,784 | 5 | 100% |
| Total | 133 | 346,922 | 13 | 10% |

Tables 4 and 5 show the results of the quantitative project file review for New Orleans and Algiers. The realization rate is significantly under 1.0 due to a few large projects where the database showed that many more units were tuned up than indicated in the project paperwork. In one project, the invoice reflected 12 units compared to 58 in the database, in another the invoice reflected 3 units compared 150 in the database, and in the third case the database reflected 93 units, while the invoice reflected 27 with only 25 approved. These changes created an overall realization rate 0.82 for kWh and 0.85 for kW.

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

| | Reported | Realization Rate | Verified | Relative Precision at 90% confidence level |
|---|---|---|---|---|
| kWh | 343,232 | 0.82 | 279,772 | 25% |
| kW | 169 | 0.85 | 143 | 22% |

**Table 5: AC Tune-up Impact Results – Algiers**

| | Reported | Realization Rate | Verified | Relative Precision at 90% confidence level |
|---|---|---|---|---|
| kWh | 3,690 | 0.82 | 3,008 | 25% |
| kW | 2.10 | 0.85 | 1.78 | 22% |

In addition, part way through the program year CLEAResult transitioned its AC tune-program to a more in depth program it calls CoolSaver. The CoolSaver program involves a more comprehensive tune-up, and includes activities such as:

- Cleaning the condenser, evaporator, and blower assembly
- Verifying a clean filter and change as needed
- Verify airflow and adjust as needed
- Verify refrigerant charge and adjust as needed

The CoolSaver Program uses M&V and modeled savings as opposed to deemed savings. Every contractor participating in the program must perform a spot check of the unit's efficiency rating (EER) before the tune-up occurs for a sample of the projects and after the tune-up for every project. If the project involved both pre- and post-tune up measurements, savings are calculated based on the measured difference between efficiency ratings; if the project involves only the post- tune up measurements, savings are derived from a model based on CLEAResult's experience with similar projects where full M&V data is available. Optimal reviewed the program M&V requirements and calculations as well as a small sample of the Cool Saver database project entries, and determined that the M&V procedures were reasonable and that the database correctly captured the full range of information for each tune-up. We therefore give a realization rate of 1.0 to the CoolSaver projects. The table below shows the savings from the standard AC Tune-up program and CoolSaver for both Entergy New Orleans and Algiers.

**Table 6: AC Tune-up and Cool Saver Totals**

| | Reported kWh | Reported kW | Verified kWh | Verified kW |
|---|---|---|---|---|
| New Orleans - AC Tune up | 343,232 | 169 | 279,772 | 143 |
| New Orleans - Cool Saver | 690,825 | 251 | 690,825 | 251 |
| New Orleans Total | 1,034,057 | 420 | 970,597 | 394 |
| Algiers - AC Tune-up | 3,690 | 2.10 | 3,008 | 1.78 |
| Algiers - Cool Saver | 283,819 | 101 | 283,819 | 101 |
| Algiers Total | 287,509 | 104 | 286,827 | 103 |
| TOTAL | 1,321,566 | 524 | 1,257,424 | 497 |

Some general observations from the database and project file review:

- Although the AC Tune-up component of the program had a realization rate of 0.85, the CoolSaver component achieved higher savings, bringing the total realization rate to 0.95.
- Documentation for the tune-ups for the large multi-family projects was confusing and the numbers in the paper work did not seem to match the numbers in the database. This was the main cause of the lower realization rate for the program. CLEAResult should ensure that the project files clearly show the number of units tuned up in projects in multi-family facilities, and that these files are clearly associated with specific addresses in the 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 7 below

shows the number of energy assessments and associated savings for the New Orleans and Algiers service territories.

**Table 7: Energy Assessments by Jurisdiction**

| | Projects | kWh Saved | Mean kWh | kW Saved | Mean kW |
|---|---|---|---|---|---|
| New Orleans | 891 | 2,119,506 | 2,379 | 802 | 0.90 |
| Algiers | 87 | 113,066 | 1,300 | 64 | 0.74 |
| Total | 978 | 2,232,572 | 2,283 | 866 | 0.89 |

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. Forty four addresses did not have any associated savings, presumably because there was no follow up after the initial audits. Furthermore, there were two line items in the database for Cool Saver projects that occurred as a result of an Energy Assessment. These rows were removed to avoid double counting with the Cool Saver program. Project records were then sorted from smallest to largest kWh claim, and placed into three strata, each with approximately one-third of the total program savings. Table 8 below shows the reported kWh, kW, and number of projects in each sampling stratum.

**Table 8: Residential Solutions Program Strata Description**

| Sampling Strata | Reported kWh | Reported kW | Projects |
|---|---|---|---|
| 1 | 692,191.79 | 415 | 660 |
| 2 | 730,453.31 | 238 | 198 |
| 3 | 809,926.95 | 214 | 120 |
| Total | 2,232,572 | 866 | 978 |

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 9 gives the sample information.

**Table 9: Residential Solutions Reviewed Project Information**

| Sampling Strata | Projects | Reported kWh | Number of Sampled Projects | % of Total Sampled |
|---|---|---|---|---|
| 1 | 660 | 692,192 | 9 | 1% |
| 2 | 198 | 730,453 | 6 | 3% |
| 3 | 120 | 809,927 | 4 | 3% |
| Total | 978 | 2,232,572 | 19 | 2% |

Tables 10 and 11 show the result of the quantitative project file review for New Orleans and Algiers.

**Table 10: Energy Assessment Impact Results – New Orleans**

| | Reported | Realization Rate | Verified | Relative Precision at 90% confidence level |
|---|---|---|---|---|
| Energy (kWh) | 2,119,506 | 0.97 | 2,058,026 | 4.0% |
| Demand (kW) | 802 | 0.97 | 779 | 4.0% |

**Table 11: Energy Assessment Impact Results – Algiers**

| | Reported | Realization Rate | Verified | Relative Precision at 90% confidence level |
|---|---|---|---|---|
| kWh | 113,066 | 0.97 | 109,787 | 4.0% |
| kW | 64 | 0.97 | 63 | 4.0% |

Some general observations from the database and project file review:

- The realization rate is under 1.0 due to one instance where the square footage used to calculate savings from attic insulation was higher than the actual square footage of the building.
- In general, the project paperwork and invoices were confusing and hard to follow. We recommend updating the paperwork to clearly show which measures were recommend and which were installed.
- In most cases, there was no indication on the paper work of the existing HVAC system. This is important, as deemed savings vary significantly depending on the type of heating and cooling of the home. We recommend including a check box on the application for the existing heating/cooling type.
- In general, it appeared as if fewer inspections were done this year than in previous years. We recommend continuing the practice of post installation inspections on a sample of projects.
- There were instances where it appeared that some direct install measures were included, but did not appear in the database savings. We assume that savings from these measures appear under a different program. We recommend ensuring that this assumption is correct, and potentially starting to track savings from direct install measures during the energy assessment under this program. 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.

## 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. In total, there were forty multi-family complexes listed in the database. However, ten of the projects had no associated savings, despite some incentives being paid out. These projects were removed for the analysis.

We conducted a review of the project documents, and found them to be internally consistent. The number of bulbs in the bulb count matched the number of bulbs used for the savings calculations, and the stipulated hours of operation by room type conformed to industry standards. We therefore use a realization rate of 1.0. Tables 12 and 13show the kWh and kW savings for the Multi-Family DI program for New Orleans and Algiers.

**Table 12: Multi-Family DI kWh Impact Results – New Orleans**

| | Reported | Realization Rate | Verified |
|---|---|---|---|
| Energy (kWh) | 1,272,462 | 1.00 | 1,272,462 |
| Demand (kW) | 132 | 1.00 | 132 |

**Table 13: Multi-Family DI kWh Impact Results – Algiers**

| | Reported | Realization Rate | Verified |
|---|---|---|---|
| kWh | 1,044,580 | 1.00 | 1,044,580 |
| kW | 86 | 1.00 | 86 |

We note that the way this program is tracked, divided between the Hard-to-Reach and Residential Solutions programs, but distinct from either, seems to cause unnecessary confusion. There were several instances where the project files first received did not seem to have any relation to the project files requested, including project name, address, or savings. While this confusion was eventually resolved, in order to ensure the accuracy of savings estimates and enable future evaluations, CLEAResult needs to ensure that project files and savings calculators are maintained and clearly associated with rows in the savings database.

Further, there were ten direct install projects in the database that had zero savings, but non-zero incentive amounts. We recommend that CLEAResult determine why projects that paid out incentive would have zero associated savings.

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 more efficient lighting reduces 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 14 and 15 show the total savings for the energy assessment and direct install components of the Residential Solutions Program.

**Table 14: Total Residential Solutions kWh Savings – New Orleans**

| | | Reported Savings | Realization Rate | Verified Savings |
|---|---|---|---|---|
| kWh | Assessments | 2,119,506 | 0.97 | 2,058,026 |
| | Multi-Family | 1,272,462 | 1 | 1,272,462 |
| | Total | 3,391,967 | 0.98 | 3,330,488 |
| kW | Assessments | 802 | 0.97 | 779 |
| | Multi-Family | 132 | 1 | 132 |
| | Total | 934 | 0.98 | 911 |

**Table 15: Total Residential Solutions kWh Savings – Algiers**

| | | Reported Savings | Realization Rate | Verified Savings |
|---|---|---|---|---|
| kWh | Assessments | 113,066 | 0.97 | 109,787 |
| | Multi-Family | 1,044,580 | 1 | 1,044,580 |
| | Total | 1,157,646 | 1.00 | 1,154,367 |
| kW | Assessments | 64 | 0.97 | 63 |
| | Multi-Family | 86 | 1 | 86 |
| | Total | 150 | 0.99 | 149 |

## ENERGY STAR AIR CONDITIONER

There were 236 homes that participated in the ENERGY STAR Air Conditioner Program in 2014, for a total of 276,981 reported kWh saved annually. Table 16 below gives the breakout of projects and savings between Algiers and New Orleans.

**Table 16: ENERGY STAR AC Projects by Jurisdiction**

| | Projects | kWh Saved | Mean kWh | kW Saved | Mean kW |
|---|---|---|---|---|---|
| New Orleans | 223 | 249,004 | 1,117 | 80 | 0.36 |
| Algiers | 13 | 27,977 | 2,152 | 9 | 0.67 |
| Total | 236 | 276,981 | 1,174 | 88 | 0.37 |

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 17 below shows the reported kWh, kW, and number of projects in each sampling stratum.

**Table 17: ENERGY STAR AC Program Strata Information**

| Sampling Strata | Reported kWh | Reported kW | Projects |
|---|---|---|---|
| 1 | 60,508 | 25 | 153 |
| 2 | 125,097 | 38 | 62 |
| 3 | 91,376 | 25 | 21 |
| Total | 276,981 | 88 | 236 |

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 18 gives the sample information.

**Table 18: ENERGY STAR AC Reviewed Project Information**

| Sampling Strata | Projects | Reported kWh | Sample Size | % of Total Number Sampled |
|---|---|---|---|---|
| 1 | 153 | 60,508 | 10 | 7% |
| 2 | 62 | 125,097 | 10 | 16% |
| 3 | 21 | 91,376 | 10 | 48% |
| Total | 236 | 276,981 | 30 | 13% |

Tables 19 and 20 show the results of the quantitative project file review for New Orleans and Algiers.

**Table 19: ENERGY STAR AC Impact Results – New Orleans**

| | Reported | Realization Rate | Verified | Relative Precision at 90% confidence level |
|---|---|---|---|---|
| kWh | 249,004 | 0.95 | 237,416 | 4.2% |
| kW | 80 | 0.99 | 79 | 6.3% |

**Table 20: ENERGY STAR AC Impact Results – Algiers**

| | Reported | Realization Rate | Verified | Relative Precision at 90% confidence level |
|---|---|---|---|---|
| kWh | 27,977 | 0.95 | 26,675 | 4.2% |
| kW | 8.70 | 0.99 | 8.59 | 6.3% |

Some general observations from the database and project file review:

- There is a gap in the deemed savings lookup tables, where air conditioners between 51,000 Btu/hr and 56,999 Btu/hr do not have savings values. If there was a unit that fell into this gap, CLEAResult rounded the range up to the next category in the deemed savings lookup table, which is meant to apply to units between 57,000 Btu/hr and 63,000 Btu/hr. However, we do not believe it is appropriate to claim the same savings for a 51,000 Btu/hr as a 63,000 Btu/hr unit, and so created an extra row in the deemed savings table to cover this gap. For this row, which applies to units of approximately 4.5 tons, the savings are exactly half way between the savings for a 4 ton unit and a 5 ton unit. This is the major factor that caused a lower than 1.0 realization rate. Going forward, we recommend updating the deemed savings table so that there is no longer a gap between 4 and 5 ton units. Alternatively, a formula could be used that includes the exact Btu/hr of the unit as an input. This would give a more accurate estimate of savings for each unit.
- Installation verification or photographs were generally not performed for these projects.

## 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 21 and 22 show the results from the project review for New Orleans and Algiers.

**Table 21: CFL Direct Install Impact Results – New Orleans**

| | Reported | Realization Rate | Verified |
|---|---|---|---|
| kWh | 1,205,662 | 1.0 | 1,205,662 |
| kW | 97.042 | 1.0 | 97 |

**Table 22: CFL Direct Install Impact Results – Algiers**

| | Reported | Realization Rate | Verified |
|---|---|---|---|
| kWh | 164,915 | 1.0 | 164,915 |
| kW | 13.097 | 1.0 | 13 |

For this program, there were very few LEDs installed. Due to increasing federal lighting standards and the quick decline of LED cost, we recommend considering a transition away from CFLs and towards LEDs.

## NEW HOMES

There were 50 homes that participated in the new homes program during Program Year 4 – none of these were located in the Algiers service territory. Total annual savings achieved was 123,196 kWh, for a mean savings of 2,464 kWh per house.

We used simple random sampling to evaluate this program. Before final sample selection, the database was reviewed to check for outliers and missing values. Table 23 below shows the reported kWh, kW, and number of projects in the program

**Table 23: New Homes Sample Information**

| Projects | Reported kWh | Sample Size | kWh of sampled projects | % of Total Number Sampled |
|---|---|---|---|---|
| 50 | 123,196.36 | 11 | 25,124 | 22% |

Table 24 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 24: New Homes Impact Results – New Orleans**

| | Reported | Realization Rate | Verified | Relative Precision at 90% confidence level |
|---|---|---|---|---|
| kWh | 123,196 | 91% | 112,562 | 6.42% |
| kW | 41 | 89% | 36 | 8.60% |

Some general observations from the database and project file review:

- Realization rates are 0.91 for kWh and 0.89 for kW. This is due to two projects where it is unclear where the database savings come from. The project files indicate that each project only had two AC units installed as part of the program. Savings were recalculated based on deemed savings from AC units and were significantly lower than savings from the database.
- Other projects used 2,087 kWh saved, whereas the deemed savings value in Appendix 6 stipulates 2,360 kWh. This difference should be reconciled.
- It is often unclear what HVAC type the new home has. We recommend that this be clearly stated on the measure application.
- We recommend that effort should be made to ensure all application material and invoices should be included in the project documentation.

## HARD-TO-REACH

### Energy Assessments

As in the Residential Solutions program, the Hard-to-Reach program is split up into 2 components – energy assessments and multifamily direct install. There were a total of 242 homes that participated in the Hard-to-Reach program. Table 25 below shows the number of energy assessments and associated savings by territory

**Table 25: Low-Income Projects by Jurisdiction**

| | Projects | kWh Saved | Mean kWh | kW Saved | Mean kW |
|---|---|---|---|---|---|
| New Orleans | 242 | 1,270,722 | 5,251 | 491 | 2.03 |
| Algiers | 7 | 7,209 | 1,030 | 4 | 0.55 |
| Total | 249 | 1,277,931 | 5,132 | 495 | 1.99 |

For sampling, we split up the projects into three tiers, as shown in Table 26.

**Table 26: Low-Income Program Sampling Description**

| Sampling Strata | Reported kWh | Reported kW | Projects |
|---|---|---|---|
| 1 | 641,769 | 300 | 179 |
| 2 | 402,549 | 121 | 52 |
| 3 | 233,613 | 74 | 18 |
| Total | 1,277,931 | 495 | 249 |

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 27 gives the sample information.

**Table 27: Low-Income Reviewed Project Information**

| Sampling Strata | Projects | Reported kWh | Number of Sampled Projects | % of Total Sampled |
|---|---|---|---|---|
| 1 | 179 | 641,769 | 5 | 3% |
| 2 | 52 | 402,549 | 3 | 6% |
| 3 | 18 | 233,613 | 1 | 6% |
| Total | 249 | 1,277,931 | 9 | 4% |

Tables 28 and 29 show the results of the quantitative project file review for New Orleans and Algiers.

**Table 28: Low-Income Impact Results – New Orleans**

| | Reported | Realization Rate | Verified | Relative Precision at 90% confidence level |
|---|---|---|---|---|
| kWh | 1,270,722 | 0.97 | 1,237,906 | 2.6% |
| kW | 491 | 0.97 | 476 | 2.5% |

**Table 29: Low-Income Impact Results – Algiers**

| | Reported | Realization Rate | Verified | Relative Precision at 90% confidence level |
|---|---|---|---|---|
| kWh | 7,209 | 0.97 | 7,023 | 2.6% |
| kW | 4 | 0.97 | 4 | 2.5% |

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

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. However, a few projects were adjusted based on incorrect square footage used in the calculations in the savings database.
- 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.

## Multi-Family Direct Install

Similarly to the Residential Solutions program, Multi-Family Direct Install was performed as an initiative within the Hard-to-Reach Program. In total, there were sixteen multi-family complexes listed in the database for the hard-to-reach program.

We conducted a review of the project documents, and found them to be internally consistent. The number of bulbs in the bulb count matched the number of bulbs used for the savings calculations, and the stipulated hours of operation by room type conformed to industry standards. We therefore use a realization rate of 1.0. Tables 30 and 31 show the kWh and kW savings for the Multi-Family DI program for New Orleans and Algiers.

**Table 30: Multi-Family DI kWh Impact Results – New Orleans**

| | Reported | Realization Rate | Verified |
|---|---|---|---|
| kWh | 587,942 | 1.00 | 587,942 |
| kW | 49 | 1.00 | 49 |

**Table 31: Multi-Family DI kWh Impact Results – Algiers**

| | Reported | Realization Rate | Verified |
|---|---|---|---|
| kWh | 108,541 | 1.00 | 108,541 |
| kW | 14 | 1.00 | 14 |

We note that the way this program is tracked, divided between the Hard-to-Reach and Residential Solutions programs, but distinct from either, seems to cause unnecessary confusion. There were several instances where the project files first received did not seem to have any relation to the project files requested, including project name, address, or savings. While this confusion was eventually resolved, in order to ensure the accuracy of savings estimates and enable future evaluations, CLEAResult needs to ensure that project files and savings calculators are maintained and clearly associated with rows in the savings database.

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

Tables 32 and 33 show the total savings for the energy assessment and direct install components of the Hard-to-Reach Program.

**Table 32: Total Residential Solutions kWh Savings – New Orleans**

| | | Reported Savings | Realization Rate | Verified Savings |
|---|---|---|---|---|
| kWh | Assessments | 1,270,722 | 0.97 | 1,237,906 |
| | Multi-Family | 587,942 | 1 | 587,942 |
| | Total | 1,858,663 | 0.98 | 1,825,848 |
| kW | Assessments | 491 | 0.97 | 476 |
| | Multi-Family | 49 | 1 | 49 |
| | Total | 540 | 0.97 | 525 |

**Table 33: Total Residential Solutions kWh Savings – New Orleans**

| | | Reported Savings | Realization Rate | Verified Savings |
|---|---|---|---|---|
| kWh | Assessments | 7,209 | 0.97 | 7,023 |
| | Multi-Family | 108,541 | 1 | 108,541 |
| | Total | 115,751 | 1.00 | 115,564 |
| kW | Assessments | 4 | 0.97 | 4 |
| | Multi-Family | 14 | 1 | 14 |
| | Total | 18 | 0.99 | 18 |

## SMALL COMMERCIAL AND INDUSTRIAL

In Program Year 4, the small Commercial and Industrial program consisted almost entirely of lighting projects. Of 75 total projects, only 3 non-lighting measures were installed: one HVAC project, and two "other." The HVAC measure was in the New Orleans service area; the two "other" projects were in Algiers. Table 34 below gives the breakout of projects between New Orleans and Algiers.

**Table 34: Small Commercial Projects by Jurisdiction**

| | Projects | kWh Saved | Mean kWh | kW Saved | Mean kW |
|---|---|---|---|---|---|
| New Orleans | 70 | 2,534,151 | 36,202 | 490 | 7.00 |
| Algiers | 8 | 216,964 | 27,121 | 37 | 4.65 |
| Total | 78 | 2,751,115 | 35,271 | 527 | 6.76 |

For sampling, we split up the projects into three tiers, as shown in Table 35.

**Table 35: Small C&I Program Strata Description**

| Sampling Strata | Reported kWh | Reported kW | Projects |
|---|---|---|---|
| 1 | 542,317 | 108 | 38 |
| 2 | 941,087 | 188 | 27 |
| 3 | 1,267,711 | 231 | 13 |
| Total | 2,751,115 | 527 | 78 |

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 36 gives the sample information.

**Table 36: C&I Program Reviewed Project Information**

| Sampling Strata | Projects | Reported kWh | Number of Sampled Projects | % of Total Sampled |
|---|---|---|---|---|
| 1 | 38 | 542,317 | 5 | 13% |
| 2 | 27 | 941,087 | 3 | 11% |
| 3 | 13 | 1,267,711 | 4 | 31% |
| Total | 78 | 2,751,115 | 12 | 15% |

Tables 37 and 38 show the results of the quantitative project file review for New Orleans and Algiers.

**Table 37: C&I Impact Results – New Orleans**

| | Reported | Realization Rate | Verified | Relative Precision at 90% confidence level |
|---|---|---|---|---|
| kWh | 2,534,151 | 0.99 | 2,519,153 | 0.5% |
| kW | 490 | 1.02 | 498 | 2.9% |

**Table 38: C&I Impact Results – Algiers**

| | Reported | Realization Rate | Verified | Relative Precision at 90% confidence level |
|---|---|---|---|---|
| kWh | 216,964 | 0.99 | 215,680 | 0.5% |
| kW | 37.16 | 1.02 | 37.76 | 2.9% |

Some general observations from the database and project file review:

- The realization rate was very close to 1.0, indicating generally good data validation procedures by CLEAResult. The few projects adjusted were due to mismatches in building type between the savings calculator and the actual facility.

- Almost all projects reviewed involved some measures replacing either T12 fluorescent lamps or incandescent lamps that are not compliant with federal regulations. In many cases, existing fixtures contained incandescent lamps that have not been compliant with federal regulations since 2012. This is odd, considering that these lamps have a typical life of less than six months in commercial applications. Since it is clear that many facilities are getting these lamps somewhere, we did not adjust the baseline to reflect the minimum code requirements. However, especially for incandescent lamps with a shorter measure life, we do not believe it is appropriate to continue claiming the full savings for program year 5. Going forwards, we recommend that CLEAResult use a code compliant halogen incandescent as the baseline technology, even in cases where the existing fixture has a non-compliant lamp. Further, we recommend evaluating what to use as a baseline in linear fluorescent fixtures that currently contain T12s. At a minimum, there should be a baseline shift for these measures, meaning that while savings may be calculated from the installed baseline for a short time, savings for the majority of the measure life should be calculated from the code-compliant baseline.
- It appears that CLEAResult is not using the building type function in the lighting savings calculator – it seems that they are starting with the operating hours of the facility and choosing whichever building type has the closest operating hours. However, actual operating hours are not documented in the project files. We recommend that if operating hours at the actual facility are different than the default values in the lighting calculator, CLEAResult should select custom, and manually enter the operating hours. In these cases, CLEAResult should include clear documentation of why the actual hours are different than the default.
- 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 lamp where multiple lamps 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 lamps 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.

## LARGE COMMERCIAL AND INDUSTRIAL

In Program Year 4, eighteen large C&I facilities participated. Of these, seven were non-lighting projects. The one large C&I project in Algiers was non-lighting. 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 39 below gives the sampling information.

**Table 39: Large C&I Sample Information**

| Projects | Reported kWh | Number of sampled projects | kWh of sampled projects | % of Total Sampled |
|---|---|---|---|---|
| 18 | 5,918,085.00 | 6 | 1595961 | 27% |

Tables 40 and 41 give the quantitative results of the review for New Orleans and Algiers.

**Table 40: Large C&I Impact Results – New Orleans**

| | Reported | Realization Rate | Verified | Relative Precision at 90% confidence level |
|---|---|---|---|---|
| kWh | 5,893,214 | 0.99 | 5,823,379 | 2.1% |
| kW | 846 | 0.98 | 831 | 3.1% |

**Table 41: Large C&I Impact Results – Algiers**

| | Reported | Realization Rate | Verified | Relative Precision at 90% confidence level |
|---|---|---|---|---|
| kWh | 24,871 | 0.99 | 24,576 | 2.1% |
| kW | 2 | 0.98 | 2 | 3.1% |

In general, it was very difficult to review large C&I projects given the level of documentation provided. Some specific comments include:

- The main adjustment was to a food service measure that installed a strip curtain in two walk-in refrigerator doors. There was no indication on how savings were calculated, but they were much higher than what could be expected based on the measure. Savings were recalculated based on an industry standard approach, and found to be significantly lower than the savings in the database. However, given the small savings of the project anyway, it did have a significant impact on the realization rate.
- In general, savings should be well documented, especially for non-standard measures.
- One reviewed measure involved the installation of two chillers. Although the part load efficiency of the chillers was somewhat better than Louisiana state energy code, the full load efficiency was below minimum requirements. This means that the rebated chillers were not fully compliant with current state

energy code. CLEAResult should ensure that any rebated equipment exceeds the minimum energy code.

Almost all projects reviewed involved some measures replacing either T12 fluorescent lamps or incandescent lamps that are not compliant with federal regulations. In many cases, existing fixtures contained incandescent lamps that have not been compliant with federal regulations since 2012. This is odd, considering that these lamps have a typical life of less than half a year in commercial applications. Since it is clear that many facilities are getting these lamps somewhere, we did not adjust the baseline to reflect the minimum code requirements. However, especially for incandescents with a shorter measure life, we do not believe it is appropriate to continue claiming the full savings for program year 5. Going forwards, we recommend that CLEAResult use a code compliant halogen incandescent as the baseline technology, even in cases where the existing fixture has a non-compliant lamp. Further, we recommend evaluating what to use as a baseline in linear fluorescent fixtures that currently contain T12s. At a minimum, there should be a baseline shift for these measures, meaning that while savings may be calculated from the installed baseline for a short time, savings for the majority of the measure life should be calculated from the code-compliant baseline.

- 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 one case, there was a file named "updated scope," which did not match the fixture count in the final calculator. It was impossible to determine which number was correct – the project invoice did not contain specific fixture counts.
- It appears that CLEAResult is not using the building type function in the lighting savings calculator – it seems that they are starting with the operating hours of the facility and choosing whichever building type has the closest operating hours. However, actual operating hours are not documented in the project files. We recommend that if operating hours at the actual facility are different than the default values in the lighting calculator, CLEAResult should select "custom" and manually enter the operating hours. In these cases, CLEAResult should include clear documentation of why the actual hours are different than the default.

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

- Do not rebate equipment that does not comply with state energy code.
- Include lighting spec sheets in the project file, so it is clear which lamps 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.

- 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 standards.[2]
- Going forwards, use a code-compliant halogen baseline if current incandescent lamps do not meet federal standards.

## ENERGY SAVINGS KITS AND ONLINE STORE

Program year 4 saw the addition of two programs that were not evaluated as part of this report. One of these programs involved distributing kits of CFLs, faucet aerators, and low-flow showerheads at various schools. Savings for this program are based on self-report install data. The other program involved the purchase of kits of lighting and smart power strips from an online store. Savings for this program are based on the amount of kits ordered, assuming that all were installed. As discussed briefly in the introduction, it is likely that the install rates of these programs are significantly below one – i.e. that the self-reported data from the school children is not very accurate and that some people who ordered the kits from the online store did not install all of the items included. If these programs are continued, we recommend performing a specific evaluation looking at the install rates.

As stated, these two programs were not evaluated specifically, and would most likely not yield significant benefit from a review of program paperwork, since the real uncertainty lies in the install rates. However, for completeness, Table 42 below gives the reported savings for the two programs.

[2] *Federal Register*, 74 FR 34080 (July 14, 2009)
http://www.regulations.gov/#!documentDetail;D=EERE-2006-STD-0131-0005

**Table 42: Energy Savings Kit and Online Store Savings**

| | kWh | kW |
|---|---|---|
| Energy Savings Kit - NOLA | 160,916 | 0 |
| Energy Savings Kit - Algiers | 0 | 0 |
| Energy Savings Kit - Total | 160,916 | 0 |
| Online Store - NOLA | 262,995 | 24 |
| Online Store - Algiers | 32,040 | 3 |
| Online Store - Total | 295,035 | 27 |

# CONCLUSION

## TOTAL RESULTS

Tables 43 through 46 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 43: Energy Savings Realization Rate – New Orleans**

| Program | Reported kWh Savings | Verified kWh Savings | kWh Realization rate |
|---|---|---|---|
| AC Tune-Up | 343,232 | 279,772 | 82% |
| CoolSaver | 690,825 | 690,825 | 100% |
| Res Solutions -Assessments | 2,119,506 | 2,058,026 | 97% |
| Res Solutions - Direct Install | 1,272,462 | 1,272,462 | 100% |
| Energy Star Air Conditioner | 249,004 | 237,416 | 95% |
| CFL Direct Install | 1,205,662 | 1,205,662 | 100% |
| New Homes | 123,196 | 112,562 | 91% |
| Hard-to-Reach Assessments | 1,270,722 | 1,237,906 | 97% |
| Hard-to-Reach Direct Install | 587,942 | 587,942 | 100% |
| Small C&I | 2,534,151 | 2,519,153 | 99% |
| Large C&I | 5,893,214 | 5,823,379 | 99% |
| Energy Savings Kits | 160,916 | 160,916 | 100% |
| Online Store | 262,995 | 262,995 | 100% |
| Total | 16,713,826 | 16,449,016 | 98% |

**Table 44: Demand Savings Realization Rate – New Orleans**

| Program | Reported kW Savings | Verified kW Savings | kW Realization rate |
|---|---|---|---|
| AC Tune-Up | 169 | 143 | 85% |
| CoolSaver | 251 | 251 | 100% |
| Res Solutions -Assessments | 802 | 779 | 97% |
| Res Solutions - Direct Install | 132 | 132 | 100% |
| Energy Star Air Conditioner | 80 | 79 | 99% |
| CFL Direct Install | 97 | 97 | 100% |
| New Homes | 41 | 36 | 89% |
| Hard-to-Reach Assessments | 491 | 476 | 97% |
| Hard-to-Reach Direct Install | 49 | 49 | 100% |
| Small C&I | 490 | 498 | 102% |
| Large C&I | 846 | 831 | 98% |
| Energy Savings Kits | 0 | 0 | n/a |
| Online Store | 24 | 24 | 100% |
| Total | 3,472 | 3,396 | 98% |

**Table 45: Energy Savings Realization Rate – Algiers**

| Program | Reported kWh Savings | Verified kWh Savings | kWh Realization rate |
|---|---|---|---|
| AC Tune-Up | 3,690 | 3,008 | 82% |
| CoolSaver | 283,819 | 283,819 | 100% |
| Res Solutions -Assessments | 113,066 | 109,787 | 97% |
| Res Solutions - Direct Install | 1,044,580 | 1,044,580 | 100% |
| Energy Star Air Conditioner | 27,977 | 26,675 | 95% |
| CFL Direct Install | 164,915 | 164,915 | 100% |
| New Homes | 0 | 0 | n/a |
| Hard-to-Reach Assessments | 7,209 | 7,023 | 97% |
| Hard-to-Reach Direct Install | 108,541 | 108,541 | 100% |
| Small C&I | 216,964 | 215,680 | 99% |
| Large C&I | 24,871 | 24,576 | 99% |
| Energy Savings Kits | 0 | 0 | n/a |
| Online Store | 32,040 | 32,040 | 100% |
| Total | 2,027,673 | 2,020,644 | 100% |

**Table 46: Demand Savings Realization Rate – Algiers**

| Program | Reported kW Savings | Verified kW Savings | kW Realization rate |
|---|---|---|---|
| AC Tune-Up | 2 | 2 | 85% |
| CoolSaver | 101 | 101 | 100% |
| Res Solutions -Assessments | 64 | 63 | 97% |
| Res Solutions - Direct Install | 86 | 86 | 100% |
| Energy Star Air Conditioner | 9 | 9 | 99% |
| CFL Direct Install | 13 | 13 | 100% |
| New Homes | 0 | 0 | n/a |
| Hard-to-Reach Assessments | 4 | 4 | 97% |
| Hard-to-Reach Direct Install | 14 | 14 | 100% |
| Small C&I | 37 | 38 | 102% |
| Large C&I | 2 | 2 | 98% |
| Energy Savings Kits | 0 | 0 | n/a |
| Online Store | 3 | 3 | 100% |
| Total | 336 | 334 | 99% |

## CONCLUSIONS AND NEXT STEPS

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

- Begin using a code compliant baseline for existing incandescent light bulbs that are not currently compliant with code. Use an average savings for T12 retrofits based on the assumption that the building owner would have to change out the bulbs in the future.
- Do not rebate equipment that does not meet code.
- Clearly indicate in the project files which measures are being installed. This is particularly important in the energy assessments.
- Clearly track savings from each multi-family direct install project, and ensure that the project paper work is clearly linked to its respective database entry.
- Ensure that all AC-tune ups in the database are properly accounted for in the project paperwork.
- 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
- 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.

Despite the above caveats, it is clear that after four 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:

- Investigations into the install rate for the Energy Savings Kit and/or Online Store programs.
- On-site verification to ensure that projects are being installed to the correct specifications.
- Evaluation of specific savings assumptions in the deemed savings algorithms that have a high degree of uncertainty or that affect a large portion of portfolio savings.
- A process evaluation looking at how to improve program processes and procedures, as opposed to impacts.
- A review of install rates and savings for the CFL Giveaway program.