# Annual Progress Report

**Covering Period:** February 1, 2011 – January 31, 2012
**Date of Report:** June, 2012

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**Proposed Funding amount:** $8M from base rate + $45.6M from STEP = $53.6M total

**Council District:** The following allocation of rebates by district excludes the Peak Saver, New Home Construction and Demand Response programs (due to the inability to separate these rebates by district):

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| District 1 | $ 1,677,920 | 8.04% | District 5 | $ 1,749,756 | 8.39% | District 9 | $ 2,180,379 | 10.45% |
| District 2 | $ 2,117,541 | 10.15% | District 6 | $ 887,952 | 4.26% | District 10 | $ 1,492,805 | 7.15% |
| District 3 | $ 486,308 | 2.33% | District 7 | $ 804,813 | 3.86% | Other | $ 6,404,832 | 30.70% |
| District 4 | $ 662,506 | 3.18% | District 8 | $ 2,400,723 | 11.51% | Total | $ 20,865,535.00 | |

**Neighborhood Location:** Figure 1 on the following page shows the geographic distribution of rebates along with a median income legend.

**Business Size:** Figure 2 on the following page shows the breakdown of commercial rebates by business size, where business size is defined by maximum peak demand.

**Rebate program collaboration:** CPS partnered with SAWS and SAHA on the Wash Right program to provide rebates for installation of high efficiency washing machines within SAHA facilities. A total of 178 units qualified for the rebate and received $13,350 in 2011.

**Private sector employment profile:** STEP programs had an estimated 700 firms participate as partners in the program in 2011, assisting customers with the installation of eligible energy efficiency measures. Based on survey data from 142 partners in 2010, 69% hold primary offices in San Antonio and 79% have an office in Bexar County. Employee counts averaged 17 for permanent employees and 3 for temporary employees. Employee counts for Bexar County offices averaged 18 permanent and 2 temporary. An average of 4 permanent employees were hired for the Bexar locations in 2010, and 31% of respondents indicated they had hired more people due to the CPS rebate incentives.

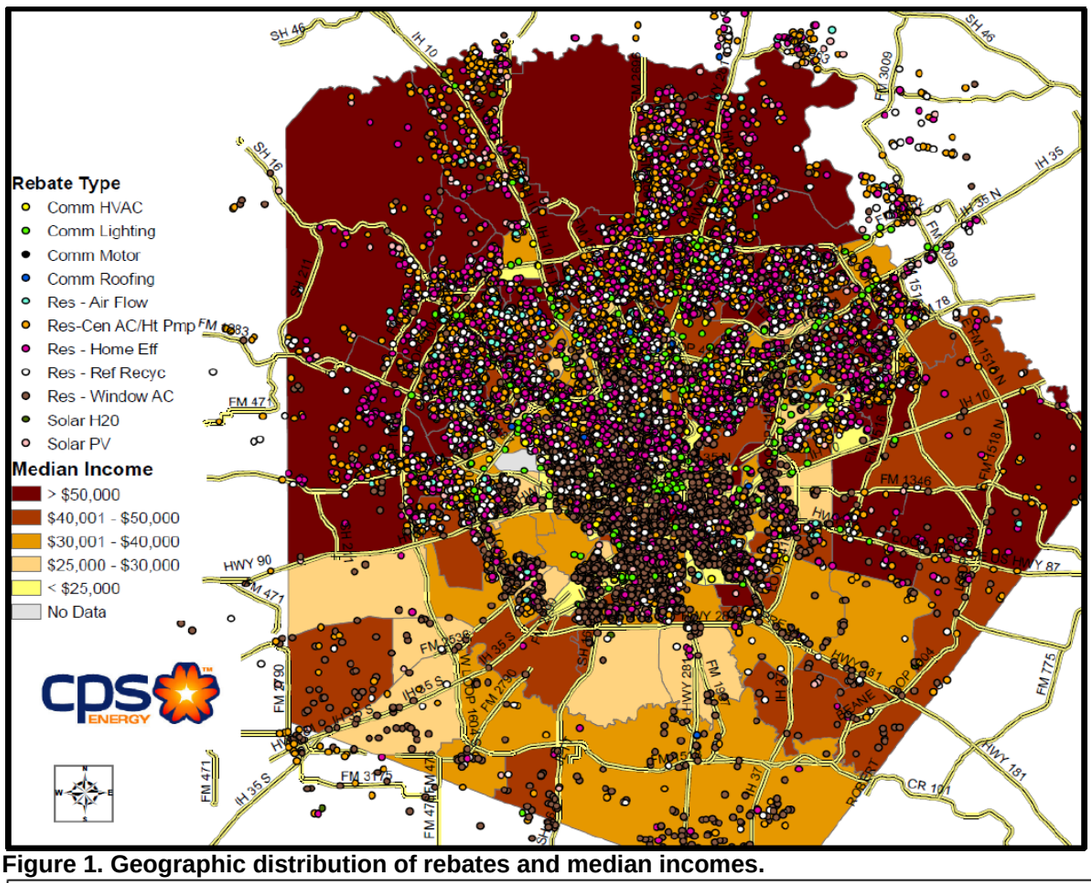



**Figure 1. Geographic distribution of rebates and median incomes.**

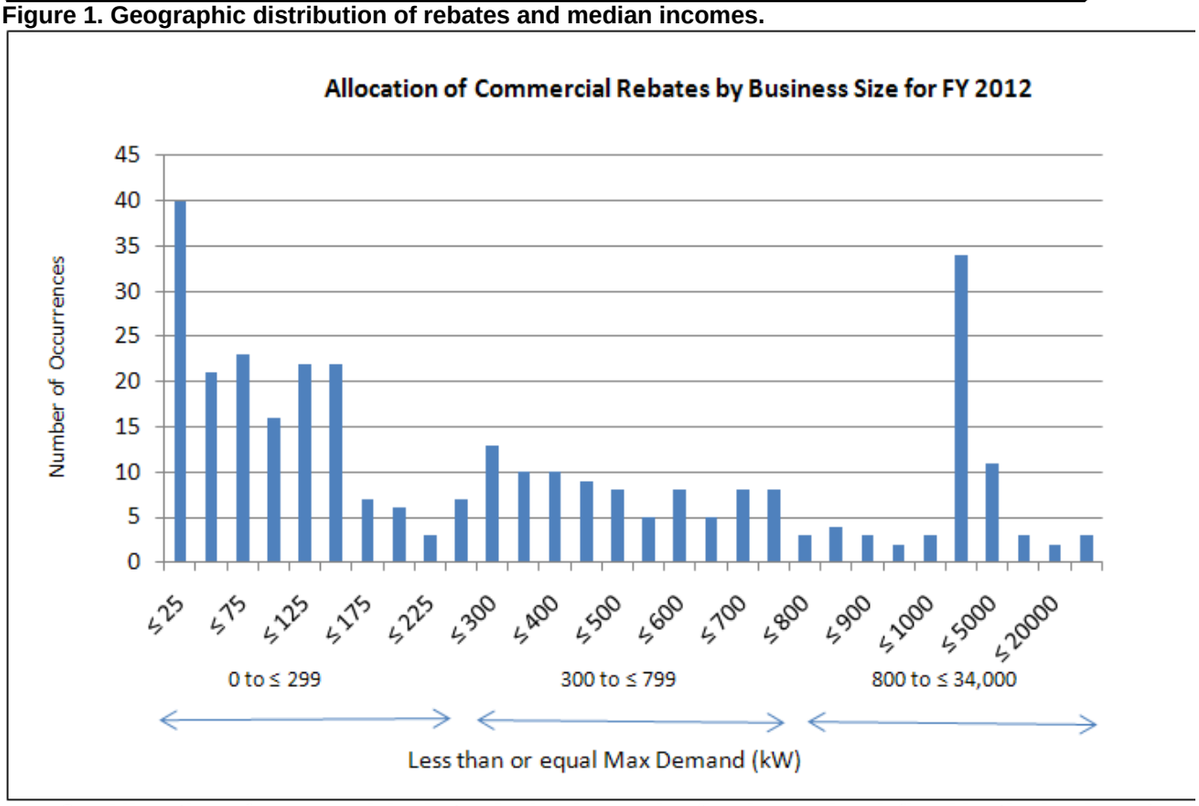



**Figure 2. Allocation of commercial rebates by business size (business size defined by the business' maximum peak demand).**

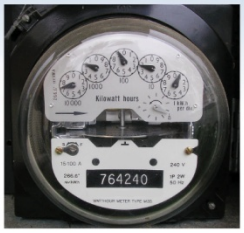
**Number of first time rebate participants:** Of the roughly 20,619 rebates allocated to residential programs in 2011, approximately 19,800 were new rebate customers and 819 were repeat customers. (These numbers excludes the Peak Saver program for which includes 64,000 customers.) Of the 510 rebates allocated to commercial programs, approximately 479 were new customers and 31 were repeat customers.

**Number of multiple rebate participants:** Of the roughly 20,619 rebates allocated to residential programs in 2011, approximately 2474 residential customers received more than one rebate this year. (These numbers exclude the CFL and Peak Saver programs for which individual customer information was not provided.) Of the 510 rebates allocated to commercial programs, approximately 50 received more than one rebate this year.

**Emissions reduction:** The following table contains the tons of avoided emissions of various pollutants for each program:

| | CO2 | NOx | SO2 |
|---|---|---|---|
| Home Efficiency | 1391 | 1 | 2 |
| Residential HVAC | 6030 | 3 | 8 |
| PeakSaver | 1177 | 1 | 1 |
| Solar PV & Water Heater | 3048 | 1 | 4 |
| Air Flow Performance | 255 | 0 | 0 |
| Wash Right | 15 | 0 | 0 |
| New Home Construction | 4005 | 2 | 5 |
| Refrigerator Recycling | 740 | 0 | 1 |
| **Residential Sector Total** | **16,661** | **8** | **21** |
| | | | |
| Com. Lighting | 24974 | 12 | 31 |
| Com. HVAC | 2586 | 1 | 3 |
| Roof Coating | 59 | 0 | 0 |
| Restaurant Equipment | 1 | 0 | 0 |
| Lean Clean Energy | 242 | 0 | 0 |
| Comm New Construction | 0 | 0 | 0 |
| Comm Custom | 567 | 0 | 1 |
| Demand Response | 1278 | 1 | 2 |
| **Commercial Sector Total** | **29,707** | **14** | **37** |
| | | | |
| ***Total*** | **46,368** | **22** | **58** |






# Measurement and Verification of CPS Energy's FY2012 DSM Program Offerings

**Submitted to CPS Energy**

**May 23, 2012**

Nexant

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## Tables



## Figures

# 1 EXECUTIVE SUMMARY

CPS Energy retained Nexant, Inc. (Nexant) to conduct a comprehensive, independent measurement and verification (M&V) evaluation of CPS Energy's FY2012 demand side management (DSM) programs (further referenced in this report as 2011 programs). This report describes the M&V methodology and process and presents the findings of the evaluation.

The evaluation primarily focused on calculating the energy and demand savings achieved by CPS Energy's 2011 DSM programs on an annualized basis. Additionally, the evaluation reviewed program expenditures to calculate program cost-effectiveness and briefly addressed program operations and procedures to make recommendations on potential program modifications for the future.

## 1.1 SUMMARY OF ENERGY AND DEMAND IMPACTS

Net energy and demand savings are listed in

Table **1-1** for individual programs, as well as totals by Energy Efficiency programs, Demand Response programs and overall. The savings below is represented on an ***annualized basis*** in order to simplify the reporting structure and for easy comparison from year to year.

**Table 1-1: 2011 Net Energy and Demand Savings**

| Program | Net Impacts | | | Benefit/Cost Ratio |
|---|---|---|---|---|
| | Energy Savings (kWh) | Peak Demand Savings (kW) | Non-Coinc. Demand Savings (kW) | |
| **Energy Efficiency Programs** | | | | |
| Home Efficiency | 2,209,950 | 384 | 671 | 1.52 |
| Residential HVAC | 9,579,104 | 2,885 | 3,606 | 2.54 |
| Solar PV & Water Heater Residential | 2,342,898 | 1,461 | 1,461 | 0.82 |
| Air Flow Performance | 405,574 | 192 | 192 | 0.53 |
| New Homes Construction | 6,361,699 | 1,445 | 2,978 | 3.52 |
| Refrigerator Recycling | 1,175,223 | 108 | 135 | 3.46 |
| Wash Right | 23,710 | 10 | 40 | 0.81 |
| ***Residential Subtotal*** | ***22,098,157*** | ***6,485*** | ***9,083*** | |
| Com Lighting | 39,672,489 | 6,905 | 7,745 | 2.51 |
| Com HVAC | 4,108,763 | 1,361 | 1,648 | 1.71 |
| Solar PV Commerical | 2,498,757 | 1,636 | 1,636 | 0.74 |
| Roof Coating | 93,572 | 10 | 13 | 1.05 |
| Restaurant Equipment | 1,872 | 0 | 0 | 3.26 |
| Lean Clean Energy | 384,495 | 18 | 21 | 54.43 |
| Com New Construction | 0 | 0 | 0 | 0.00 |
| Com Custom | 900,893 | 27 | 35 | 6.72 |
| ***Commercial Subtotal*** | ***47,660,840*** | ***9,958*** | ***11,097*** | |
| ***Energy Efficiency Total*** | ***69,758,997*** | ***16,443*** | ***20,180*** | |
| **Demand Response/Load Control Programs** | | | | |
| PeakSaver | 1,870,517 | 25,764 | 25,764 | 1.65 |
| Demand Response | 2,030,450 | 68,562 | 68,562 | 1.11 |
| ***Demand Response Total*** | ***3,900,967*** | ***94,326*** | ***94,326*** | |
| **Total** | **73,659,964** | **110,769** | **114,506** | |

## 1.2 SUMMARY OF ECONOMIC IMPACTS

Nexant's evaluation included collecting program cost data, including internal program costs, such as administration, management, and marketing, as well as total rebates paid, and found the following economic impacts:

- Cost of Saved Energy, which represents the levelized program cost per annual kWh saved, was **$0.044/kWh** for the 2011 programs.
- Net Reduction in Revenue Requirements, which represents the net reduction in utility costs due to the impact of the energy efficiency improvements, was **$8,822,893** for the 2011 programs.

## 1.3 KEY PROCESS FINDINGS AND RECOMMENDATIONS

Nexant's evaluation team finds CPS Energy's DSM efforts continue to be led by committed, skilled, and experienced staff. The portfolio of DSM program offerings addresses a wide variety of electric efficiency measures and services for both residential and nonresidential customers.

CPS Energy's programs follow many best practices documented for efficiency programs, including:

- Program quality control procedures include collecting sufficient data to verify installed equipment (pre and post inspections, equipment specification forms, etc.), while not requiring excessive reporting by customers and contractors
- Programs have straightforward participation processes, and CPS Energy works closely with customers and contractors to complete applications and ensure projects meet program requirements
- Trade ally network continues to expand and program staff keeps trade allies informed of program updates

To support and extend the many strengths of CPS Energy's programs, the evaluation team offers the following broad process recommendations in addition to program-specific recommendations detailed in each program section:

- Nexant recommends CPS Energy facilitate or work closely with the city of San Antonio to develop code compliance training sessions to provide clear and concise information in which interested parties can develop work plans for facilities in which meet IECC 2009 minimum code compliance.
- For purposes of calculating a more precise estimation of energy savings, Nexant recommends CPS collect information for each facility as specified in the program-specific recommendations
- Nexant recommends optimizing M&V activities to include targeting complex commercial projects for more in-depth monitoring (pre- and post) to optimize and capture realized energy and demand savings

- Continue to track changes to minimum efficiency standards, incremental equipment cost, and market trends to evaluate potential changes to program requirements and incentive levels
- As programs continue to expand, CPS Energy should continue planning for the resources necessary to support large-scale deployment of DSM program portfolio and to achieve both short-term and long-term goals

## 2.1 OVERVIEW OF EVALUATION METHODOLOGY

The general process used by Nexant in the 2008 through 2011 M&V evaluation is shown in Figure 2-1 and described in detail below.

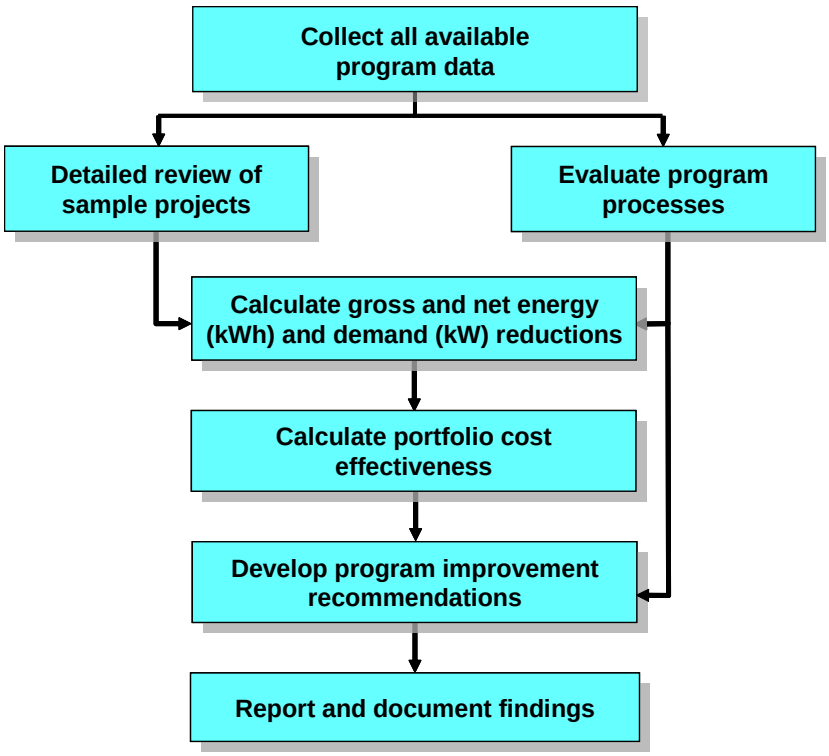


**Figure 2-1: M&V Evaluation Process**

While the specific evaluation procedures varied slightly for each sector, the general process for calculating the savings was the same across all sectors. Nexant conducted this analysis using the steps described below.

- **Collect Program Data.** CPS Energy provided Nexant with all the individual project data for 2011 DSM projects, including electronic copies of program databases, engineering calculations and spreadsheet analysis, and hard copies of customer applications.
- **Calculate Gross Savings.** Gross savings are the energy and demand savings that are found at a customer site as the direct result of the installation of eligible energy efficiency measures and are determined through data collection, site inspections, and engineering analysis.

  Using the detailed project data provided by CPS Energy, Nexant conducted file reviews of individual projects to check the equipment installed and adherence to program rules. Additionally, for a subset of projects, Nexant performed site inspections to verify

equipment installation and operation. To determine gross energy and demand savings, Nexant calculated and summed individual project savings using industry standard savings calculation methods, including standard baselines for existing facilities and new construction. Where applicable, the interactive effects of particular energy efficiency measures were incorporated (i.e. reduced internal HVAC loads due to improved lighting efficiency).

- **Determine Net Impacts.** Net program impacts incorporate customer and market behavior into the gross program savings, which can add to or subtract from a program's direct results. Net impacts typically include two metrics: *free ridership*, the proportion of measures that would have been installed in the absence of the program; and *spillover*, additional savings that have occurred because of a program's operations but outside of its administrative framework. To determine net impacts, these metrics are combined into a net-to-gross (NTG) ratio, which is applied to the gross program savings.

  To remain consistent with the 2008, 2009, and 2010 M&V evaluations, Nexant used the same methodology for developing program NTG ratios; through market research of similar programs around the country, which were applied to the calculated gross savings for each program.

- **Process Evaluation.** The process evaluation involved reviewing program procedures and providing recommendations on potential improvements. For the 2009, 2010, and 2011 M&V evaluations, Nexant primarily focused on program recordkeeping, including information collected on customer applications and tracked in program databases.

- **Program Economic Analysis.** Nexant's economic analysis summarized cost-effectiveness for the overall portfolio of savings from three perspectives: Cost of Saved Energy, Reduction in Revenue Requirements, and Program Administrator Benefit Cost Ratio:

  - *Cost of Saved Energy (CSE).* The Cost of Saved Energy is the total cost per kWh of realizing the efficiency improvement. CSE is determined by dividing levelized program costs by the annual energy savings, as shown in the following equation. Levelized program costs are calculated using a Capital Recovery Factor (CRF), which incorporates the number of years that the energy savings persist and an annual discount rate.

$$CSE = \frac{Program\ Costs\ (\$)\ x\ CRF}{Annual\ Energy\ Savings\ (kWh)}$$

  - *Program Administrator Benefit Cost Ratio.* The benefit cost ratio calculation used for energy efficiency programs consists of the net present value of avoided energy and capacity cost (benefit) divided by the rebate cost plus admin cost (cost).

$$Benefit\ Cost\ Ratio = \frac{Net\ Present\ Value\ (NPV)\ Avoided\ Cost}{Rebates + Admin/Marketing\ Costs}$$

- *Reduction in Revenue Requirements (RRR).* The reduction in revenue requirements is the net reduction in utility costs from the energy saved through the presence of the DSM program offerings. RRR is calculated based on the difference of avoided energy and demand costs from the DSM impacts and the DSM program costs, as shown in the following equation:

$$RRR = Avoided\ Energy\ and\ Demand\ Costs - Program\ Costs$$

# 3 RESIDENTIAL PROGRAMS

## 3.1 SUMMARY OF RESIDENTIAL IMPACTS

CPS Energy offered the following programs for the residential sector in 2011:

- Home Efficiency
- Air Flow Performance
- HVAC
- Solar Initiative (Residential)
- New Homes Construction
- Refrigerator Recycling
- Wash Right

The following sections include a brief summary of each program and describe the methodology and the results of the impact analysis.

## 3.2 HOME EFFICIENCY PROGRAM

### 3.2.1 Overview

CPS Energy's Home Efficiency Program targets a wide range of energy efficiency measures that save cooling and heating energy in existing homes. In 2011, rebates were provided for the following list of measures:

- Attic insulation (contractor installed)
- Do-it-Yourself attic insulation
- Cool Roof
- Spray foam insulation
- Wall insulation
- Window film or solar screens

The Home Efficiency Program had 2,842 projects in 2011, including 3 projects with two eligible measures installed. This corresponds to a 3% decrease in program participation from last year. Rebates for ENERGY STAR Windows were not offered this year but there are 64 rebates paid in 2011 in which savings will be accounted for.

Figure 3-1 shows the total number of installations of each type of measure in 2011 (Note: the number of installations exceeds the number of projects due to the projects with multiple measures installed and carry over rebates paid out for ENERGY STAR Windows):

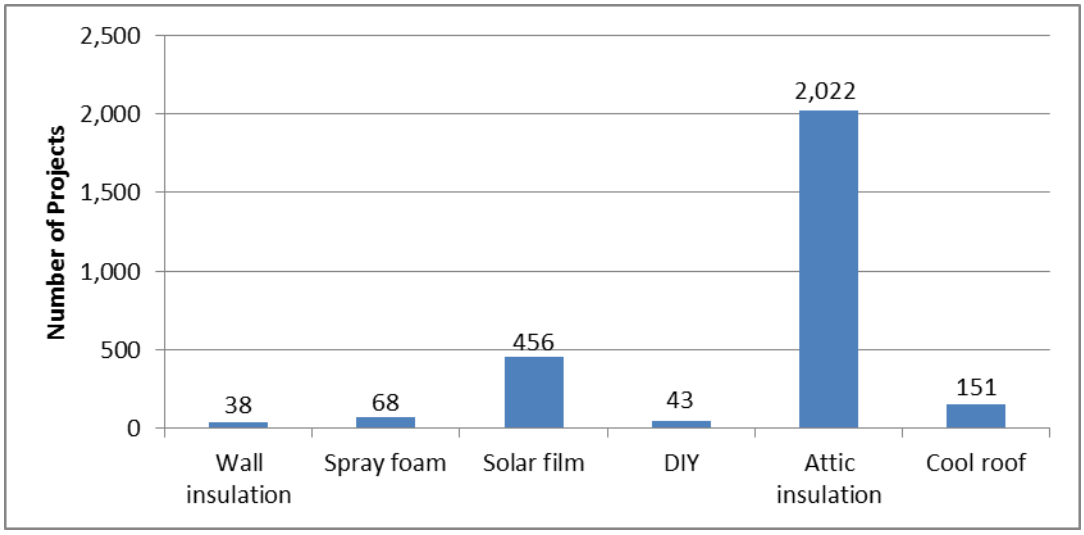


**Figure 3-1: Number of Installations of Home Efficiency Measures**

### 3.2.2 Savings Calculations

Nexant estimated the energy savings and demand savings for individual measures based both on the Texas Public Utilities Commission approved deemed values[1] and engineering calculations. For households where multiple measures had been installed, the interactive effects between measures were taken into account in order to avoid overestimating the savings. For each measure, the savings mentioned below are gross savings.

#### 3.2.2.1 Attic Insulation

Nexant used engineering calculations for energy and demand savings for the ceiling insulation measure. Texas PUC deemed savings are available for this measure, however, the deemed savings are based on the installation of R-30 ceiling insulation. Participating CPS Energy customers installed insulation up to R-60; therefore, to capture the impacts of the additional insulation beyond the deemed values, Nexant calculated the reduction in heat loss through the insulation material and took into account the size and the efficiency of the household's air conditioner. For equations used for this calculation, please refer to document '2011 CPS STEP (Save for Tomorrow Energy Plan) - RESIDENTIAL REFERENCE MANUAL' obtained from CPS Energy.

Homes with electric heating, including electric resistance heaters and heat pumps, will also realize electric savings during the heating season. Based on CPS Energy's Residential Saturation Study[2] and the Energy Information Agency's (EIA) West-South-Central Regional residential consumption data, Nexant estimated 41% of customers used electric heating in their homes.

[1] Deemed Savings, Installation & Efficiency Standards, Residential and Small Commercial Standard Offer Program and Hard to Reach Standard Offer Program, prepared by Frontier Associates, LLC, February, 2006.
[2] San Antonio 2004 Residential Appliance Saturation Study, KEMA, Inc., April 2004

The total gross energy and demand savings for 2011 attic insulation installations are as follows:

**Table 3-1: Attic Insulation Gross Energy and Demand Savings**

| Measure | Energy Savings (kWh) | Peak Demand Savings (kW) | Non-coinc. Demand Savings (kW) |
|---|---|---|---|
| Attic Insulation (contractor installed) | 1,721,686 | 242 | 516 |
| Attic Insulation (Do-it-Yourself) | 36,917 | 8 | 11 |
| **Total** | 1,758,603 | 250 | 527 |

#### 3.2.2.2 Cool Roof

Savings calculations for the residential cool roofs measure were based on online Department of Energy calculator software that evaluates cooling and heating savings for roof products (http://www.ornl.gov/sci/roofs+walls/SteepSlopeCalc/index.htm). Assumptions for the calculation were as follows:

- R-30 ceiling insulation,
- Air conditioner COP of 2.34 (equivalent to 8 EER)
- Roof reflectance and emittance were set at 43 and 79, respectively, which represent average values for metal cool roof products based on the ENERGY STAR product list[1] (based on available project data, all participating projects appear to have metal roofs)

Based on the assumptions listed above, the DOE calculator estimated 0.0738 watts per square foot of cooling savings for the roof. This average savings value was multiplied by the square footage of roof product installed to estimate the savings per home. Total energy and demand savings for this measure for 2011 projects are listed in the table below.

**Table 3-2: Residential Cool Roof Gross Energy and Demand Savings**

| Energy Savings (kWh) | Peak Demand Savings (kW) | Non-coinc. Demand Savings (kW) |
|---|---|---|
| 78,077 | 11 | 23 |

[1] http://downloads.energystar.gov/bi/qplist/roofs_prod_list.pdf

#### 3.2.2.3 ENERGY STAR Windows

The Texas PUC deemed savings for ENERGY STAR windows states that in order to qualify for the calculated deemed savings values, the windows must have a U-factor of 0.40 or less and a solar heat gain coefficient of 0.40 or less. CPS Energy no longer offers rebates for windows but are included in this report because of carryover from last year's program.

Savings impacts based on the Texas *Deemed Savings, Installation and Efficiency Standards* published by the PUC are as follows:

**Table 3-3: ENERGY STAR Windows Gross Energy and Demand Savings**

| Energy Savings (kWh) | Peak Demand Savings (kW) | Non-coinc. Demand Savings (kW) |
|---|---|---|
| 2,713 | 2 | 2 |

#### 3.2.2.4 Spray Foam Insulation

Nexant used engineering calculations for energy and demand savings for the spray foam insulation measure similar to the ceiling insulation measure. Savings are based on the reduction in heat loss through the insulation material and took into account the R-value of the installed insulation and the size and efficiency of the household's air conditioner using the same equation listed above for ceiling insulation.

The available data supported the fact that the required program insulation depths for closed cell or open cell insulation were achieved in order to provide an insulation value of R-30. Nexant also assumed an average baseline insulation value of existing insulation in the home of R-11 and a building structure insulation value of R-4.

Total energy and demand savings for 2011 projects that installed spray foam insulation are listed in the following table:

**Table 3-4: Spray Foam Insulation Gross Energy and Demand Savings**

| Energy Savings (kWh) | Peak Demand Savings (kW) | Non-coinc. Demand Savings (kW) |
|---|---|---|
| 67,216 | 9 | 20 |

#### 3.2.2.5 Wall Insulation

Wall insulation energy and demand savings were calculated using engineering calculations similar to the ceiling insulation calculation, incorporating the increase in R-value, square feet of wall area insulated, and the HVAC equipment efficiencies. For equations used for this calculation, please refer to document '2011 CPS STEP (Save for Tomorrow Energy Plan) -RESIDENTIAL REFERENCE MANUAL' obtained from CPS Energy.

The baseline wall insulation was assumed to be R-2, which would include the insulating properties of exterior and interior wall materials and the air pocket in the wall cavity. The post-installation R-value was recorded in the program database or assumed to be R-15 where absent.

The total energy and demand savings for wall insulation installations are listed in the following table:

**Table 3-5: Wall Insulation Gross Energy and Demand Savings**

| Energy Savings (kWh) | Peak Demand Savings (kW) | Non-coinc. Demand Savings (kW) |
|---|---|---|
| 123,187 | 39 | 39 |

#### 3.2.2.6 Window Film or Solar Screens

The window film and solar screen measures reduce the amount of solar radiation that enters a house through its windows, thus decreasing the load on the air conditioner in the summer. Nexant used the Texas PUC deemed savings data for Climate Zone 3 to evaluate the window film and solar screen savings. Based on the market shares of heating equipment, a weighted average of 5.03 kWh/sq ft of solar film was multiplied by the square feet of films or screen installed on each home. Deemed demand savings of 0.00159 kW/sq ft were used to calculate peak demand savings.

Total energy and demand savings for window film and solar screen installations are included in the following table:

**Table 3-6: Window Film and Solar Screen Gross Energy and Demand Savings**

| Energy Savings (kWh) | Peak Demand Savings (kW) | Non-coinc. Demand Savings (kW) |
|---|---|---|
| 346,493 | 110 | 110 |

### 3.2.3 Findings and Recommendations

The gross energy and demand savings calculated for all measures included in the Home Efficiency Program are listed in
Table 3-7 below:

**Table 3-7: Home Efficiency Gross Energy and Demand Savings**

| Measure | Energy Savings (kWh) | Peak Demand Savings (kW) | Non-coinc. Demand Savings (kW) |
|---|---|---|---|
| Attic Insulation (contractor installed) | 1,721,686 | 242 | 516 |
| Attic Insulation (Do-it-Yourself) | 36,917 | 8 | 11 |
| Cool roof | 78,077 | 11 | 23 |
| ENERGY STAR Windows (carryover from FY2011) | 2,713 | 2 | 2 |
| Spray foam | 67,216 | 9 | 20 |
| Wall insulation | 123,187 | 39 | 39 |
| Window film & solar screen | 346,493 | 110 | 110 |
| **Total** | **2,376,290** | **421** | **721** |

The following are program findings and recommendations that CPS Energy may consider for the program in the future:

- Nexant found that the Home Efficiency database is well-designed, comprehensive, and for the majority of measures, collects the appropriate data to evaluate project compliance with program rules and calculate energy and demand savings.
- For future project tracking and to enable a more precise estimation of energy savings, Nexant recommends CPS collect information for each home including the following information:
  - For cool roof measures collect specific material information and reflectivity value (from manufacturer or from ENERGY STAR products list)

## 3.3 AIR FLOW PERFORMANCE PROGRAM

### 3.3.1 Overview

CPS Energy's Air Flow Performance Program aims to improve the energy efficiency of conditioned air distribution systems by providing rebates for duct testing and duct repair/replacement. The program had 257 projects in 2011, including two repairs, eight partial replacements, and 247 total duct replacements. This corresponds to a 30% decrease in program participation from last year.

### 3.3.2 Savings Calculations

Nexant estimated the energy savings and demand savings based on the Texas Public Utilities Commission approved deemed values for Climate Zone 3.[1] The following values were applied based on the type of heating and the conditioned square footage recorded in the CPS program database for each project (with a maximum allowed savings limit of 30% of total estimated annual home energy consumption). Because demand savings are associated with summer peak, they are not influenced by heating type; thus deemed demand savings are a single value applied to all projects regardless of heating type.

- gas: 0.74378 kWh/SF
- electric: 1.80968 kWh/SF
- heat pump: 1.13027 kWh/SF
- all: 0.000486 kW/SF

### 3.3.3 Findings and Recommendations

Total energy and demand savings for duct repairs and replacements are included in the following table:

**Table 3-8: Duct Repair & Replacement Gross Energy and Demand Savings**

| Energy Savings (kWh) | Peak Demand Savings (kW) | Non-coinc. Demand Savings (kW) |
|---|---|---|
| 450,638 | 213 | 213 |

The following are program findings and recommendations that CPS Energy may consider for the program in the future:

- As there is a downward trend of participation for the program this year as compared to last year, it is recommended that marketing strategies be revisited to stimulate additional participation in this program
- Nexant recommends that the following information be collected:
  - Total system airflow, which would allow direct calculation of cooling energy savings from leakage test results to compare to deemed savings estimates.
  - Heating system capacity, which would allow direct calculation of heating energy savings for electric and heat pump systems to compare to deemed savings estimates.

[1] Deemed Savings, Installation & Efficiency Standards, Residential and Small Commercial Standard Offer Program and Hard to Reach Standard Offer Program, prepared by Frontier Associates, LLC, February, 2006.

## 3.4 HVAC PROGRAM

### 3.4.1 Overview

The residential HVAC program provides customers with rebates for the purchase of eligible central air conditioners, heat pumps and room air conditioners. Rebates for the 2011 program year were issued as a bill credit to the customer and varied depending on the size efficiency of the unit installed as follows:

- Central Air Conditioners:
  - $110/ton for 15 SEER/12.0 EER units
  - $125/ton for 16 SEER/12.5 EER units
  - $160/ton for 16 SEER/13.0 EER units
  - $225/ton for 17 SEER/13.0 EER or greater units
- Heat Pumps:
  - $110/ton for 15 SEER/12.0 EER/8.2 HSPF units
  - $125/ton for 15 SEER/12.5 EER/8.5 HSPF units
  - $160/ton for 16 SEER/12.5 EER/8.5 HSPF units
  - $225/ton for 17 SEER/12.5 EER/8.5 HSPF or greater units
- Room Air Conditioners:
  - $50 for ENERGY STAR-certified units 8,000 Btu or less
  - $100 for ENERGY STAR-certified units greater than 8,000 Btu

In 2011, a total of 12,230 residential HVAC rebates were paid to participating customers, including 3,170 central A/C rebates, 1,906 heat pump rebates, and 7,154 room air-conditioner rebates. This corresponds to a 3% decrease in program participation from last year. Figure 3-2 shows the breakdown of participating central air conditioners and heat pumps by SEER rating:

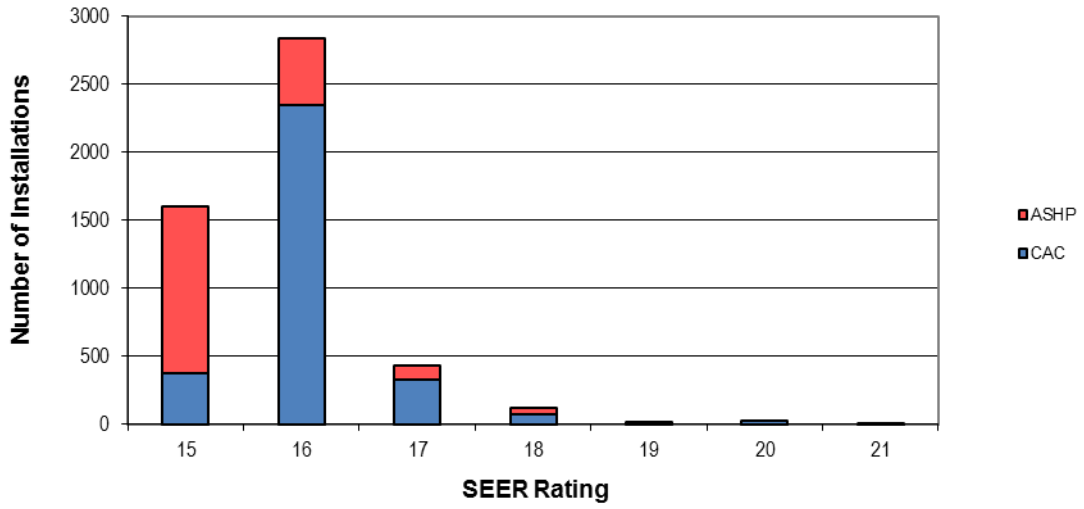


**Figure 3-2: SEER Ratings of CAC and ASHP Installations**

### 3.4.2 Savings Calculations

Nexant received program data from CPS Energy's residential HVAC database, which includes detailed information on each unit installed including: brand, model number, and serial number, and equipment size and efficiency. Energy and demand savings were calculated for each type of equipment based on the size and efficiency of the baseline and change case equipment and the following assumptions:

- Base case cooling efficiency for CAC and ASHP was assumed to be 13 SEER, which is the minimum federal efficiency standard for residential equipment. Base case heating efficiency was assumed to be 7.7 HSPF, which is also the minimum federal efficiency standard.
- Base case cooling efficiency for room air conditioners was assumed to meet the federal minimum efficiency standard based on the size and type of unit (http://www.energystar.gov/index.cfm?c=roomac.pr_crit_room_ac)
- The ENERGY STAR equipment installed was assumed to be the same size as the base case equipment.

For equations used for this calculation, please refer to document '2011 CPS STEP (Save for Tomorrow Energy Plan) -RESIDENTIAL REFERENCE MANUAL' obtained from CPS Energy.

### 3.4.3 Equipment Verification

To verify the accuracy of the efficiency data listed in the program database, Nexant randomly selected samples of 11 CAC projects, 11 HP projects, and 11 Room A/C projects to verify equipment

information and efficiency based on the brand, model number, and serial number provided. Nexant used equipment information listed in databases maintained by the Air Conditioning, Heating, and Refrigeration Institute (AHRI)[1] and the federal ENERGY STAR website[2]. The results of the equipment verification are as follows:

- 11 of 11 CAC units were verified as having the correct SEER or EER rating or better according to the AHRI directory
- 11 of 11 heat pump units (100%) were verified as having the correct SEER rating or better according to the AHRI directory
- 11 of the 11 room air conditioners were verified as having the correct EER rating according to ENERGY STAR.

No adjustments to the overall population of projects were made based on the equipment verification findings. However, Nexant did adjust the efficiency ratings for the central air conditioners found to be incorrect in the program database.

### 3.4.4 Findings and Recommendations

The gross energy and demand savings calculated for the 2011 Residential HVAC program are listed in the table below:

**Table 3-9: 2011 Residential HVAC Gross Energy and Demand Savings**

| Measure | Energy Savings (kWh) | Peak Demand Savings (kW) | Non-coinc. Demand Savings (kW) |
|---|---|---|---|
| ENERGY STAR Central AC | 4,511,215 | 1,613 | 2,017 |
| ENERGY STAR Heat Pump | 3,822,936 | 798 | 998 |
| ENERGY STAR Room AC | 1,749,116 | 626 | 782 |
| **Total** | **10,083,267** | **3,037** | **3,796** |

The following are program findings and recommendations that CPS Energy may consider for the program in the future:

- Nexant found the data collected in the program database to be accurate, comprehensive, and sufficient for assessing participation and determining program impacts.
- The program should base eligibility on both SEER and EER ratings, not one or the other.

[1] http://www.ahridirectory.org/ahridirectory/pages/home.aspx
[2] http://www.energystar.gov/index.cfm?c=roomac.pr_room_ac

- The program should also continue to verify equipment efficiencies based on industry databases, such as AHRI and ENERGY STAR, including conducting secondary reviews of a sample of projects to validate the accuracy of the data stored in the program database.

## 3.5 SOLAR INITIATIVE - RESIDENTIAL

### 3.5.1 Overview

CPS Energy's Solar Initiative provides incentives for the installation of both solar photovoltaic (PV) systems and solar water heaters. Regarding the solar PV systems, once energized, CPS Energy rebated systems must adhere to strict CPS Energy policies and cannot be disconnected or moved without CPS Energy approval. CPS Energy requires completion of an Interconnection Application & Agreement for Distributed Generation as the PV system is based on a net metering configuration.

Participation records show a total of 259 residential solar photovoltaic systems and 65 solar water heaters installed in 2011. This corresponds to an 88% increase in program participation from last year. The following sections describe Nexant's approach to evaluating the energy and demand savings provided by the Solar Initiative. All the numbers mentioned below are gross savings.

### 3.5.2 Savings Calculations

#### 3.5.2.1 Solar Photovoltaic - Residential

The energy and power produced by a photovoltaic solar array can be determined by the array rated power, the location (latitude) of the site, the tilt angle of the solar panels, and the azimuth angle. The calculation methodology is based on local weather patterns that condition the solar insolation at the installed location. The calculation methodology then adjusts the solar power captured by the array based on the tilt and azimuth angles. Various software products have been developed by the solar industry in the past decades to estimate the power and the energy produced by solar PV systems. PV Watts is a free, publicly available, online calculator, which is used by CPS Energy in determining project impacts and was used by Nexant to verify the recorded savings estimates in the CPS database.

Rebates are calculated based on number of modules multiplied by PTC rating (per http://www.gosolarcalifornia.ca.gov/equipment/pv_modules.php) multiplied by inverter efficiency (per http://www.gosolarcalifornia.ca.gov/equipment/inverters.php) multiplied by rebate amount per associated Tier rating.

#### 3.5.2.2 Solar Water Heaters - Residential

CPS Energy's records show completion of 65 solar hot water projects in 2011 program year. The energy and demand savings provided by a solar hot water system can be determined by the system size, tilt, and azimuth angle. The Texas A&M University Energy Systems Laboratory's eCalc software (Energy and Emissions Calculator) is based on a DOE-2 building energy simulation platform and has a comprehensive weather patterns database for all counties in Texas.

For this M&V review, system size and angles were not included in the summary database Nexant received. Consequently, Nexant was unable to verify the stated savings in the summary file. However, Nexant considers the aforementioned eCalc software an acceptable method of estimating savings and has therefore used these savings provided by CPS.

Rebates are calculated based on Solar Rating and Certification Corporation (SRCC) rating multiplied by stipulated rebate amount. SRCC ratings can be found at www.solar-rating.org/ratings/ratings.htm

### 3.5.3 Findings and Recommendations

The gross energy and demand savings for the Solar Initiative program are listed in the table below:

**Table 3-10: Solar Initiative Gross Energy and Demand Savings**

| Measure | Energy Savings (kWh) | Peak Demand Savings (kW) | Non-coinc. Demand Savings (kW) |
|---|---|---|---|
| Residential Solar PV | 2,181,256 | 1,412 | 1,412 |
| Solar Water Heaters | 161,642 | 48 | 48 |
| **Total** | **2,342,898** | **1,461** | **1,461** |

For future project tracking, Nexant recommends CPS collect information from customers who install solar hot water systems on their existing water heater (type and efficiency).

## 3.6 NEW HOMES CONSTRUCTION

### 3.6.1 Overview

In 2011, CPS offered incentives to builders and contractors for new construction projects that exceed City of San Antonio building codes (IECC 2009) by 15% or more. CPS Energy collaborated with Build San Antonio Green to provide consistent approach to incentivizing new construction. The program provides different incentive levels based on the building's performance above code. The incentive tiers are as follows:

Using ENERGY STAR®:

- ENERGY STAR® compliant (HERS rating of 75 to 58) = $800 per structure
- ENERGY STAR® compliant (HERS rating of 57 or less) = $1,500 per structure

Using other testing methods:

- Other methods under (2009 IECC) energy codes at (15% to 30% above code) = $800 per structure

- Other methods under (2009 IECC) energy codes at (31% or greater above code) = $1,500 per structure

### 3.6.2 Savings Calculations

CPS Energy provided Nexant with a listing of 1,314 ENERGY STAR® compliant homes receiving a 2011 CPS Incentive for Builders and Contractors for New Constructions. This corresponds to a 94% increase in program participation from last year. To estimate annual energy savings (kWh) for a participating new home, Nexant applied HERS rating data supplied by builders and multiplied the savings by the average annual consumption of a typical home in Texas provided by Energy Information Administration 2005 Survey[1.]

Based on an impact evaluation study conducted by Nexant in 2009 for a utility company with a similar New Homes Construction program, deemed savings of 1.1 kW was used to calculate peak demand savings.

### 3.6.3 Findings and Recommendations

The gross energy and demand savings for the New Homes Construction program are listed in the table below:

**Table 3-11: New Homes Construction Gross Energy and Demand Savings**

| Gross Energy Savings (kWh) | Peak Demand Savings (kW) | Non-coinc. Demand Savings (kW) |
|---|---|---|
| 6,361,699 | 1,445 | 2,978 |

For future project tracking and to enable a more precise estimation of energy savings, Nexant recommends CPS collect information for each home including the following information:

- ENERGY STAR® HERS rating
- Annual energy consumption (kWh) of designed home
- Annual energy consumption of baseline home
- REMRate file as provided by certified HERS rater

## 3.7 REFRIGERATOR RECYCLING

### 3.7.1 Overview

CPS Energy began a refrigerator and freezer recycling program in 2010 with the intent of removing old refrigerators and freezers from the electric grid and incentivizing purchases of new ENERGY STAR units over new standard efficiency units. In 2011, customers were offered a $65 rebate for recycling their appliance and offered an additional $35 rebate if an ENERGY STAR certified unit was purchased to replace the old unit. CPS Energy's subcontractor, Appliance Recycling Centers of

[1] *2005 Energy Consumption Survey*, Energy Information Administration, 2008.

America, Inc. (ARCA), was responsible for picking up and recycling appliances. ARCA records each appliance pick-up in a database and recycles the appliance in an environmentally responsible manner.

In 2011, a total of 1,799 units were recycled by CPS customers and a total of 1,675 new ENERGY STAR units were purchased.

### 3.7.2 Savings Calculations

For new ENERGY STAR purchases, the savings calculations are based on ENERGY STAR Calculator and the difference between energy consumption of a new ENERGY STAR unit and a new standard efficiency unit.

For recycling an existing refrigerator or freezer, estimated annual energy savings are based on the removed appliance's Unit Energy Consumption (UEC), or annual energy consumption. For this evaluation, average UEC values were calculated using a regression equation developed for the California Public Utilities Commission[1]. Using Equation 1 and averaged values from the database, such as age and size, the average refrigerator UEC was calculated.

Equation 1

$$UEC = (Intercept) - (A_1)(\%Single\ Door\ Configuration) + (A_2)(\%\ Side - by - Side\ Configuration) + (A_3)(Average\ Age) + (A_4)(\%\ Primary\ Appliance) + (A_5)(Household\ Occupants) + (A_6)(Climate\ Variable)$$

*Where:*

| Coefficient | Value | T-value |
|---|---|---|
| | | |
| A1 | -629.71 | -3.2 |
| A2 | 435.71 | 6 |
| A3 | 25.88 | 5.4 |
| A4 | 256.47 | 3.4 |
| A5 | 71.15 | 2.8 |
| A6 | 225.77 | 3.2 |

| Variable | CPS Average |
|---|---|
| Intercept | 165.7 |
| % Single Door Configuration | 0.0112 |
| % Side-by-Side Configuration | 0.2884 |
| Average Age (Years) | 17.504 |
| % Primary Appliance | 0.0494 |
| Household Occupants | 2.74 |
| Climate Variable | 0.268 |

Once the average refrigerator UEC was established, the average freezer UEC needed to be calculated. This regression equation does not apply to freezers. Therefore, a ratio of refrigerator to freezer UEC values, from other similar studies, was calculated and multiplied by the calculated refrigerator UEC to determine the average freezer UEC using Equation 2:

[1] Residential Retrofit High Impact Measure Evaluation Report, The Cadmus Group, Inc. February 2010

Equation 2

$$Freezer\ UEC = Refrigerator\ UEC \times UEC\ Ratio$$

*Where:*

Freezer UEC = Average UEC for all freezers in database
Refrigerator UEC = Average UEC for refrigerators calculated with Equation 1
UEC Ratio = Ratio of refrigerator to freezer UECs from similar studies

The average refrigerator and freezer UECs are then multiplied by the corresponding number of recycled appliances and the part-use factor using Equation 3. The part-use factor accounts for the small percentage of appliances that do not run for the entire year, and adjusts the gross savings accordingly. For this evaluation, the part-use factor is a deemed value from a similar evaluation[1].

Equation 3

$$Gross\ Savings = [(Refrigerator\ UEC \times RR) + (Freezer\ UEC \times FR)] \times U$$

*Where:*

RR = Number of refrigerators recycled
RF = Number of freezers recycled
U = Part-use factor

#### 3.7.2.1 Demand Savings

Demand savings for appliance recycling programs are simply the sum of the kW for all removed appliances. Per unit demand savings are calculated using Equation 4:

Equation 4

$$Demand = UEC_{Gross} \div Operating\ Hours$$

Where:

Demand = Per unit demand reduction
$UEC_{Gross}$ = Gross unit UEC (refrigerator 1007, freezer 930)
Operating Hours = Annual operating hours (8,760)

### 3.7.3 Findings and Recommendations

The savings calculated for the appliance recycling program are listed in the table below:

[1] Process and Impact Evaluation of Georgia Power Company's Refrigerator and Freezer Recycling Pilot Program, Nexant, Inc. March 2011

**Table 3-12: Refrigerator Program Gross Energy and Demand Savings**

| | Gross Energy Savings (kWh) | Peak Demand Savings (kW) | Non-coinc. Demand Savings (kW) |
|---|---|---|---|
| Recycled Refrigerator/Freezer | 1,687,883 | 154 | 193 |
| Purchased ENERGY STAR | 177,550 | 18 | 22 |
| **Total** | **1,865,433** | **172** | **215** |

The following are program findings and recommendations that CPS Energy may consider for the program in the future:

- Record all model numbers: Recording appliance model numbers will assist in future evaluations.
- Perform *In-Situ* metering: CPS Energy should consider performing in-situ metering tests either as part of in-program on-going Measurement & Verification activities, a separate market research study or as part of the next full evaluation.
- Conduct customer surveys: Conducting surveys with customer at the time of appliance pick-up provides insight into program effectiveness and queries customers when they are most familiar with their participation in the program. Survey questions could include:

1. How did you hear about the Refrigerator and Freezer Recycling Program?
    a. Provide a list of current marketing channels.
2. People participate in the program for different reasons. Please tell me whether each of the following aspects of the program influenced your decision to participate.
    a. Rebate paid for participating
    b. Free pick-up
    c. Simple one call procedure
    d. Electricity savings
    e. Help the environment by recycling
    f. Recommendation from friend or family
    g. Recommendation from appliance retailer/dealer
    h. Unaware of other options
    i. Other (*Specify*:_____)
3. (If respondent chose more than one answer in Question 2) Of the above reasons, what was the most important reason for participating?
    a. Rebate paid for participating
    b. Free pick-up

c. Simple one call procedure
d. Electricity savings
e. Help the environment by recycling
f. Recommendation from friend or family
g. Recommendation from appliance retailer/dealer
h. Unaware of other options
i. Other (*Specify*:_____)

4. Do you plan to replace the refrigerator(s) or freezer(s) with another one?

a. Yes, a new model
b. Yes, a used model
c. No, not replacing
d. Don't know

5. Will the replacement unit be an ENERGY STAR unit?

a. Yes
b. No
c. Don't Know

6. Had you **planned** to dispose of, or recycle your refrigerator before you found out about the program? By planned I mean you had collected information, selected equipment or otherwise begun the process of replacement.

a. Yes
b. No
c. Don't Know

7. How had you planned to dispose of the unit?

a. Sell the unit
b. Given the unit away
c. Thrown the unit away
d. Hired someone to remove the unit
e. Taken unit to a recycling center
f. Left the unit in the house when you moved
g. Have appliance retailer pick up the unit
h. Don't know

8. If the unit had not been picked up, and you were not planning on disposing of it, what were you planning to do with it?

a. Keep the unit plugged in and in use
b. Kept the unit stored and unplugged
c. Do not know if unit would have been used or stored
d. How many months out of the last 12 months was the refrigerator or freezer running?
e. Record # of Months:_____

f. Don't know

9. During the years that you would have kept the unit, about how many months of the year would it have been plugged in and running?

   a. Record # of Months:_____

## 3.8 WASH RIGHT

### 3.8.1 Overview

CPS Energy did not extend rebates for the Wash Right program in program year 2011 but there are 178 rebates paid out in which savings will be accounted for. CPS Energy's Wash Right program was a collaborative energy efficiency program with San Antonio Water System (SAWS) and Bexar Metropolitan Water District (BexarMet). The program is designed to achieve energy and demand savings as well as reduce residential water consumption through the use of high efficiency clothes washers. CPS Energy provides a direct customer rebate of $75 for the purchase of an eligible unit[1].

### 3.8.2 Savings Calculations

CPS Energy provided Nexant with customer and equipment information for 178 clothes washers that received a 2011 CPS Energy Wash Right rebate.

To estimate annual energy savings, Nexant used data available in the on-line federal ENERGY STAR® calculator[2] as well as results from CPS Energy's 2009 Residential Appliance Study[3] to develop a deemed savings estimate for participating clothes washers as follows:

- Using baseline and average efficiency ratings for eligible clothes washers, the following deemed savings values were calculated for a variety of combinations of water heating and clothes drying equipment as well as homeowners' clothes drying habits:

**Table 3-13: Wash Right Clothes Washer Deemed Savings**

| Deemed Savings Category | | | Baseline Equip. kWh/yr | Eligible Equip. kWh/yr | Savings kWh/yr |
|---|---|---|---|---|---|
| Electric Water Heater | Electric Dryer | Use clothes dryer for all loads | 787 | 556 | 231 |
| | | Use dryer for some loads | 560 | 373 | 187 |
| | | Use dryer infrequently | 378 | 226 | 152 |
| | Gas Dryer | Use clothes dryer for all loads | 333 | 190 | 143 |
| | | Use dryer for some loads | 333 | 190 | 143 |
| | | Use dryer infrequently | 333 | 190 | 143 |

[1] Eligible clothes washers must meet Consortium for Energy Efficiency's Tier 3 eligibility criteria: http://www.cee1.org/resid/seha/rwsh/rwsh-prod.pdf

[2] http://www.energystar.gov/ia/business/bulk_purchasing/bpsavings_calc/CalculatorConsumerClothesWasher.xls

[3] *CPS Energy Residential Appliance Study*, Palm Market Research, Inc., February 2010.

| Deemed Savings Category | | | Baseline Equip. kWh/yr | Eligible Equip. kWh/yr | Savings kWh/yr |
|---|---|---|---|---|---|
| Gas Water Heater | Electric Dryer | Use clothes dryer for all loads | 487 | 385 | 102 |
| | | Use dryer for some loads | 284 | 221 | 63 |
| | | Use dryer infrequently | 121 | 89 | 32 |
| | Gas Dryer | Use clothes dryer for all loads | 81 | 56 | 24 |
| | | Use dryer for some loads | 81 | 56 | 24 |
| | | Use dryer infrequently | 81 | 56 | 24 |

Based on equipment saturations and homeowner's reported clothes drying habits from CPS Energy's Residential Appliance Study, the weighted deemed savings is calculated to be 144 kWh per unit.

### 3.8.3 Findings and Recommendations

The gross energy and demand savings calculated for the Wash Right program carryover are listed in the table below:

**Table 3-14: Wash Right Program Gross Energy and Demand Savings**

| Energy Savings (kWh) | Peak Demand Savings (kW) | Non-coinc. Demand Savings (kW) |
|---|---|---|
| 25,632 | 11 | 43 |

# 4 NON-RESIDENTIAL PROGRAMS

## 4.1 SUMMARY OF NON-RESIDENTIAL IMPACTS

The non-residential sector included the following program offerings in 2011:

- Lighting
- HVAC
- Solar Initiative (Commercial)
- Cool Roofs
- Restaurant Equipment
- Lean Clean Energy
- New Construction
- Custom

The following sections include a brief summary of each program and describe the methodology and the results of the impact analysis.

## 4.2 LIGHTING PROGRAM

### 4.2.1 Overview

The Lighting Program offers incentives to customers who install efficient lighting in their facilities. Incentives are offered for building improvement and retrofit projects. In 2011, this program was open to all businesses, regardless of the size of the retrofit.

Energy and demand savings are calculated for retrofit projects using pre-retrofit conditions as a baseline.

In 2011, a total of 302 commercial lighting projects received funding through the program. This corresponds to a 81% increase in program participation from 2010.

### 4.2.2 Savings Calculations

Nexant gathered available program data from the CPS Energy commercial program database and hard copies of project data including customer applications with fixture information for each lighting project. Site inspections were conducted on a sample of projects to verify energy savings and operating hours. Fixture information including wattages for lamp/ballast combinations was verified during the on-site inspection. Peak demand coincidence factors, or the percentage of the facility demand that occurs during the peak period, was estimated for each project based on the facility type. The estimated annual hours of operation were verified during the site inspection. Table 4-1 highlights the coincidence factors used in the savings calculation methodology for each building type.

**Table 4-1: Coincidence factor and Operating Hours for Building Types**

| Building Type | Description | Coincidence Factor |
|---|---|---|
| Office | Office buildings and other commercial properties in operation during normal business hours | 78% |
| Retail | Retail facilities, including restaurants | 94% |
| Warehouse | Warehouse and storage facilities | 96% |
| Major Healthcare | Hospitals and in-patient health clinics | 84% |
| 24 Hour Facilities | Any facility that operates 24 hours/day or has high occupancy during peak hours | 94% |
| K-12 Schools | Primary education facilities | 73% |
| Colleges & Universities | Secondary education facilities. | 71% |
| Assembly | Conference facilities and public gathering spaces | 89% |
| Hotel | Lodging facilities | 51% |

Retrofit project energy and peak demand savings were calculated based on the difference in lighting wattages between the baseline fixtures and the newly installed fixtures using the following formulas for each fixture type:

$$kW\ savings = (FixtureWattage_{base} - FixtureWattage_{post})\ x\ N_{fixtures}\ x\ \frac{1kW}{1{,}000\ watts}$$

$$Peak\ kW\ savings = kW\ savings \times CF$$

$$kWh\ savings = kW\ savings \times Annual\ Operating\ Hours$$

Where:

$FixtureWattage_{base}$ = Fixture wattage from standard wattage table for pre-retrofit fixture

$FixtureWattage_{post}$ = Fixture wattage from standard wattage table for post-retrofit fixture

$N_{fixtures}$ = Number of fixtures

$CF$ = Deemed coincident demand factor based on building type.

$Annual\ Operating\ Hours$ = Deemed annual operating hours for the affected space.

The energy and demand savings for each fixture type included in the project was summed to determine the total facility savings.

To capture the reduction in HVAC load from the energy efficient fixtures, an additional 10% demand savings and 5% energy savings for interactive effects were attributed to projects where the retrofit occurred in conditioned spaces.

### 4.2.3 Findings and Recommendations

The gross energy and demand savings calculated for the commercial lighting program are listed in Table 4-2 below:

**Table 4-2: Commercial Lighting Gross Energy and Demand Savings**

| Program | Energy Savings (kWh) | Peak Demand Savings (kW) | Non-coinc. Demand Savings (kW) |
|---|---|---|---|
| Lighting | 46,673,517 | 8,124 | 9,112 |

The following are program findings and recommendations that CPS Energy may consider for the program in the future:

- Create and utilize a standardized fixture wattage lookup table and standardized customer-input friendly lighting spreadsheets/database.
- Require customer submittal to include room-by-room or floor-by floor fixture counts to optimize the inspection and verification process.
- Include interactive HVAC effects in savings calculations
- Track the facility type for each project, and use deemed operational hours and coincidence factors based on facility type

## 4.3 HVAC PROGRAM

### 4.3.1 Overview

The HVAC program offers incentives for the installation of high efficiency unitary AC equipment, heat pumps and chillers. Two tiers of efficiency were established for the 2011 program year for each equipment size and category. Rebates are paid at the following amounts, where the Step 1 and 2 efficiency thresholds vary by equipment type and are included in the HVAC rebate matrix provided on the CPS website:

- $65/ton for Step 1
- $150/ton for Step 2

In 2011, a total of 124 facilities received funding through the program. This corresponds to a 5% decrease in program participation from 2009.

### 4.3.2 Savings Calculations

Nexant gathered available data from the commercial program database and hard copies of each project for retrofit projects. All the data was subsequently input into the standardized HVAC spreadsheets, which included standard baseline COP/IPLV values for each equipment size, type, and category. Baseline equipment efficiencies for Retrofit projects were assumed to be the ASHRAE 90.1-1999. The following equations were used to calculate HVAC program savings:

**Unitary AC Equipment**

$$kW\ savings = Capacity \times CF \times Conversion\ \ Factor \times (\frac{1}{EER_{pre}} - \frac{1}{EER_{post}})$$

$$kWh\ savings_{AC} = Capacity \times Conversion\ \ Factor \times EFLH_C \times (\frac{1}{IPLV_{pre}} - \frac{1}{IPLV_{post}})$$

$$EFLH_C = A \times (CDD^{b+1})$$

where:

$Capacity =$ Rated equipment cooling capacity, Btu/hr

$CF =$ Deemed coincident demand factor based on building type.

$Conversion\ Factor$ = 1 kW / 1000 Watt

$EFLH_C =$ Equivalent full load hours for cooling.

$CDD =$ Cooling degree days.

$EER_{pre} =$ Efficiency of the existing cooling equipment. ASHRAE 90.1-1999 standard

$EER_{post} =$ Efficiency of the new cooling equipment

$IPLV_{pre} =$ Integrated part load value of the existing cooling equipment. ASHRAE 90.1-1999 standard

$IPLV_{post} =$ Integrated part load value of the new cooling equipment

**Chillers**

$$kW\ savings = Capacity \times CF \times Conversion\ Factor \times (\frac{1}{COP_{pre}} - \frac{1}{COP_{post}})$$

$$kWh\ savings = Capacity \times EFLH_C \times Conversion\ Factor \times (\frac{1}{IPLV_{pre}} - \frac{1}{IPLV_{post}})$$

$$EFLH_C = A \times (CDD^{b+1})$$

where:

$Capacity =$ Rated equipment cooling capacity, ton

$ConversionFactor =$ 3.517 kW / ton

$CDD =$ Cooling degree days

$CF =$ Deemed coincident demand factor based on building type.

$EFLH_C =$ Equivalent full load hours, regression of $EFLH_C$ for various facility types was developed from DEER savings data. See for coefficients A and b.

$COP_{pre} =$ Efficiency of the existing cooling equipment ASHRAE 90.1-1999 standard

$COP_{post} =$ Efficiency of the new cooling equipment

$IPLV_{pre} =$ Integrated part load value of the existing cooling equipment ASHRAE 90.1-1999 standard

$IPLV_{post} =$ Integrated part load value of the new cooling equipment

**Table 4-3: Coincidence factor and Coefficients for Building Types**

| Building Type | A | b | CF |
|---|---|---|---|
| Education - Community College | 327.8300 | -0.8835 | 0.71 |
| Education - Secondary School | 240.9800 | -0.9174 | 0.73 |
| Education - University | 512.1100 | -0.9148 | 0.71 |
| Health/Medical - Clinic | 313.5400 | -0.8437 | 0.84 |
| Health/Medical - Hospital | 730.7600 | -0.8836 | 0.84 |
| Lodging | 589.6100 | -0.8750 | 0.51 |
| Office | 657.9100 | -0.9437 | 0.78 |
| Retail | 404.0000 | -0.8645 | 0.94 |

### 4.3.3 Findings and Recommendations

The gross energy and demand savings calculated for the Commercial HVAC program are listed in the following table:

**Table 4-4: Commercial HVAC Gross Energy and Demand Savings**

| Energy Savings (kWh) | Peak Demand Savings (kW) | Non-coinc. Demand Savings (kW) |
|---|---|---|
| 4,279,961 | 1,418 | 1,717 |

The following are program findings and recommendations that CPS Energy may consider for the program in the future:

- Calculate demand savings using full-load COP only. Using integrated part-load values (IPLVs) to calculate peak demand savings results in an under-estimation since the IPLV represents the average power consumption over time accounting for the reduction in demand seen at part load conditions.
- Track the facility type for each project, and use deemed operational hours and coincidence factors based on facility type

- Avoid rounding COPs and IPLVs to 0 or 1 decimal place, which can result in rebate overpayment.

## 4.4 SOLAR INITIATIVE - COMMERICAL

### 4.4.1 Overview

CPS Energy's Solar Initiative provides incentives for the installation of solar photovoltaic (PV) systems. Regarding the solar PV systems, once energized, CPS Energy rebated systems must adhere to strict CPS Energy policies and cannot be disconnected or moved without CPS Energy approval. CPS Energy requires completion of an Interconnection Application & Agreement for Distributed Generation as the PV system is based on a net metering configuration.

Participation records show a total of 50 commercial solar photovoltaic systems installed in 2011. The following sections describe Nexant's approach to evaluating the energy and demand savings provided by the Solar Initiative. All the numbers mentioned below are gross savings.

### 4.4.2 Savings Calculations

#### 4.4.2.1 Solar Photovoltaic - Commercial

The energy and power produced by a photovoltaic solar array can be determined by the array rated power, the location (latitude) of the site, the tilt angle of the solar panels, and the azimuth angle. The calculation methodology is based on local weather patterns that condition the solar insolation at the installed location. The calculation methodology then adjusts the solar power captured by the array based on the tilt and azimuth angles. Various software products have been developed by the solar industry in the past decades to estimate the power and the energy produced by solar PV systems. PV Watts is a free, publicly available, online calculator, which is used by CPS Energy in determining project impacts and was used by Nexant to verify the recorded savings estimates in the CPS database.

Rebates are calculated based on number of modules multiplied by PTC rating (per http://www.gosolarcalifornia.ca.gov/equipment/pv_modules.php) multiplied by inverter efficiency (per http://www.gosolarcalifornia.ca.gov/equipment/inverters.php) multiplied by rebate amount per associated Tier rating.

### 4.4.3 Findings and Recommendations

The gross energy and demand savings for the Solar Initiative program are listed in the table below:

**Table 4-5: Solar Initiative Gross Energy and Demand Savings**

| Measure | Energy Savings (kWh) | Peak Demand Savings (kW) | Non-coinc. Demand Savings (kW) |
|---|---|---|---|
| Commercial Solar PV | 2,498,757 | 1,636 | 1,636 |

For future project tracking, Nexant recommends CPS collect information from customers who install solar hot water systems on their existing water heater (type and efficiency).

## 4.5 COOL ROOF INSTALLATIONS

### 4.5.1 Overview

In 2011, CPS Energy offered incentives for cool roof installations. Rebate was $0.10/sq ft. There was a total of 24 roofing projects.

### 4.5.2 Savings Calculations

The following sections described the savings calculation methods for the cool roof program.

#### 4.5.2.1 Roof Savings

Roof Savings were calculated as illustrated below

Algorithms:

kWh Cool Roof Savings(cooling) = Roof Area x Cool Roof Savings x EFLCH x (1/1000))

kW Cool Roof Savings (cooling) = kWh Savings (cooling) x Cool Roof Ratio

Variables:

| | |
|---|---|
| Area Measure Area | Area of the cool roof, in $ft^2$ (application input) |
| Cool Roof Savings | 0.0738 $W/ft^2$ (Source: DOE calculator http://www.ornl.gov/sci/roofs+walls/SteepSlopeCalc/index.htm ) |
| EFLCH | 2237 Equivalent Full Load Cooling Hours for San Antonio (Source: ENERGY STAR Savings Calculator http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=EP ) |
| Cool Roof Ratio (kW/kWh) | 0.000138 (Source: Nexant's proprietary model performed for 2008 CPS Demand Side Management Potential Study) |

### 4.5.3 Findings and Recommendations

The gross energy and demand savings calculated for the Roof Coating is listed in the table below:

**Table 4-6: Commercial Roof Coating Gross Energy and Demand Savings**

| Measure | Energy Savings (kWh) | Peak Demand Savings (kW) | Non-coinc. Demand Savings (kW) |
|---|---|---|---|
| Roof Coatings | 103,969 | 11 | 14 |

The following are program findings and recommendations that CPS Energy may consider for the program in the future:

- Collect and track the following project information:
  - Building Type
  - HVAC equipment type, age, size (tons) for both cooling and heating

## 4.6 COMMERCIAL RESTAURANT EQUIPMENT PROGRAM

### 4.6.1 Overview

The Restaurant Equipment program was a new offering in 2010 and offers incentives for the installation of high efficiency commercial refrigeration equipment, including refrigerators, freezers, and ice makers. The level of incentive offered depends on the type of equipment and its efficiency rating (EnergyStar or CEE Tier).

In 2011, a total of 3 projects received funding through the program.

### 4.6.2 Savings Calculations

Nexant based savings calculation for this program on outputs from the EnergyStar Commercial Kitchen Equipment Calculator[1]. Nexant gathered information from the rebate application forms and additional submitted materials to determine the most appropriate inputs to the calculator. Required information includes the type and size of equipment.

### 4.6.3 Findings and Recommendations

The gross energy and demand savings calculated for the Commercial Restaurant Equipment program are listed in the following table:

[1] EnergyStar Commercial Kitchen Equipment Calculator: http://www.energystar.gov/ia/business/bulk_purchasing/bpsavings_calc/commercial_kitchen_equipment_calculator.xls

**Table 4-7: Commercial Restaurant Equipment Gross Energy and Demand Savings**

| Energy Savings (kWh) | Peak Demand Savings (kW) | Non-coinc. Demand Savings (kW) |
|---|---|---|
| 1,991 | 0 | 0 |

The following are program findings and recommendations that CPS Energy may consider for the program in the future:

- Require submission of equipment spec sheet to ensure EnergyStar rating

## 4.7 LEAN CLEAN ENERGY PROGRAM

### 4.7.1 Overview

The Lean Clean Energy program (LCE) provides diagnostic training and facility assessment opportunities for industrial facilities. In some cases, energy efficiency measures were identified through LCE that were eligible for STEP rebates. The savings from these measures were included in the savings totals for the appropriate non-residential program in which they participated and are not individually classified in this report. In the case of the participating facility, a portion of the installed measures were not rebated through any other commercial program. The savings from measures installed at this facility is described in the following sections.

### 4.7.2 Savings Calculations

Nexant performed a review of the facility that received a rebate through the LCE program. The savings calculation for each measure was reviewed for correctness, consistency, and conformity with industry-standard guidelines. In some cases, savings numbers were revised either up or down.

### 4.7.3 Findings and Recommendations

The gross energy and demand savings calculated for the Lean Clean Energy program are listed in the table below:

Table 4-8: Lean Clean Energy Program Gross Energy and Demand Savings

| Energy Savings (kWh) | Peak Demand Savings (kW) | Non-coinc. Demand Savings (kW) |
|---|---|---|
| 424,856 | 20 | 23 |

The following are program findings and recommendations that CPS Energy may consider for the program in the future:

- Conduct internal review of savings calculations including possible pre- and post data logging prior to paying rebates

## 4.8 NEW CONSTRUCTION PROGRAM

### 4.8.1 Overview

In 2011, CPS offered a New Commercial Construction incentive to for new construction projects that exceeded City of San Antonio building codes (IECC 2009) by 15% or more. The program provides different incentive levels based on the building's performance above code. The incentive levels are as follows:

**Table 4-9 Commercial New Construction Incentives**

| | Energy Incentive | Peak Demand Incentive | Percentage Savings Above Code |
|---|---|---|---|
| Tier 1 | $0.08/kWh | $125/kW | 15% - 24.9% |
| Tier 2 | $0.12/kWh | $150/kW | 25% - 34.9% |
| Tier 3 | $0.20/kWh | $200/kW | 35% or greater |

In 2011 there were no applications submitted through the Commercial New Construction program.

### 4.8.2 Findings and Recommendations

The gross energy and demand savings calculated for the New Construction program are listed in the table below:

**Table 4-10: Commercial New Construction Savings**

| Energy Savings (kWh) | Peak Demand Savings (kW) | Non-coinc. Demand Savings (kW) |
|---|---|---|
| 0 | 0 | 0 |

Nexant recommends CPS Energy facilitate or work closely with the city of San Antonio to develop code compliance training sessions to provide clear and concise information in which interested parties can develop work plans for facilities in which meet IECC 2009 minimum code compliance.

For future project tracking and to enable a more precise estimation of energy savings, Nexant recommends CPS to collect the following information from the applicant:

- Customer to contact CPS Energy prior to application submittal to identify specific unique information to be gathered by customer for application submittal
- Electronic energy model files for both the baseline case and proposed case

- Summary of energy model input information (spreadsheet to be provided to customer by CPS Energy)
- Summary of facility information to include information such as facility type, total square footage, occupancy schedules, equipment schedules
- Project construction drawings in electronic format

## 4.9 CUSTOM PROGRAM

### 4.9.1 Overview

In 2011, CPS Energy offered incentives for custom commercial measures:

- Custom – rebate of $0.08/kWh and $200/kW saved

There were a total of 7 custom projects receiving rebates in 2011 including projects such as window film (prior commitment made by CPS Energy), fan wall HVAC equipment and anti-sweat heater controllers.

### 4.9.2 Savings Calculations

Savings for custom projects were reviewed individually. The savings calculation submitted by the customer was reviewed and adjusted as deemed appropriate by Nexant.

The following table summarizes the custom rebate projects submitted in 2011.

| Ctrl # | Project Description |
|---|---|
| 97 | AT&T Fan Wall |
| 344 | AT&T Window Film |
| 389 | HEB SA3 |
| 390 | HEB SA5 |
| 391 | HEB SA13 |
| 392 | HEB SA 15 |
| 393 | HEB SA 18 |

### 4.9.3 Findings and Recommendations

The gross energy and demand savings calculated for the Custom Program are listed in the table below:

Table 4-11: Commercial Custom Gross Energy and Demand Savings

| Energy Savings (kWh) | Peak Demand Savings (kW) | Non-coinc. Demand Savings (kW) |
|---|---|---|
| 938,430 | 28 | 36 |

The following are program findings and recommendations that CPS Energy may consider for this program in the future:

- Require submission of more vigorous backup calculation of savings. Back of the envelope type calculations should not be permitted
- In instances where the estimated savings are significant and the proposed measure is complex, consider the requirement of pre- and post-inspections with possible data logging

## 4.10 INSPECTION METHODOLOGY

As part of the measurement and verification process for commercial projects, Nexant randomly selected the following projects for inspection.

**Table 4-12: Initial Random Sample for Inspection**

| Category | Customer Name |
|---|---|
| Lighting | Vickery & Associates |
| | HEB Grocery |
| | Oak Farms San Antonio |
| | Stage |
| | Suburban School |
| | Altex, Inc |
| | Century San Antonio Op Association |
| | Jehovah's Witness Assembly Hall |
| | USAA |
| | St. Andrew Lutheran Church |
| | City of San Antonio – Woodlawn Gym |
| | City of San Antonio – Oimos Park |
| | Polymer Logistics |
| | Andy Food Service |
| | Danbury Aerospace |
| | The Dominion Country Club |
| HVAC | South Park Mall |
| | Ross |
| | Temple Inland |
| | Holts Mechanical LTD |
| | Walgreen Co #3734 |
| | Walgreen Co |
| | Walgreen Co #3634 |
| | Walgreen Co #3804 |
| | YMCA of San Antonio |
| | Alamo Restaurants |
| | Petco Animal Supply Stores |
| | Walmart |
| | Office Depot |
| HVAC (Chiller) | University of the Incarnate Word |
| | Texas Center for Infectious Diseases |
| | Lillibridge Healthcare Trust |
| | City of San Antonio |
| | Northside ISD – Adams Hill Elem |
| | Northside ISD – Sul Ross Middle |
| | Northside ISD – Linton Elem |
| | Edgewood ISD |

All the selected sites were inspected for reported measures. All projects were inspected to verify that the site conditions matched the post-retrofit conditions as stated in the customer submittal.

Within each program, projects for inspection were selected randomly. A secondary check was performed to ensure that the variation of project sizes within the sample roughly matched the variation of project sizes within the entire population.

The table below shows the total number of inspected projects within each program. The number of inspections to be conducted was determined based on the program's total number of participants, in order to achieve 80% confidence and 20% precision within each program, assuming a coefficient of variation of 0.5. The coefficient of variation is a measure of variance in the parameter being investigated and is defined as the standard deviation of the particular value being divided by the mean.

**Table 4-13: Inspected Sample**

| Program | Number of Program Participants | Number of Inspected Projects |
|---|---|---|
| Lighting | 302 | 16 |
| HVAC - Unitary Equipment | 92 | 13 |
| HVAC Chillers | 32 | 8 |
| Roof Coatings | 1 | 1 |

# 5 DEMAND RESPONSE PROGRAMS

## 5.1 SUMMARY OF DEMAND RESPONSE IMPACTS

CPS Energy offered the following programs for demand response in 2011:

- Residential Peak Saver Program
- Commercial and Industrial Demand Response Program

The following sections include a brief summary of each program and describe the methodology and the results of the impact analysis.

## 5.2 PEAK SAVER PROGRAM

### 5.2.1 Overview

CPS Energy's Peak Saver Program is a direct load control program for residential, multi-family, and small business customers wherein a free programmable thermostat is installed in the residence/facility in exchange for the customer's agreement to allow CPS Energy remote access to their central air conditioning system. Through the program, CPS Energy can cycle on and off the air conditioner compressor for short periods of time on defined event days.

In 2011, CPS Energy enrolled 22,362 customers in the Peak Saver program, which brings the total program enrollment to 64,406 customers as of the end of the program year. This corresponds to a 28% increase in program participation from 2010.

During the summer of 2011, 29 control events were called for system wide program participants for an average duration of slightly more than two and a half hours each event. In comparison, 15 control events were called in the summer of 2010 due to cooler temperatures. San Antonio broke record high temperatures this summer and consecutive days over 100 degrees. This is the most events triggered in a single year since program inception.

### 5.2.2 Savings Calculations

In 2011, kW was calculated based on results from an impact evaluation conducted by Nexant. See Table 5-1 below. Based on three temperature bins and two cycling strategies, load impacts were calculated for each event for three customer sectors. The enrolled kW available for curtailment is 25,764 kW.

To determine the achieved energy impacts (kWh) during the summer of 2011, CPS Energy provided Nexant with information on the events called during the year, including the event date, event duration, and the number of participants enrolled on the event day. The achieved energy savings is 1,870,517 kWh.

Average air conditioning load impact results per customer and various temperature bins are presented in the table below.

**Table 5-1: Load Impact Results by Cycling Strategy**

| Segment | Temperature Bin | 33% Cycling | 50% Cycling |
|---|---|---|---|
| Residential | 90-94°F | 0.20 | 0.35 |
| | 95-99°F | 0.36 | 0.63 |
| | 100°F + | 0.49 | 0.78 |
| Multi-Family | 90-94°F | 0.10 | 0.15 |
| | 95-99°F | 0.10 | 0.20 |
| | 100°F + | 0.15 | 0.06 |
| Commercial | 90-94°F | 0.57 | 0.88 |
| | 95-99°F | 0.84 | 1.28 |
| | 100°F + | 1.00 | 1.46 |

### 5.2.3 Findings and Recommendations

The gross energy and demand savings calculated for the Peak Saver program are listed in the following table:

**Table 5-2: Peak Saver Gross Energy and Demand Savings**

| Energy Savings (kWh) | Peak Demand Savings (enrolled kW) | Non-coinc. Demand Savings (enrolled kW) |
|---|---|---|
| 1,870,517 | 25,764 | 25,764 |

Nexant recommends continuing to collect program event data, including duration, outside temperature, and number of participants.

## 5.3 COMMERCIAL AND INDUSTRIAL DEMAND RESPONSE PROGRAM

### 5.3.1 Overview

The Demand Response (DR) Program is a voluntary load curtailment program offered to commercial and industrial customers. Incentives are provided to participating customers for shedding electric load when requested by CPS Energy during high demand periods in the summer. Incentive payments are made based on the amount of load curtailed during called events. In 2011, CPS Energy enrolled 76 customers in the DR program, and 22 curtailment events were called between June and August. This corresponds to a 49% increase in program participation from 2010.

### 5.3.2 Savings Calculations

CPS Energy collected participating facility load data and calculated the kW and kWh savings that were achieved during the 2011 DR events. The objective of Nexant's analysis was to independently verify the savings based on CPS Energy's baseline calculation methodology and the interval meter data collected for the participating facilities. Nexant's analysis included the following steps:

1. Gain an understanding of the methodology used by CPS Energy to calculate the facility's baseline load and determine the load curtailed during called events.
2. Choose a sample of event days and apply CPS Energy's baseline calculation methodology and event data to independently calculate the load impacts and energy savings. The kW and kWh savings were calculated for three randomly chosen sample event days in 2011 – Aug 4, 11, and 29 for all the customers.
3. Divide the Nexant-calculated savings by the CPS-calculated savings to derive program kW and kWh realization rates.
4. Apply these realization rates to the program-calculated kW and kWh savings for all event days in 2011 to arrive at the total Nexant kW and kWh savings for the program.

To calculate the curtailed load for each event, facility load data for ten (10) eligible days prior to the event day were provided by CPS Energy. The top three out of the 10 days are selected based on the total kWh during the peak period of 3 PM to 7 PM. The kW for the 3 days is then averaged to derive the baseline. In some cases, this average may not be representative of the baseline due to changes in weather and operations on the event day. To adjust the baseline, a baseline shift factor is applied to this average to derive the "true" baseline.

Due to the number of independent variables that can impact the facility's load, the calculation of the baseline shift factor is one of the subjective components of the calculation methodology. Nexant calculated the baseline shift factor as follows, which may vary slightly from CPS Energy's methodology:

1. Graph the event kW and non-adjusted baseline kW to check for unusual trends like a higher than usual event kW before the event compared to the baseline kW. If no unusual trends are noted and the actual load prior to the event matches the calculated based line, no baseline shift factor is required; otherwise, proceed to Step 2.

2. Calculate the sum of standard deviations between each interval pair of event day and baseline kW between 13:00 and 15:00. In other words, calculate:

   Total deviation = Standard deviation (x1, y1) + Standard deviation (x2, y2) + …… Standard deviation (xn, yn)

   Where:

   x = event kW
   y = baseline kW
   1, 2,….n represent 15 minute intervals from 13:00 through 15:00 which is the 3-hour interval before the event.

3. Look for outlier standard deviations (especially close to the event time) and eliminate them from the total deviation calculation.

4. Solve for the baseline shift factor that minimizes this total deviation.

If the above methodology still fails to match the load profile of the baseline with the event day, the following adjustments are made sequentially till a good fit is achieved:

1. Expand the time window in Step 2 from 13:00 to 15:00 to 12:00 to 15:00 and continue with the iteration as outlined above.

2. Examine the graph of demand versus time for each of the top 3 days, and eliminate any day among that does not match the other two days and the event day. Include the next highest demand day to calculate the unadjusted baseline average.

One of the 10 eligible days with a load shape similar to the event day load shape is used as a proxy to the baseline. The baseline shift factor is then applied to this proxy day to adjust the baseline closer to the event day load profile. The baseline shift factor is calculated as detailed above. At a minimum, the sum of the standard deviations as calculated in Step 2 should be lower than the above two adjustments.

### 5.3.3 Findings and Recommendations

The gross energy and demand savings calculated for the Commercial DR program are listed in the following table:

**Table 5-3: Demand Response Gross Energy and Demand Savings**

| Energy Savings (kWh) | Peak Demand Savings (average event kW) | Non-coinc. Demand Savings (average event kW) |
|---|---|---|
| 2,030,450 | 68,562 | 68,562 |

The following are program findings and recommendations that CPS Energy may consider for the program in the future:

- The realization rate or the ratio of Nexant calculated savings and CPS calculated savings is 1.003, which means there is only a 0.3% difference between the two calculations.
- The R-Square regression factor between Nexant calculated savings and CPS calculated savings for three event days (Aug 4, 11 and 29) exceeded 0.99, which signifies a good correlation between the two savings calculations.
- Nexant recommends CPS continue with current calculation methodology

# 6 TOTAL IMPACTS AND COST-EFFECTIVENESS SUMMARY

## 6.1 NET PROGRAM IMPACTS

To determine net program impacts, Nexant conducted market research of evaluations for other utility-sponsored DSM programs around the country. NTG ratios from programs similar in operation, goals, and market as CPS Energy's programs were applied to the gross program savings to determine program net impacts, as shown in Table 6-1:

**Table 6-1: 2011 Program Gross and Net Impacts**

| Program | Gross Savings | | | NTG Ratio | Net Impacts | | |
|---|---|---|---|---|---|---|---|
| | Energy Savings (kWh) | Peak Demand Savings (kW) | Non-Coinc. Demand Savings (kW) | | Energy Savings (kWh) | Peak Demand Savings (kW) | Non-Coinc. Demand Savings (kW) |
| **Energy Efficiency Programs** | | | | | | | |
| Home Efficiency | 2,376,290 | 413 | 721 | 0.930 | 2,209,950 | 384 | 671 |
| Residential HVAC | 10,083,267 | 3,037 | 3,796 | 0.950 | 9,579,104 | 2,885 | 3,606 |
| Solar PV & Water Heater Residential | 2,342,898 | 1,461 | 1,461 | 1.000 | 2,342,898 | 1,461 | 1,461 |
| Air Flow Performance | 450,638 | 213 | 213 | 0.900 | 405,574 | 192 | 192 |
| New Homes Construction | 6,361,699 | 1,445 | 2,978 | 1.000 | 6,361,699 | 1,445 | 2,978 |
| Refrigerator Recycling | 1,865,433 | 172 | 215 | 0.630 | 1,175,223 | 108 | 135 |
| Wash Right | 25,632 | 11 | 43 | 0.925 | 23,710 | 10 | 40 |
| ***Residential Subtotal*** | ***23,505,857*** | ***6,752*** | ***9,427*** | | ***22,098,157*** | ***6,485*** | ***9,083*** |
| Com Lighting | 46,673,517 | 8,124 | 9,112 | 0.850 | 39,672,489 | 6,905 | 7,745 |
| Com HVAC | 4,279,961 | 1,418 | 1,717 | 0.960 | 4,108,763 | 1,361 | 1,648 |
| Solar PV Commerical | 2,498,757 | 1,636 | 1,636 | 1.000 | 2,498,757 | 1,636 | 1,636 |
| Roof Coating | 103,969 | 11 | 14 | 0.900 | 93,572 | 10 | 13 |
| Restaurant Equipment | 1,991 | 0 | 0 | 0.940 | 1,872 | 0 | 0 |
| Lean Clean Energy | 424,856 | 20 | 23 | 0.905 | 384,495 | 18 | 21 |
| Com New Construction | 0 | 0 | 0 | 1.000 | 0 | 0 | 0 |
| Com Custom | 938,430 | 28 | 36 | 0.960 | 900,893 | 27 | 35 |
| ***Commercial Subtotal*** | ***54,921,481*** | ***11,237*** | ***12,538*** | | ***47,660,840*** | ***9,958*** | ***11,097*** |
| ***Energy Efficiency Total*** | ***78,427,338*** | ***17,989*** | ***21,965*** | | ***69,758,997*** | ***16,443*** | ***20,180*** |
| **Demand Response/Load Control Programs** | | | | | | | |
| PeakSaver | 1,870,517 | 25,764 | 25,764 | 1.000 | 1,870,517 | 25,764 | 25,764 |
| Demand Response | 2,030,450 | 68,562 | 68,562 | 1.000 | 2,030,450 | 68,562 | 68,562 |
| ***Demand Response Total*** | ***3,900,967*** | ***94,326*** | ***94,326*** | | ***3,900,967*** | ***94,326*** | ***94,326*** |
| **Total** | **82,328,305** | **112,315** | **116,291** | | **73,659,964** | **110,769** | **114,506** |

Figure 6-1 and Figure 6-2 present a breakdown of the contribution by each program to the overall net program impacts:

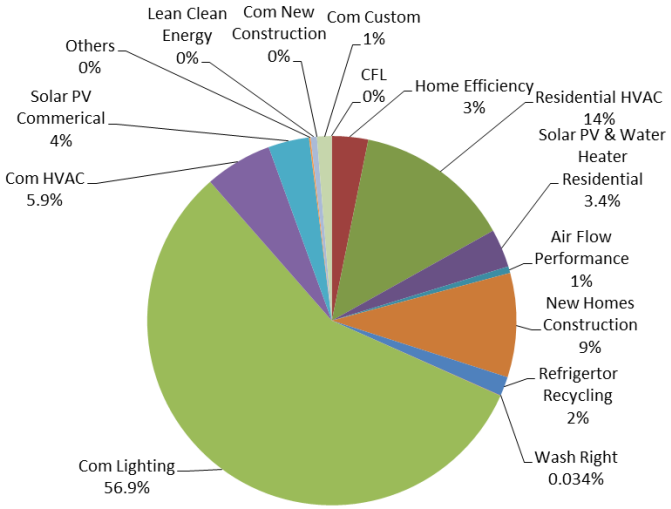


**Figure 6-1: 2011 Energy (kWh) Savings by Program**

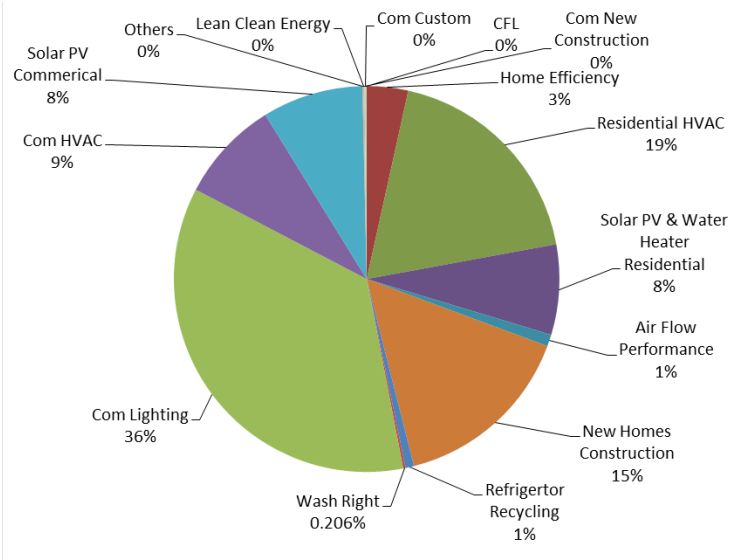


**Figure 6-2: 2011 Non Coincident Demand (kW) Savings by Program**

Figure 6-3 presents a comparison of the non-coincident demand savings achieved by the 2011 program offerings compared with 2008, 2009, and 2010 program results:

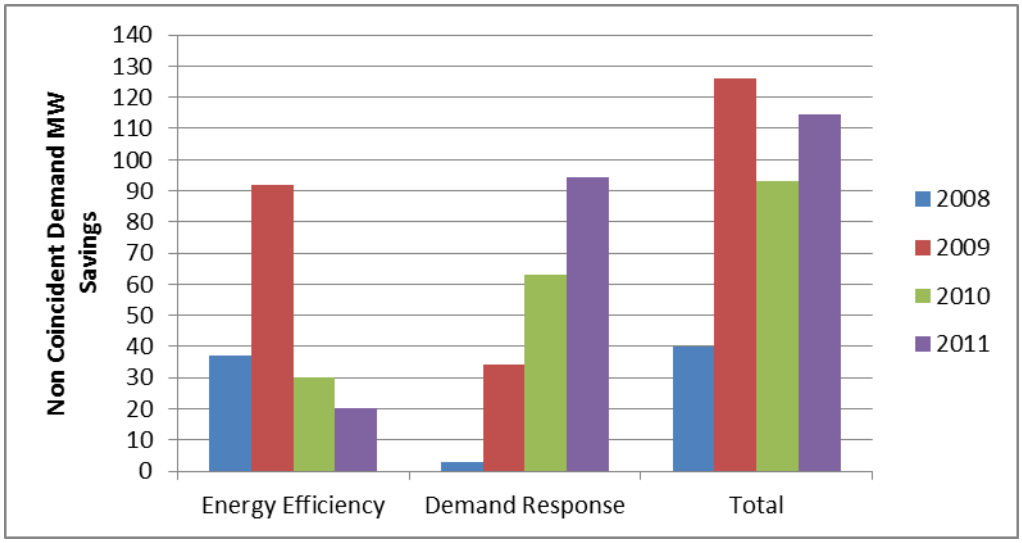


**Figure 6-3: Comparison of 2008, 2009, 2010, and 2011 Non-Coincident Demand (kW) Savings**

## 6.2 PROGRAM PROCESS FINDINGS AND RECOMMENDATIONS

In addition to the program-specific findings and recommendations included in the previous sections, Nexant's evaluation resulting in the following general program findings and recommendations:

- CPS Energy's DSM efforts are led by committed, skilled, and experienced staff.
- The portfolio of DSM program offerings addresses a wide variety of electric efficiency measures and services for both residential and nonresidential customers.
- Existing programs are effectively designed and implemented and are well positioned for continued expansion
- Programs have implemented numerous established DSM best practices, including:
  - Program quality control procedures include collecting sufficient data to verify installed equipment (pre and post inspections, equipment specification forms, etc), while not requiring excessive reporting by customers and contractors
  - Programs have easy participation processes and are satisfying to participants
  - Trade ally network continues to expand and program staff keeps trade allies informed of program updates
- Programs should continue to track changes to minimum efficiency standards, incremental equipment cost, and market trends to evaluate potential changes to program requirements and incentive levels

- As programs expand, CPS Energy should continue planning for the resources necessary to support large-scale deployment of DSM program portfolio and to achieve both short-term and long-term goals

## 6.3 ECONOMIC ANALYSIS

The economic evaluation of CPS Energy's 2011 DSM program offerings included collection of all program-related costs, which are summarized in the table below. The costs include rebates and incentives paid directly to customers, program administration, marketing outreach to customers and contractors, internal labor costs and incentives provided to CPS Energy staff, consultant fees for program development, implementation, and evaluation, and infrastructure development costs to manage and track the programs:

**Table 6-2: 2011 Program Expenditures**

| Category | Amount |
|---|---|
| Program Management and Marketing Costs | $3,583,879 |
| Rebates and Incentives Paid | $35,956,849 |
| Total Program Expenditures | $39,540,728 |

Program cost-effectiveness was evaluated from two perspectives, Cost of Saved Energy and Reduction in Revenue Requirements, resulting in the following:

- Cost of Saved Energy[1]:

$$CSE = \frac{\$26{,}255{,}633 \times 0.11767}{69{,}758{,}997 \ kWh} = \textbf{\$0.044/kWh}$$

- Net Reduction in Revenue Requirements

RRR = $48,363,621 - $39,540,728 = **$8,822,893**

- Overall Benefit Cost Ratio

$$BCR = \frac{\$48{,}363{,}621}{\$39{,}540{,}728} = \textbf{1.22}$$

[1] Includes costs and energy savings for energy efficiency programs only (does not include Peak Saver or Commercial Demand Response or Home Manager Pilot Program)

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