CERTIFICATE OF SENIOR VICE PRESIDENT
Re: 2009 Measurement & Verification Report

I, Terry M. Fry, in my position as Senior Vice President – Energy & Carbon Management of Nexant, Inc., a Delaware corporation (the "Company"), duly authorized by the Company, hereby certify as follows:

> The attached report, *Measurement and Verification of CPS Energy's 2009 DSM Program Offerings*, has been prepared in accordance with generally accepted evaluation practices and protocols, which Company has consistently applied throughout our evaluation of the component energy efficiency programs contained in CPS Energy's 2009 Save for Tomorrow Energy Plan (STEP). Company is a nationally recognized expert in energy efficiency program evaluation, performed this study to professional standards of the industry, and attests to the validity and accuracy of the study's findings.

In witness whereof, I have hereunto set my hand as of this 7th day of May, 2010

NEXANT, INC.

By: _____
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Measurement and Verification of CPS Energy's 2009 DSM Program Offerings

Submitted to CPS Energy

Submitted by Nexant

May, 2010

Nexant

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1 EXECUTIVE SUMMARY

CPS Energy retained Nexant, Inc. (Nexant) to conduct a comprehensive, independent measurement and verification (M&V) evaluation of CPS Energy's 2009 demand side management (DSM) 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 2009 DSM programs. 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 sector and overall.

Table 1-1: 2009 Net Energy and Demand Savings

Program	Energy Savings (kWh)	Peak Demand Savings (kW)	Non-Coinc. Demand Savings (kW)
CFL	52,234,024	5,186	61,157
Home Efficiency	1,815,706	737	801
Residential HVAC	6,814,768	2,078	2,597
Peak Saver[1]	735,677	13,048	13,048
Solar Initiative	327,694	176	176
Air Flow Performance	441,698	219	274
Residential Subtotal	*62,369,566*	*21,444*	*78,052*
Commercial Lighting	18,478,590	4,151	4,757
Commercial HVAC	4,830,881	2,163	2,855
Commercial Other (Motors, Window Film, Roof Coating, Other)	418,501	135	161
Demand Response[1]	615,439	16,884	16,884
Non-Residential Subtotal	*24,343,412*	*23,333*	*24,657*
Total	***86,712,978***	***44,777***	***102,709***

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:

[1] PeakSaver and Commercial Demand Response demand savings are based on the total available savings per event.

- Cost of Saved Energy, which represents the levelized program cost per annual kWh saved, was **$0.032/kWh** for the 2009 programs.
- Net Reduction in Revenue Requirements, which represents the net reduction in utility costs due to the impact of the energy efficiency improvements, was **$10,330,732** for the 2009 programs.

1.3 KEY PROCESS FINDINGS AND RECOMMENDATIONS

Nexant's evaluation team finds CPS Energy's DSM efforts 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 chapter:

- 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 2009 M&V evaluation is shown in Figure 2-1 and described in detail below.

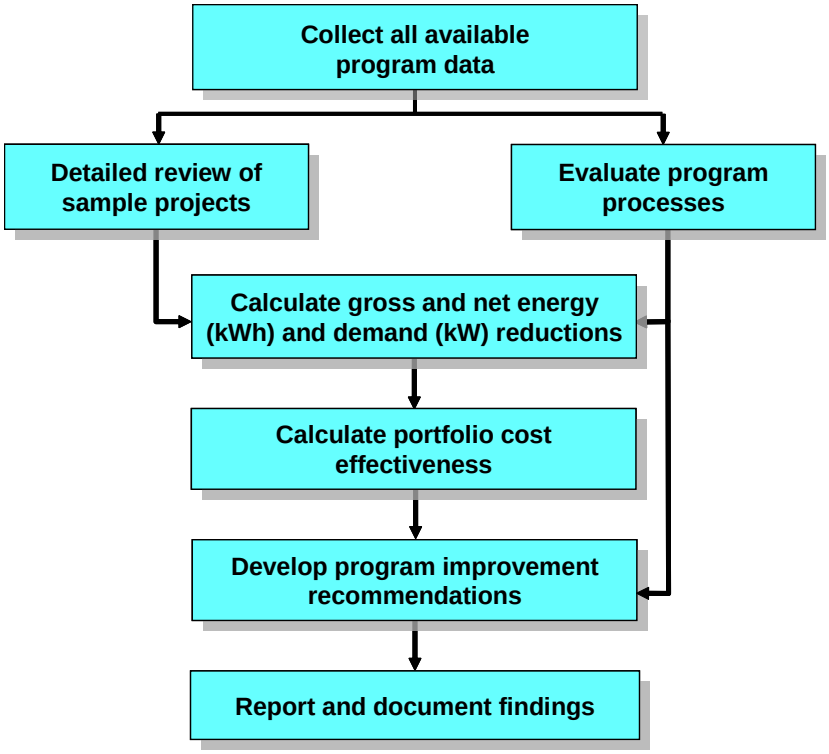

Figure 2-1: M&V Evaluation Process

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 2009 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 M&V evaluation, 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 M&V evaluation, 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 two perspectives: Cost of Saved Energy and Reduction in Revenue Requirements:

  - *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.

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

  - *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:

$$RRR = Avoided\ Energy\ and\ Demand\ Costs - \mathrm{Pr}\,ogram\ Costs$$

3.1 SUMMARY OF RESIDENTIAL IMPACTS

CPS Energy offered the following programs for the residential sector in 2009:

- Compact Fluorescent Lamps (CFL)
- Home Efficiency
- HVAC
- Peak Saver
- Solar Initiative
- Air Flow Performance

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

3.2 COMPACT FLUORESCENT LAMPS (CFL) PROGRAM

3.2.1 Overview

CPS Energy offered instant rebate coupons to customers for the purchase of CFLs, including a $2 coupon for the purchase of a single pack and $4 for a multi-pack of bulbs. The coupons were redeemable at local H-E-B stores and are available from CPS Energy's website. The rebate was credited at the time of purchase. CPS Energy also offers promotional CFL giveaways to customers.

In 2009, CPS Energy customers redeemed 1,422,202 instant rebate coupons, representing 1,812,641 bulbs. 78% of the coupons redeemed were for single pack bulbs, and 99% of all bulbs purchased were 13 Watts. CPS Energy also gave away 10,574 CFLs in 2009.

3.2.2 Savings Calculations

CPS Energy provided Nexant with detailed program data including: the bulb manufacturer and description, quantity of bulbs purchased, wattage, and number of bulbs included in the multi-packs sold. For each CFL size, Nexant estimated the typical wattage of the incandescent bulb that would be replaced, as shown in Table 3-1:

Table 3-1: CFL and Incandescent Wattages

ENERGY STAR qualified CFLs (Watts)	Equivalent Incandescent Bulb (Watts)	CFL Savings per bulb (Watts)
7	25	18
9	40	31
11	40	29
13	60	47
14	60	46
15	60	45
16	75	59
18	75	57
19	75	56
20	75	55
23	100	77
26	100	74
30	100	70
32	125	93
40	125	85

To estimate annual energy savings, Nexant conducted market research of available studies on CFL and residential lighting hours of operation, installation rates, and average energy consumption. Based on the findings of KEMA Inc.'s 2005 CFL Metering Study[1] in California, Nexant estimated that the average usage of a CFL is 2.34 hours per day. Several studies have also been recently conducted on the installation rate of CFLs purchased and given away. Based on a review of available studies, Nexant included the following assumptions on CFL installation rates, which were incorporated into the savings calculations:

Quantity	Installation Rate
Single-Pack	90%
2 or 3 bulb Multi-Pack	90%
4 or 5 bulb Multi-Pack	78%
6 bulb Multi-Pack	57%
CFL giveaway	90%

Annual energy savings for CFLs were calculated using the following formula:

[1] *CFL Metering Study*, KEMA, Inc., February 25, 2005.

$$kWh\,savings = (W_{inc} - W_{CFL})\ x\ \frac{1kW}{1{,}000\,watts}\ x\ N_{bulbs}\ x\ Install\ Rate\ x\ Annual\ Hours$$

Where:

W_{inc} = Wattage of incandescent bulb replaced

W_{CFL} = Wattage of CFL

N_{bulbs} = Number of bulbs purchased

Install Rate = Estimated average installation rate based on the number of bulbs purchased

Annual Hours = Annual hours of operation (assuming 2.34 hrs/day)

Non-coincident demand savings for CFLs are calculated simply by taking the difference in wattage of the CFL and the incandescent bulb that was replaced. However, residential lighting usage patterns vary widely and usage is scattered throughout the day; therefore the non-coincident program savings is not a number that could be used for system planning as it will not occur at a single point in time, but be distributed throughout the year.

Peak demand savings capture the coincident demand impacts that occur during the summer peak period. To determine peak demand impacts, Nexant conducted secondary market research of several CFL evaluation studies. Based on a review of available studies, Nexant estimated an average peak savings of 4 watts per bulb.

3.2.3 Findings and Recommendations

The gross energy and demand savings calculated for the CFL program are listed in Table 3-2 below:

Table 3-2: CFL Program Gross Energy and Demand Savings

Energy Savings (kWh)	Peak Demand Savings (kW)	Non-coinc. Demand Savings (kW)
65,292,530	6,483	76,446

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

- Nexant found the program data collection to be sufficient for assessing participation and determining program impacts.

- CPS Energy should incorporate the results of residential appliance surveys and other market research, as well as upcoming changes to federal lighting efficiency standards, to determine the most effective structure for promoting energy efficient lighting technologies for the residential sector.

3.3 HOME EFFICIENCY PROGRAM

3.3.1 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 2009, rebates were provided for the following list of measures:

- Ceiling insulation
- Cool Roof
- ENERGY STAR® windows
- Spray foam insulation
- Wall insulation
- Window film or solar screens

The Home Efficiency Program had 2,339 projects in 2009, including 40 projects with two eligible measures installed and 11 projects with three eligible measures installed.

Figure 3-1 shows the total number of installations of each type of measure in 2009 (Note: the number of installations exceeds the number of projects due to the projects with multiple measures installed):

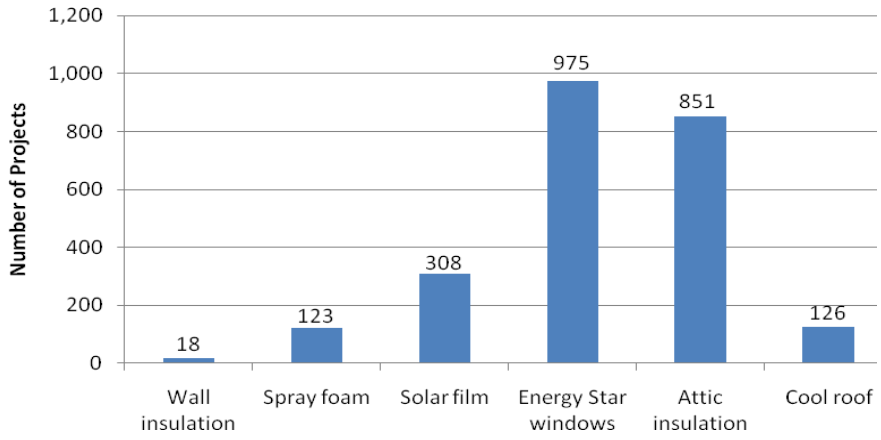

Figure 3-1: Number of Installations of Home Efficiency Measures

3.3.2 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.

3.3.2.1 Ceiling 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, using the following equation:

$$kWh\ savings_{cooling} = \frac{Area_{Measure\ Area} \times \left(\frac{1}{R_{base}} - \frac{1}{R_{change}} \right) \times CDD \times 24}{SEER / 1{,}000}$$

Where:

Area $_{MeasureArea}$ = Area of the insulation, in ft^2

R = Rated R-value for the insulation, ft^2 hr ^oF/BTU

CDD = Cooling Degree Days for San Antonio

SEER = Rated SEER value for the A/C Unit, BTU/watt

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. The following formula was used to calculate heating energy and demand savings from improved ceiling insulation:

$$kWh\ savings_{heating} = \frac{Area_{Measure\ Area} \times \left(\frac{1}{R_{base}} - \frac{1}{R_{change}} \right) \times HDD \times 24}{HSPF / 1{,}000}\ x\ Elec\ Heat\ Share$$

[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

Where:

Area $_{MeasureArea}$ = Area of the insulation, in ft^2

R = Rated R-value for the insulation, ft^2 hr ^oF/BTU

HDD = Heating Degree Days for San Antonio

HSPF = Rated Heating Seasonal Performance Factor, BTU/watt

Elec Heat Share = the percentage of customers with electric heat

The total gross energy and demand savings for 2009 ceiling insulation installations are as follows:

Table 3-3: Ceiling Insulation Gross Energy and Demand Savings

Energy Savings (kWh)	Peak Demand Savings (kW)	Non-coinc. Demand Savings (kW)
661,438	149	198

3.3.2.2 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 are listed in Table 3-4.

Table 3-4: Residential Cool Roof Gross Energy and Demand Savings

Energy Savings (kWh)	Peak Demand Savings (kW)	Non-coinc. Demand Savings (kW)
61,055	9	18

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

3.3.2.3 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. To be eligible to participate in CPS Energy's program, windows must be ENERGY STAR certified; however, ENERGY STAR criteria for San Antonio's climate zone requires a U-factor of 0.65 or less, which does not match the PUC deemed savings criteria.

Therefore, Nexant calculated the energy and demand savings using engineering calculations based on cooling and heating load energy savings for the windows incorporating the U-value of the window, the number of cooling degree-days and heating degree-days, and HVAC unit efficiencies, as shown in the following equations. Heating savings incorporated the electric heating share assumption described for the ceiling insulation measure above.

$$kWh\ savings_{cooling} = \frac{Area_{Measure\ Area} \times (U_{base} - U_{change}) \times CDD \times 24}{SEER / 1{,}000}$$

$$kWh\ savings_{heating} = \frac{Area_{Measure\ Area} \times (U_{base} - U_{change}) \times HDD \times 24}{HSPF / 1{,}000} \ x\ Elec\ Heat\ Share$$

Where:

U_{base} = Rated U-value for the baseline window, BTU/ft^2 hr ^{o}F (assumed same baseline value as Texas PUC deemed savings calculations of 0.87)

U_{change} = Rated U-value for the ENERGY STAR window, BTU/ft^2 hr ^{o}F

Nexant used the reported U-value and window area for each ENERGY STAR window installation, resulting in the following impacts:

Table 3-5: ENERGY STAR Windows Gross Energy and Demand Savings

Energy Savings (kWh)	Peak Demand Savings (kW)	Non-coinc. Demand Savings (kW)
849,026	500	500

3.3.2.4 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 for spray foam insulation projects did not include information on the insulation thickness or R-value for all installations. Therefore, Nexant based its energy savings calculations on the assumption that the installed insulation complied with the program's required insulation depths for closed cell or open cell insulation and achieved 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 the installation of spray foam insulation are listed in the following table:

Table 3-6: Spray Foam Insulation Gross Energy and Demand Savings

Energy Savings (kWh)	Peak Demand Savings (kW)	Non-coinc. Demand Savings (kW)
128,551	28	39

3.3.2.5 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, as shown in the following equations:

$$kWh\ savings_{cooling} = \frac{Area_{Measure\ Area} \times \left(\frac{1}{R_{base}} - \frac{1}{R_{change}} \right) \times CDD \times 24}{SEER / 1{,}000}$$

Where:

Area $_{MeasureArea}$ = Wall area of the insulation, in ft^2

R = Rated R-value for the insulation, ft^2 hr ^oF/BTU

CDD = Cooling Degree Days for San Antonio

SEER = Rated SEER value for the A/C Unit, BTU/watt

$$kWh\ savings_{heating} = \frac{Area_{Measure\ Area} \times \left(\frac{1}{R_{base}} - \frac{1}{R_{change}} \right) \times HDD \times 24}{HSPF / 1{,}000}\ x\ Elec\ Heat\ Share$$

Where:

HDD = Heating Degree Days for San Antonio

HSPF = Rated Heating Seasonal Performance Factor, BTU/watt

Elec Heat Share = the percentage of customers with electric heat

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 3-7: Wall Insulation Gross Energy and Demand Savings

Energy Savings (kWh)	Peak Demand Savings (kW)	Non-coinc. Demand Savings (kW)
39,192	38	38

3.3.2.6 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 3-8: Window Film and Solar Screen Gross Energy and Demand Savings

Energy Savings (kWh)	Peak Demand Savings (kW)	Non-coinc. Demand Savings (kW)
213,110	68	68

3.3.3 Findings and Recommendations

The gross energy and demand savings calculated for all measures included in the Home Efficiency Program are listed in Table 3-9 below:

Table 3-9: Home Efficiency Gross Energy and Demand Savings

Measure	Energy Savings (kWh)	Peak Demand Savings (kW)	Non-coinc. Demand Savings (kW)
Ceiling insulation	661,438	149	198
Cool roof	61,055	9	18
ENERGY STAR Windows	849,026	500	500
Spray foam	128,551	28	39
Wall insulation	39,192	38	38
Window film & solar screen	213,110	68	68
Total	**1,952,372**	**792**	**861**

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.
- If feasible, the program should attempt to collect the following additional data from customers and record in the database:
  - For cool roof measures collect specific material information and reflectivity value (from manufacturer or from ENERGY STAR products list)
  - For solar screen and window film measures, record if the specific measure was film or a screen.
  - For spray foam measures, record depth of spray foam installed in each location (ceiling, walls), and because of the program change in 2010 to allow ceiling-only installations, note these projects accordingly.

3.4 AIR FLOW PERFORMANCE PROGRAM

3.4.1 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 was a new offering for customers in 2009 and had 302 projects in 2009, including four repairs, 43 partial replacements, and 204 total duct replacements.

3.4.2 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):

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

3.4.3 Findings and Recommendations

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

Table 3-10: Duct Repair & Replacement Gross Energy and Demand Savings

Energy Savings (kWh)	Peak Demand Savings (kW)	Non-coinc. Demand Savings (kW)
490,775	243	304

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

- Nexant found that the Air Flow Performance database contained duct output efficiency values in various units of measurement and errors in other fields. CPS Energy program staff was helpful in revising the entries based on original submitted test results so that the results presented herein are believed to be accurate and complete. Nexant recommends standardization of data entry so that every project contains the same unit of measurement for a given field (e.g., all duct output efficiency values should correspond to leakage fractions of total system airflow) and that field headers or labels contain the expected unit of measurement for entered field values.
- Nexant also recommends that the following additional pieces of 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.

[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.

- Heating system capacity, which would allow direct calculation of heating energy savings for electric and heat pump systems to compare to deemed savings estimates.

3.5 HVAC PROGRAM

3.5.1 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 2009 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 and Heat Pumps:
  - $110/ton for 15 SEER units
  - $125/ton for 16 SEER units
  - $140/ton for 17 SEER units
  - $160/ton for 18 SEER 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 2009, a total of 7,990 residential HVAC rebates were paid to participating customers, including 2,459 central A/C rebates, 1,352 heat pump rebates, and 4,179 room air-conditioner rebates. This corresponds to a 223% increase in program participation from 2008. Figure 3-2 shows the breakdown of participating central air conditioners and heat pumps by SEER rating:

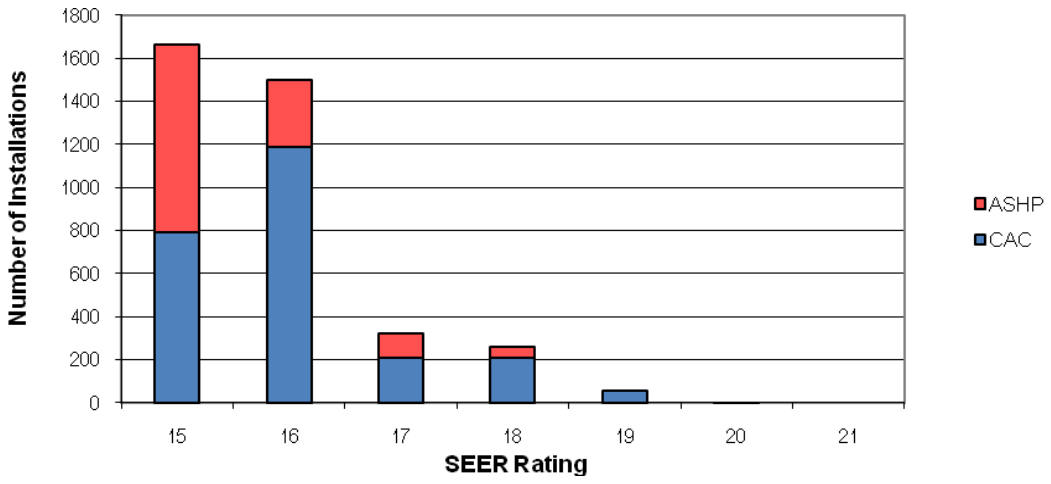

Figure 3-2: SEER Ratings of CAC and ASHP Installations

3.5.2 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.

The following equations were used to calculate energy savings for each type of equipment included in the residential HVAC program:

Central air conditioner and heat pump cooling savings

$$kWh\ savings_{cooling} = Tons \times 12 \times \left(\frac{1}{SEER_{base}} - \frac{1}{SEER_{change}} \right) \times EFLCH$$

Where:

Tons = Size of CAC or ASHP, tons
SEER = Rated SEER value, BTU/watt
EFLCH = Effective Full Cooling Load Hours for San Antonio

Heat pump heating savings

$$kWh\ savings_{heating} = Tons \times 12 \times \left(\frac{1}{HSPF_{base}} - \frac{1}{HSPF_{change}} \right) \times EFLHH$$

Where:

HSPF = Rated HSPF value, BTU/watt
EFLHH = Effective Full Heating Load Hours

Room air conditioner cooling savings

$$kWh\ savings_{cooling} = Btu/hr \times \left(\frac{1}{EER_{base}} - \frac{1}{EER_{change}} \right) \times \frac{1\,kW}{1{,}000\ watts}\ x\ EFLCH$$

Where:

Btu/hr = Size of room air conditioner
SEER = Rated SEER value, BTU/watt
EFLCH = Effective Full Cooling Load Hours for San Antonio

3.5.3 Equipment Verification

To verify the accuracy of the efficiency data listed in the program database, Nexant randomly selected samples of 30 CAC projects, 30 HP projects, and 30 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[1]. The results of the equipment verification are as follows:

[1] http://www.ahridirectory.org/ahridirectory/pages/home.aspx

- 28 of 30 CAC units (93%) were verified as having the correct SEER rating or better according to the AHRI directory
- 28 of the 30 heat pump units (93%) were verified as having the correct SEER rating or better according to the AHRI directory
- All of the 30 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 CAC and room air conditioners found to be incorrect in the program database.

3.5.4 Findings and Recommendations

The gross energy and demand savings calculated for the 2009 Residential HVAC program are listed in the table below:

Table 3-11: 2009 Residential HVAC Gross Energy and Demand Savings

Measure	Energy Savings (kWh)	Peak Demand Savings (kW)	Non-coinc. Demand Savings (kW)
ENERGY STAR Central AC	3,340,899	1,195	1,493
ENERGY STAR Heat Pump	2,659,384	573	716
ENERGY STAR Room AC	1,173,157	420	524
Total	**7,173,440**	**2,187**	**2,734**

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 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.

[1] http://www.energystar.gov/index.cfm?c=roomac.pr_room_ac

3.6 PEAK SAVER PROGRAM

3.6.1 Overview

CPS Energy's Peak Saver program is a residential air-conditioner direct load control program. CPS Energy installs a free Honeywell programmable thermostat in participating customers' homes when they enroll in the program. The thermostat is used by CPS Energy to cycle off the compressor of participating air conditioners during periods of peak demand throughout the summer. Typically compressors are cycled off for 10 minutes of each 30 minute period during a called event.

In 2009, CPS Energy enrolled 5,574 customers in the Peak Saver program, which brings the total program enrollment to 20,074 customers. 23 events were called during the summer of 2009, with durations ranging from two hours to almost four hours.

3.6.2 Savings Calculations

Direct load control programs typically have two metrics for determining impacts:

- *Enrolled kW*, which is the total amount of load available to be curtailed when needed
- Achieved kWh, which is the actual impacts realized during the previous year

The enrolled kW for the Peak Saver program is based on the total number of participants that have a thermostat installed in their home, as well as the average kW impact during an event. The customer enrollment includes thermostats installed in 2009 as well as customers that enrolled in previous years that continue to participate in the program. CPS Energy retained Summit Blue Consulting to conduct an impact evaluation of the program[1] to determine the average impact per unit. Their evaluation found that the average impact for the most common control event, 33% cycling on days with a maximum temperature between 95° F and 99° F, is 0.65 kW per unit. Therefore, based on the 20,074 units enrolled in the program at the end of the 2009 program year, the enrolled kW available for curtailment is 13,048 kW.

To determine the achieved energy impacts during the summer of 2009, CPS Energy provided Nexant with information on the events called during the year, including the date, event duration, and the number of participants enrolled. Based on these criteria, the following average demand impacts from the Summit Blue study were used:

Table 3-12: Peak Saver Demand Impacts

Max Daily Temp	33% cycling
90-94 deg F	0.52
95-99 deg F	0.65

[1] *Impact Evaluation of Peak Saver Program*, Summit Blue Consulting, December 2008

The achieved kWh savings during each event was calculated using the appropriate average demand impact and the estimated number of participants. Nexant calculated total achieved energy savings for the 2009 program of 735,677 kWh.

3.6.3 Findings and Recommendations

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

Table 3-13: Peak Saver Gross Energy and Demand Savings

Energy Savings (kWh)	Peak Demand Savings (enrolled kW)	Non-coinc. Demand Savings (enrolled kW)
735,677	13,048	13,048

Nexant found the data recorded during each event to be sufficient to calculate program impacts. Additionally, the Summit Blue Impact Evaluation provides the program with a matrix of data on the average impacts per unit for events based on the maximum daily temperature and the cycling strategy used. Nexant recommends continuing to collect program event data, including duration, outside temperature, and number of participants.

3.7 SOLAR INITIATIVE

3.7.1 Overview

CPS Energy's Solar Initiative provides incentives for the installation of both solar photovoltaic systems and solar water heaters. Participation records show a total of 34 solar photovoltaic systems and 8 solar water heaters installed in 2009, which represents the highest annual participation for the program. 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.

3.7.2 Savings Calculations

3.7.2.1 Solar Photovoltaic

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.

3.7.2.2 Solar Water Heaters

CPS Energy's records show completion of 8 solar hot water projects in the 2009 program. 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, however, 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.

3.7.3 Findings and Recommendations

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

Table 3-14: Solar Initiative Gross Energy and Demand Savings

Measure	Energy Savings (kWh)	Peak Demand Savings (kW)	Non-coinc. Demand Savings (kW)
Solar PV	308,841	171	171
Solar Water Heaters	18,853	6	6
Total	**327,694**	**176**	**176**

For future project tracking, Nexant recommends that CPS enter all relevant engineering quantities (e.g. tilt and azimuth) into the summary databases to enable thorough review of savings estimates. Additionally, Nexant recommends CPS collect information from customers who install solar hot water systems on their existing water heater (type and efficiency).

4 NON-RESIDENTIAL PROGRAMS

4.1 SUMMARY OF NON-RESIDENTIAL IMPACTS

The non-residential sector included the following program offerings in 2009:

- Lighting
- HVAC
- Motors, Cool Roofs, Window Film, and others
- Lean, Clean, and Energy[1]
- Demand Response

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 both retrofit and new construction projects. In 2009, CPS Energy offered two program components:

- Custom Lighting projects, with 50 or more applicable lighting fixtures.
- Small Lighting projects with less than 50 applicable fixtures.

Energy and demand savings are calculated based on pre-retrofit conditions for retrofit projects, and the 2001 International Energy Conservation Code (IECC) Standard Lighting Power Densities (watt/sq ft) by facility type are used for new construction projects.

In 2009, a total of 147 projects received funding through the program, which included 14 new construction projects.

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. All the project data was input into standardized lighting spreadsheets, which included deemed lighting wattages for each lamp/ballast combination. Additionally, Nexant worked with CPS Energy to identify the facility type for each project, which is not a data field that is

[1] The Lean, Clean, and Energy program provides diagnostic training and facility assessment opportunities for industrial facilities. Energy efficiency measures identified through this program that are eligible for STEP rebates were included in the savings totals for the appropriate non-residential program in which they participated and are not individually classified in this report.

collected by the program. Annual hours of operation and peak demand coincidence factors, or the percentage of the facility demand that occurs during the peak period, were estimated for each project based on the facility type. Table 4-1 highlights the coincidence factors and annual operation hours 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	Annual Operating Hours
Office	Office buildings and other commercial properties in operation during normal business hours	78%	3,850
Retail	Retail facilities, including restaurants	94%	5,167
Warehouse	Warehouse and storage facilities	96%	5,632
Major Healthcare	Hospitals and in-patient health clinics	84%	2,900
24 Hour Facilities	Any facility that operates 24 hours/day or has high occupancy during peak hours	94%	8,234
K-12 Schools	Primary education facilities	73%	2,246
Colleges & Universities	Secondary education facilities.	71%	2,992
Assembly	Conference facilities and public gathering spaces	89%	4,190
Hotel	Lodging facilities	51%	3,735

For new construction projects in which program savings were based on the reduction in power density from 2001 IECC standards, the savings calculation methodology and total facility wattage was verified.

Retrofit project energy and peak demand savings were calculated based on the difference in deemed 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:

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

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

$N_{fixtures}$ = Number of fixtures

CF = Deemed coincident demand factor based on building type.

$AnnualOperating\ Hours$ = 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

Energy Savings (kWh)	Peak Demand Savings (kW)	Non-coinc. Demand Savings (kW)
21,739,518	4,884	5,596

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

- Consider using 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. Three tiers of efficiency were established for the 2009 program year for each equipment size and category. Rebates are paid at the following amounts:

- $20/ton for Step 1
- $65/ton for Step 2
- $150/ton for Step 3

In 2009, a total of 112 projects received funding through the program.

4.3.2 Savings Calculations

Nexant gathered available data from the commercial program database and hard copies of each project for the retrofit and new construction 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 90.1-1989 standard, while baseline efficiencies for New Construction projects were assumed to be the ASHRAE 90.1-1999 standard. The following equations were used to calculate HVAC program savings:

Unitary AC Equipment

$$kW\ savings = Capacity \times CF \times ConversionFactor \times \left(\frac{1}{EER_{pre}} - \frac{1}{EER_{post}}\right)$$

$$kWh\,savings_{AC} = Capacity \times ConversionFactor \times EFLH_C \times \left(\frac{1}{IPLV_{pre}} - \frac{1}{IPLV_{post}}\right)$$

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

where:

$\text{Capacity} =$ 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 90.1-1989 standard

EER_{post} = Efficiency of the new cooling equipment

$IPLV_{pre}$ = Integrated part load value of the existing cooling equipment. ASHRAE 90.1-1989 standard

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

Chillers

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

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

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

where:

Capacity = Rated equipment cooling capacity, ton

Conversion Factor = 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 90.1-1989 standard

COP_{post} = Efficiency of the new cooling equipment

$IPLV_{pre}$ = Integrated part load value of the existing cooling equipment ASHRAE 90.1-1989 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

Table 4-4: Baseline and Minimum Efficiencies – Unitary AC

Equipment Size/Category	Baseline EER	Baseline IPLV/SEER	Minimum EER	Minimum IPLV
Air Cooled-Unitary AC < 65,000 Btu/h Package	9.20	9.70	11.60	13.00
Air Cooled-Unitary AC < 65,000 Btu/h Split	9.20	10.00	11.60	13.00
Air Cooled-Unitary AC > 135,000 Btu/h & < 240,000 Btu/h	8.20	7.20	9.70	9.70
Air Cooled-Unitary AC > 240,000 Btu/h & < 760,000 Btu/h	8.20	7.20	9.50	9.70
Air Cooled-Unitary AC > 65,000 Btu/h & < 135,000 Btu/h	8.90	8.30	10.30	10.30
Air Cooled-Unitary AC > 760,000 Btu/h	8.00	7.20	9.20	9.40
Water Cooled-Unitary AC < 65,000 Btu/h Package	9.3	8.3	12.1	12.1

Equipment Size/Category	Baseline EER	Baseline IPLV/SEER	Minimum EER	Minimum IPLV
Water Cooled-Unitary AC < 65,000 Btu/h Split	9.3	8.3	12.1	12.1
Water Cooled-Unitary AC > 135,000 Btu/h & < 240,000 Btu/h	9.4	8.5	11	11
Water Cooled-Unitary AC > 240,000 Btu/h & < 760,000 Btu/h	9.4	8.5	11	10.3
Water Cooled-Unitary AC > 65,000 Btu/h & < 135,000 Btu/h	10.5	10.5	11.5	11.5
Water Cooled-Unitary AC > 760,000 Btu/h	9.4	8.5	11	10.3

Table 4-5: Baseline and Minimum Efficiencies – Chillers

Equipment Size/Category	Minimum COP	Minimum IPLV
Air cooled---screw---< 150	2.7	2.8
Air cooled---screw---> 150	2.5	2.5
Air cooled---reciprocating---< 150	2.7	2.8
Air cooled---reciprocating---> 150	2.5	2.5
Water cooled---reciprocating--->150	3.8	3.9
Water cooled---rotary---< 150	3.8	3.9
Water cooled---rotary---> 150 & < 300	4.2	4.5
Water cooled---rotary---> 300	4.7	4.8
Water cooled---centrifugal---< 150	3.8	3.9
Water cooled---centrifugal---> 150 & < 300	4.2	4.5
Water cooled---centrifugal---> 300	4.7	4.8
Water cooled---screw---< 150	3.8	3.9
Water cooled---screw---> 150 & < 300	4.2	4.5
Water cooled---screw---> 300	4.7	4.8
Water cooled---scroll---< 150	3.8	3.9
Water cooled---scroll---> 150 & < 300	4.2	4.5
Water cooled---scroll---> 300	4.7	4.8

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 4-6: Commercial HVAC Gross Energy and Demand Savings

Energy Savings (kWh)	Peak Demand Savings (kW)	Non-coinc. Demand Savings (kW)
5,032,168	2,253	2,974

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

- Track the facility type for each project, and use deemed operational hours and coincidence factors based on facility type
- Use EER/COP or full load kW/ton for peak demand savings calculation and the IPLV/IEER/SEER for energy savings calculations (Note: IEER has replaced IPLV as the standard for calculating part-load efficiency for unitary air conditioners and heat pump equipment as of January 1, 2010[1])
- Stipulate Baseline equipment efficiency for retrofit projects as the ASHRAE 90.1 – 1989 standard
- Request or take photographs of pre and post equipment (nameplate data) for use as supplemental verification tools.
- Use customer-friendly input/output spreadsheets or database for savings calculation

4.4 MOTORS, BUILDING ENVELOPE, AND CUSTOM PROGRAMS

4.4.1 Overview

In 2009, CPS Energy offered incentives for the following additional commercial measures:

- Installation of reflective roofs – rebate of $0.10/sq ft
- Window coatings – rebate of $0.40-60/sq ft, depending on type of coating
- High efficiency motors – rebate of $150/kW saved

There were a total of 28 roofing projects, 1 motor replacement project, 9 window film projects, and 1 custom project involving variable frequency drives and air compressors.

[1] http://ahrinet.org/ARI/util/showdoc.aspx?doc=1626

4.4.2 Savings Calculations

Roof Savings were calculated using proprietary Nexant calculation tools, which is based on ASHRAE's Heat Balance Method. An overview of the methodology is illustrated below

$$kW_{savings} = \frac{A}{COP} \times \left[\left(\frac{1}{R_{Exist} + \frac{1}{h_{in,air}}} - \frac{1}{R_{Prop} + \frac{1}{h_{in,air}}} \right) \left(t_0 - \frac{\varepsilon \Delta R}{h_0} - t_{in} \right) + \frac{(1-\rho_{Exist})E_{tP}}{(R_{Exist} + \frac{1}{h_{in,air}})h_0} - \frac{(1-\rho_{Prop})E_{tP}}{(R_{Prop} + \frac{1}{h_{in,air}})h_0} \right]$$

where:

A: roof area, ft^2.

h_o: coefficient of heat transfer by long-wave radiation and convection at outer surface, Btu/ h °F ft^2.

COP: equipment efficiency

R: the total thermal resistance value (R-value) of the roof, h °F ft^2/Btu.

$h_{in,\ air}$: the heat transfer coefficient for indoor air, Btu/ h °F ft^2.

ρ: reflectance of surface for solar radiation.

$E_{t,P}$: total peak solar radiation incident on surface during a cooling period, Btu/h ft^2.

ε: Emittance of surface for solar radiation

ΔR: difference between long-wave radiation incident on surface from sky and radiation emitted by blackbody at outdoor air temperature, Btu/h ft^2.

t_{in}: indoor air temperature

t_o: outdoor air temperature

$$kWh_{savings} = \frac{A}{COP} \times \left[\left(\frac{1}{R_{Exist} + \frac{1}{h_{in,air}}} - \frac{1}{R_{Prop} + \frac{1}{h_{in,air}}} \right) \left(\sum_{i=1}^{n} t_{0,i} - n \times \frac{\varepsilon \Delta R}{h_0} - n \times t_{in} \right) + \frac{(1-\rho_{Exist}) \sum_{i=1}^{n} E_{t,i}}{(R_{Exist} + \frac{1}{h_{in,air}})h_0} - \frac{(1-\rho_{Prop}) \sum_{i=1}^{n} E_{t,i}}{(R_{Prop} + \frac{1}{h_{in,air}})h_0} \right]$$

where:

A: roof area, ft^2.

h_o: coefficient of heat transfer by long-wave radiation and convection at outer surface, Btu/ h °F ft^2.

COP: equipment efficiency

R: the total thermal resistance value (R-value) of the roof, h °F ft^2/Btu.

$h_{in,\ air}$: the heat transfer coefficient for indoor air, Btu/ h °F ft^2.

ρ: reflectance of surface for solar radiation.

$\Sigma E_{t,i}$: total peak solar radiation incident on surface during a cooling period, Btu/h ft^2.

n: the number of total cooling hours when solar radiation exists.

ε: emittance of surface for solar radiation

ΔR: difference between long-wave radiation incident on surface from sky and radiation emitted by blackbody at outdoor air temperature, Btu/h ft^2.

Savings for motors were calculated using the methodology listed below

$$kW_{Savings} = RatedHorsePower \times ConverstionFactor \times LF \times (\frac{1}{\eta_{pre}} - \frac{1}{\eta_{post}})$$

$$kWh_{Savings} = kW_{Savings} \times AnnualOperationalHours$$

where:

$RatedHorsePower$ = Nameplate horsepower data of the motor

$ConverstionFactor$ = 0.746 kW/hp

LF = Estimated load factor for the motor. If load factor is not available, deemed load factors in Table 4-7 can be used

η_{pre} = Efficiency of the existing motor. If unavailable, efficiencies listed in Table 4-7 can be used

η_{post} = Efficiency of the new motor. If unavailable, efficiencies listed in Table 4-7 can be used

$AnnualOperationalHours$ = Estimated annual operational hours for the motor. If unavailable, annual operational hours in Table 4-7 can be used

Table 4-7: Operation Hours, Load factors, and Efficiencies by Motor Size

hp	Hours	Load Factor	η_{pre}	η_{post}
1	2,373	0.50	80.10%	86.77%
1.5	2,373	0.50	83.75%	88.35%
2	2,373	0.50	84.67%	88.57%
3	2,373	0.50	86.25%	89.88%
5	2,373	0.50	87.17%	90.13%
7.5	2,797	0.50	88.67%	91.83%
10	2,797	0.50	89.45%	92.52%
15	2,797	0.50	90.35%	92.65%
20	2,797	0.50	90.60%	93.13%
25	3,160	0.60	91.58%	93.82%
30	3,160	0.60	91.75%	94.12%
40	3,160	0.60	92.57%	94.53%
50	3,160	0.60	92.80%	94.97%
60	4,067	0.50	93.40%	95.13%
75	4,067	0.50	93.57%	95.17%
100	4,067	0.50	93.90%	95.50%
125	4,335	0.70	94.22%	95.78%
150	4,335	0.70	94.60%	95.97%
200	4,335	0.70	94.83%	96.13%

Nexant reviewed the project data available for the window film projects, but the available data did not include sufficient information on shading coefficients, window orientation, or facility HVAC equipment to accurately calculate project savings. Therefore, no energy or demand savings were calculated for the window film projects.

4.4.3 Findings and Recommendations

The gross energy and demand savings calculated for the Motors, Building Envelope, and Custom Programs are listed in the table below:

Table 4-8: Commercial Roof, Window Film, Motor, and Custom Gross Energy and Demand Savings

Measure	Energy Savings (kWh)	Peak Demand Savings (kW)	Non-coinc. Demand Savings (kW)
Roof Coatings	207,621	146	174
High Efficiency Motors	1,951	<1	<1
Window Film	N/A	N/A	N/A
Custom	244,477	4	5
Total	**454,049**	**150**	**179**

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

- Use customer-friendly input/output spreadsheets or database for savings calculation
- Set up formal inspection protocols and random selection for pre and post inspections
- For motors replacements, use of deemed values may be used, with efficiencies of base case equipment stipulated at the EPACT 1992 standard.
- For roof coating projects, collect and track the following project information:
  - Building Type
  - Ceiling insulation R-values for pre and post retrofit
  - HVAC system information (type, size, and efficiency)
- For window film projects, collect and track the following project information:
  - Building Type
  - HVAC system information (type, size, and efficiency)
  - Data and specifications on the existing windows and film installed, as shown in the following table:

Table 4-9: Data Collection Template for Window Film Projects

Orientation	Window Area (square feet)	Window Film Area (square feet)	Interior Shading Device (if any)	Pre-installation Shading Coefficient	Post-installation Shading Coefficient
SE					
SSE					
S					
SSW					
SW					
WSW					
W					
WNW					
NW					

4.5 DEMAND RESPONSE PROGRAM

4.5.1 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 2009, CPS Energy enrolled 19 customers in the DR program, and 22 curtailment events were called between June and September.

4.5.2 Savings Calculations

CPS Energy collected participating facility load data and calculated the kW and kWh savings that were achieved during the 2009 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.
3. Divide the Nexant-calculated savings by the program-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 2009 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 (esp. 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 two alternative methods are employed:

Proxy Day: 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. If there is no day having a load profile similar to the event day, the following method or Interval Deltas method is employed.

Interval Deltas: This method is employed when the main method and Proxy day methodology fails. The average delta from one interval to the next is applied starting with the first curtailed period interval. In other words, for any interval n in the curtailment period, the baseline demand zn = (yn/ yn-1) X (z n-1) where y = unadjusted 3-day average baseline kW and z = event day kW.

Neither of the two alternative methods was required for the 2009 DR events.

4.5.3 Findings and Recommendations

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

Table 4-10: Demand Response Gross Energy and Demand Savings

Energy Savings (kWh)	Peak Demand Savings (max event kW)	Non-coinc. Demand Savings (max event kW)
615,439	16,884	16,884

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 Energy-calculated savings, is 0.96, which means there is only a 4% difference between the two calculations, primarily due to the baseline shift factor calculations.
- The program may consider developing a more defined procedure for calculating and applying the baseline shift factor and documenting the methodology used each time the baseline shift factor is incorporated into the load calculations.

4.6 INSPECTION METHODOLOGY

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

Table 4-11: Initial Random Sample for Inspection

Category	Customer Name
Lighting	USAA – LL
	Fountainhead Tower
	Tesoro Corporate Headquarters
	John B Sanfilippo & Sons LL
	Endura Advisory Group
	Garden Ridge LP
	Holiday Inn
	SAISD
	Walgreens #11520
	City of San Antonio/Municipal Building
HVAC	Tesoro Corporate Headquarters
	Alamo Cement
	Target #2452
	MSB Pacific Plaza L.P.
	One Oak Hills Place
	Stevenson Middle School
	Holiday Inn
	9311 Property Interests, LTD
	Walgreens #11520
Window	Manana Acquisition Corp.
	The San Antonio Country Club
Roof	USAA – LL
	Tesoro Corporate Headquarters
	John B Sanfilippo & Sons LL
	Holiday Inn
Motor	The San Antonio Country Club

All the selected sites were inspected for reported measures. The percentage of kW savings represented by the selected sites is listed in Table 4-11. All projects that were inspected matched the post-retrofit conditions as stated in the customer submittal. The table below illustrates the sample size of actual inspected projects, along with the percentage of savings that the sample contributed to the overall program savings.

Table 4-12: Inspected Sample

Program	Number of Inspected Projects	Inspected kW	Total kW*	Inspected kW %
Lighting	11	1,271	5,170	22%
HVAC	9	1,103	4,199	26%
Window	2	N/A	N/A	N/A
Roof coating	4	N/A	N/A	N/A
Motor	1	0.4	0.4	100%

***The Savings numbers listed in this table are based on savings estimated by CPS Energy for Program Year 2009. These savings are not verified savings.**

5.1 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 5-1:

Table 5-1: 2009 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)
CFL	65,292,530	6,483	76,446	0.80	52,234,024	5,186	61,157
Home Efficiency	1,952,372	792	861	0.93	1,815,706	737	801
Residential HVAC	7,173,440	2,187	2,734	0.95	6,814,768	2,078	2,597
Peak Saver	735,677	13,048	13,048	1.00	735,677	13,048	13,048
Solar Initiative	327,694	176	176	1.00	327,694	176	176
Air Flow Performance	490,775	243	304	0.90	441,698	219	274
Residential Subtotal	*75,972,488*	*22,929*	*93,569*	-	*62,369,566*	*21,444*	*78,052*
Commercial Lighting	21,739,518	4,884	5,596	0.85	18,478,590	4,151	4,757
Commercial HVAC	5,032,168	2,253	2,974	0.96	4,830,881	2,163	2,855
Commercial Other (Motors, Window Film, Roof Coating, Other)	454,049	150	179	0.89-0.94	418,501	135	161
Demand Response	615,439	16,884	16,884	1.00	615,439	16,884	16,884
Commercial Subtotal	*27,841,174*	*24,171*	*25,633*	-	*24,343,412*	*23,333*	*24,657*
Total	***103,813,662***	***47,100***	***119,202***		***86,712,978***	***44,777***	***102,709***

Figure 5-1 and Figure 5-2 present a breakdown of the contribution by each program to the overall net program impacts:

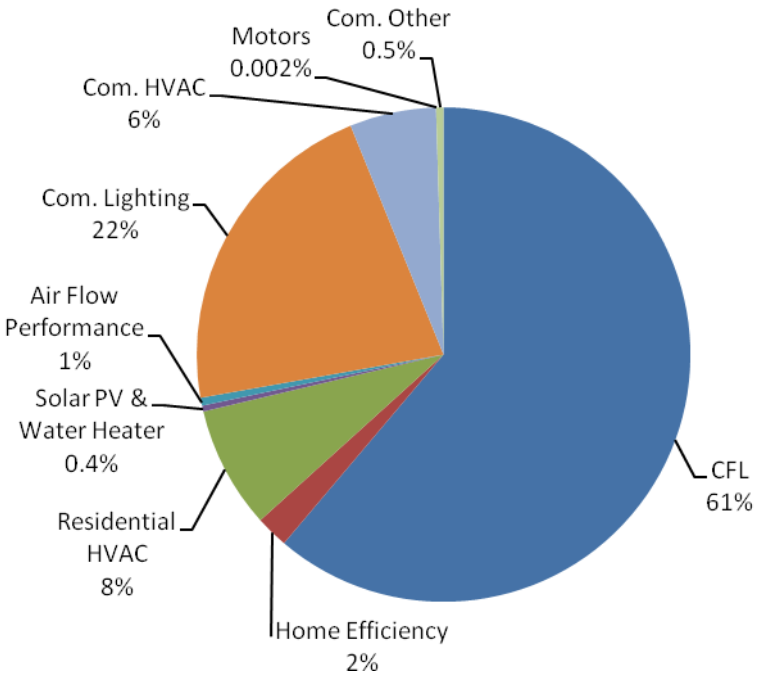

Figure 5-1: 2009 Energy (kWh) Savings by Program

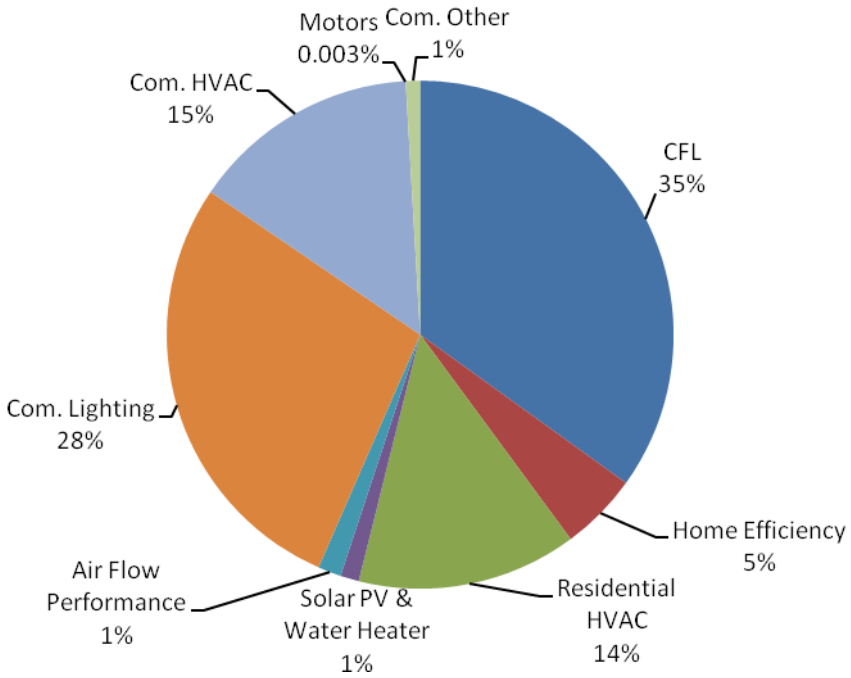

Figure 5-2: 2009 Peak Demand (kW) Savings by Program

Figure 5-3 presents a comparison of the peak demand savings achieved by the 2009 program offerings compared with the 2008 program results:

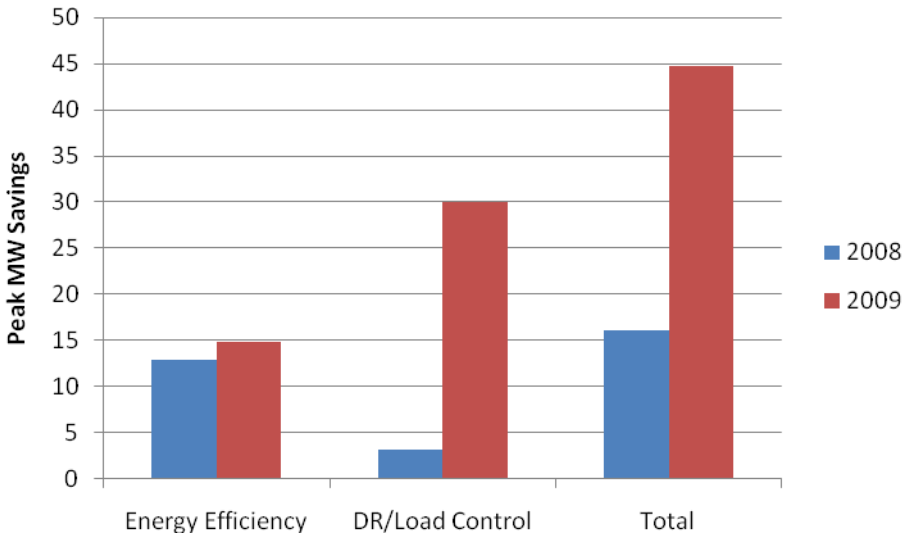

Figure 5-3: Comparison of 2008 and 2009 Peak Demand (kW) Savings

5.2 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

5.3 ECONOMIC ANALYSIS

The economic evaluation of CPS Energy's 2009 DSM program offerings included collection of all program-related costs, which are summarized in Table 5-2. 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 5-2: 2009 Program Expenditures

Category	Amount
Program Management and Marketing Costs	$3,595,144
Rebates and Incentives Paid	$16,846,918
Total Program Expenditures	$20,442,063

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]:

$$CSE = \frac{\$15{,}419{,}461 \times 0.1753}{85{,}361{,}862 \ kWh} = \mathbf{\$0.032/kWh}$$

- Net Reduction in Revenue Requirements

RRR = $30,772,795 - $20,442,063 = **$10,330,732**

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

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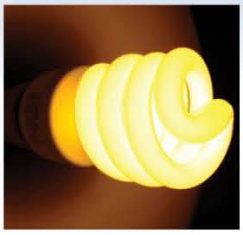



ADDENDUM TO
Measurement and Verification of CPS Energy's 2009 DSM Program Offerings

Submitted to CPS Energy

Submitted by Nexant

June, 2010

Nexant

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1 EXECUTIVE SUMMARY

Subsequent to filing the *Measurement and Verification of CPS Energy's 2009 DSM Program Offerings* report with CPS Energy, Nexant received additional data on select programs and projects as well as clarifying information on existing data that has impacted the M&V findings and results. Therefore, this addendum to the original M&V report includes updated energy and demand savings and program cost data for CPS Energy's 2009 demand side management (DSM) programs. Updated results listed in this addendum supersede results listed in the original report.

1.1 SUMMARY OF ENERGY AND DEMAND IMPACTS

Net energy and demand savings are listed in Table 1-1A for individual programs, as well as totals by sector and overall. Table 1-1A replaces Table 1-1 in the original M&V report.

Table 1-1A: 2009 Net Energy and Demand Savings

Program	Energy Savings (kWh)	Peak Demand Savings (kW)	Non-Coincident Demand Savings (kW)
Energy Efficiency Programs			
CFL	52,277,117	6,754	79,573
Home Efficiency	1,815,706	737	801
Residential HVAC	6,814,768	2,078	2,597
Solar Initiative	327,694	176	176
Air Flow Performance	441,698	219	274
Wash Right	309,860	130	527
Residential Subtotal	*61,986,843*	*10,094*	*83,948*
Commercial Lighting	18,478,590	4,151	4,757
Commercial HVAC	5,257,919	2,371	3,110
Commercial Other (Motors, Window Film, Roof Coating, Other)	418,501	135	161
Non-Residential Subtotal	*24,155,010*	*6,657*	*8,028*
Energy Efficiency Total	*86,141,853*	*16,751*	*91,976*
Demand Response/Load Control Programs[1]			
Peak Saver	735,677	16,702	16,702
Demand Response	615,439	16,884	16,884
DR/Load Control Total	*1,351,116*	*33,586*	*33,586*
Overall DSM Program Total	***87,492,969***	***50,336***	***125,562***

[1] Demand Response and Load Control program savings are based on the total available savings per event. Peak demand savings are equivalent to non-coincident demand savings for these programs because curtailment events are called during the summer peak period; therefore all demand savings occur on-peak.

2 UPDATED PROGRAM FINDINGS AND IMPACTS

2.1 COMPACT FLUORESCENT LAMPS (CFL) PROGRAM

CPS Energy provided Nexant with updated totals of CFLs purchased through the end of the 2009 program year. The updated totals represent the final bulb counts based on coupon reimbursements paid to participating vendors in 2009, and include 1,171,165 coupons for single pack bulbs and 555,777 multi-pack coupons. The total number of CFLs given away by CPS Energy in 2009 was unchanged from the original report (10,574 bulbs).

Based on the final bulb counts, the gross energy and demand savings calculated for the CFL program are listed in Table 2-1A below (this table replaces Table 3-2 in the original report):

Table 2-1A: CFL Program Gross Energy and Demand Savings

Energy Savings (kWh)	Peak Demand Savings (kW)	Non-coinc. Demand Savings (kW)
65,346,396	8,442	99,466

The updated bulb count also impacted the overall program economics, which are updated in Section 3 below.

2.2 PEAK SAVER PROGRAM

Peak Saver participation totals used in the original M&V report were based on the number of participants enrolled as of the last Peak Saver event called in 2009, which occurred on September 3, 2009. CPS Energy has provided Nexant with updated Peak Saver participation information that includes customers enrolled through the end of the 2009 fiscal year: 10,733 customers had Peak Saver thermostats installed in 2009, bringing the overall total program participation to 25,696 customers.

As stated in the original M&V report, direct load control programs typically have two metrics for determining impacts:

- *Enrolled kW*, which is the total amount of load available to be curtailed when needed
- *Achieved kWh*, which is the actual impact realized during the previous year

The updated gross energy and demand savings calculated for the Peak Saver program are listed in the following table, which replaces Table 3-13 in the original M&V report:

Table 2-2A: Peak Saver Gross Energy and Demand Savings

Energy Savings (kWh)	Peak Demand Savings (enrolled kW)	Non-coinc. Demand Savings (enrolled kW)
735,677	16,702	16,702

The totals in Table 2-2A represent the energy savings and enrolled kW for all Peak Saver participants. The contribution from Peak Saver customers enrolled in 2009 is 6,976 kW.

2.3 RESIDENTIAL WASH RIGHT PROGRAM

CPS Energy's Wash Right program is 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]. 2009 program participation data was not available for the original M&V report; therefore, energy and demand impacts for the Wash Right program were not included in the report. Wash Right program costs were included in the overall portfolio cost data provided for the original report and were included in the Program Economics section of the report. However, because project level data was not available, customer incentives paid for the Wash Right program were not classified in the "Rebates and Incentives Paid" category, but were included in the "Program Management and Marketing Costs" category. The program economics listed in Table 3-2A below have been updated to appropriately classify the Wash Right incentives paid in 2009.

2.3.1 Savings Calculations

CPS Energy provided Nexant with customer and equipment information for all 2,331 clothes washers that received a 2009 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:

[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.

Table 2-3A: 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
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 was calculated to be 144 kWh per unit.

2.3.2 Findings and Recommendations

The gross energy and demand savings calculated for the Wash Right program are listed in Table 2-4A below:

Table 2-4A: Wash Right Program Gross Energy and Demand Savings

Energy Savings (kWh)	Peak Demand Savings (kW)	Non-coinc. Demand Savings (kW)
334,984	140	570

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

- The program may consider recording additional project information in the program database, including efficiency ratings and clothes washer volume.

2.4 COMMERCIAL HVAC PROGRAM

The 2009 Commercial HVAC program included projects at both existing facilities and new construction. The original M&V report calculated the energy and demand impacts of the high efficiency HVAC equipment installed through the program using the conservative assumption that all projects were new construction projects, which, as stated in Section 4.3.2 of the report, use

ASHRAE 90.1-1999 standards for baseline equipment efficiencies. Savings for retrofits at existing facilities use ASHRAE 90.1-1989 standards for baseline equipment efficiencies, which typically have lower efficiency standards. In reviewing the project data in more detail and with assistance from CPS Energy to identify and classify the HVAC projects, Nexant has identified the projects that were installed at existing facilities and has updated the savings calculations for these projects using ASHRAE 90.1-1989 as the standard baseline.

Based on the revised calculations, the updated gross energy and demand savings calculated for the Commercial HVAC program are listed in the following table, which replaces Table 4-6 in the original M&V report:

Table 2-5A: Commercial HVAC Gross Energy and Demand Savings

Energy Savings (kWh)	Peak Demand Savings (kW)	Non-coinc. Demand Savings (kW)
5,476,999	2,470	3,240

3 TOTAL IMPACTS AND COST-EFFECTIVENESS SUMMARY

3.1 NET PROGRAM IMPACTS

Based on the changes to the savings calculations for the CFL, Peak Saver, Wash Right, and Commercial HVAC programs, Table 3-1A lists the updated program gross savings and net impacts. Table 3-1A replaces Table 5-1 in the original M&V report.

Table 3-1A: 2009 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							
CFL	65,346,396	8,442	99,466	0.80	52,277,117	6,754	79,573
Home Efficiency	1,952,372	792	861	0.93	1,815,706	737	801
Residential HVAC	7,173,440	2,187	2,734	0.95	6,814,768	2,078	2,597
Solar Initiative	327,694	176	176	1.00	327,694	176	176
Air Flow Performance	490,775	243	304	0.90	441,698	219	274
Wash Right	334,984	140	570	0.93	309,860	130	527
Residential Subtotal	*75,625,661*	*11,980*	*104,111*	-	*61,986,843*	*10,094*	*83,948*
Commercial Lighting	21,739,518	4,884	5,596	0.85	18,478,590	4,151	4,757
Commercial HVAC	5,476,999	2,470	3,240	0.96	5,257,919	2,371	3,110
Commercial Other (Motors, Window Film, Roof Coating, Other)	454,049	150	179	0.89-0.94	418,501	135	161
Commercial Subtotal	*27,670,566*	*7,504*	*9,015*	-	*24,155,010*	*6,657*	*8,028*
Energy Efficiency Total	*103,296,227*	*19,484*	*113,126*	-	*86,141,853*	*16,751*	*91,976*
Demand Response/Load Control Programs							
Peak Saver	735,677	16,702	16,702	1.00	735,677	16,702	16,702
Com. Demand Response	615,439	16,884	16,884	1.00	615,439	16,884	16,884
DR/Load Control Total	*1,351,116*	*33,586*	*33,586*	-	*1,351,116*	*33,586*	*33,586*
Overall DSM Program Total	***104,647,343***	***53,070***	***146,712***		***87,492,969***	***50,336***	***125,562***

Figure 3-1A and Figure 3-2A present a breakdown of the contribution by each energy efficiency program to the overall net program impacts (and replace Figure 5-1 and 5-2 in the original M&V report):

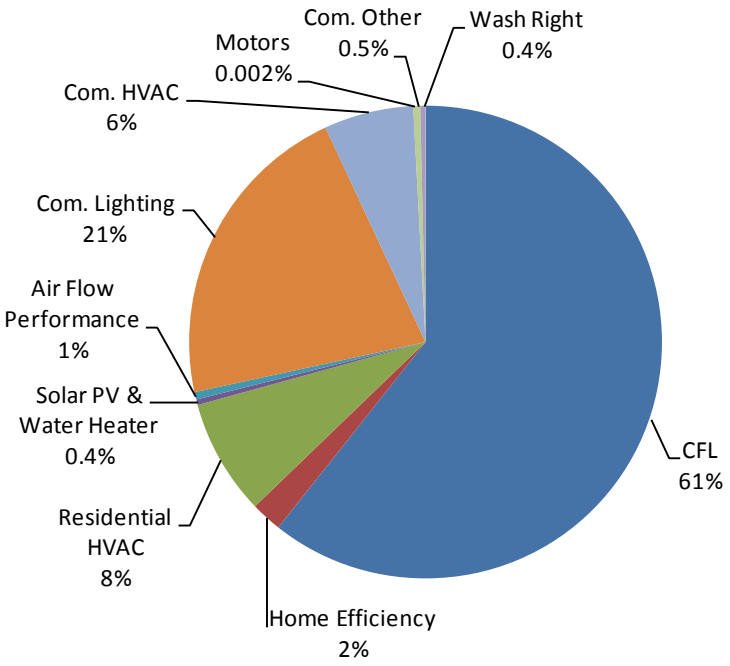

Figure 3-1A: 2009 Energy (kWh) Savings by Energy Efficiency Program

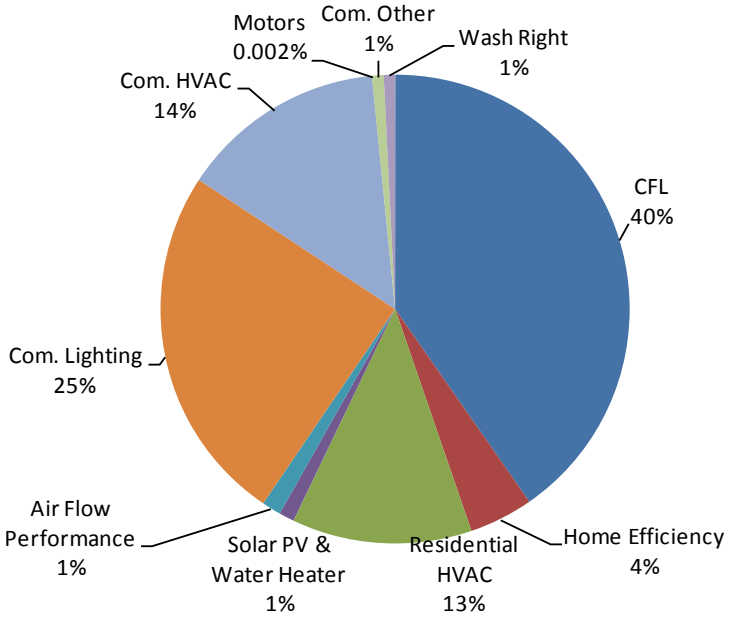

Figure 3-2A: 2009 Peak Demand (kW) Savings by Energy Efficiency Program

Figure 3-3A presents a comparison of the peak demand savings achieved by the 2009 program offerings compared with the 2008 program results (and replaces Figure 5-3 in the original M&V report):

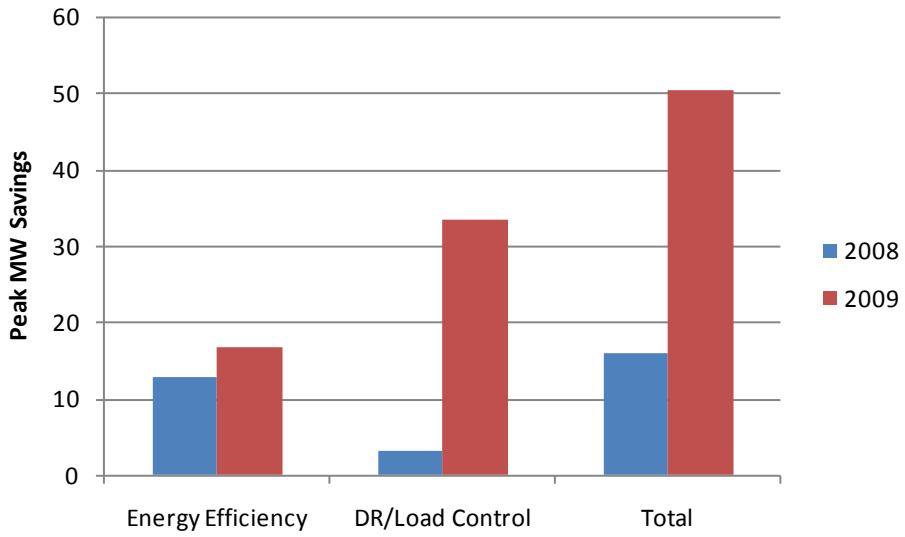

Figure 3-3A: Comparison of 2008 and 2009 Peak Demand (kW) Savings

3.2 ECONOMIC ANALYSIS

Program-related costs listed in the original M&V report included the correct total program expenditures; however, the breakdown of the costs into customer incentives and other program costs has been updated based on the revisions described in this addendum. Updated 2009 program costs are included in Table 3-2A, which replaces Table 5-2 in the original M&V report.

Table 3-2A: 2009 Program Expenditures

Category	Amount
Program Management and Marketing Costs	$2,399,239
Rebates and Incentives Paid	$18,042,823
Total Program Expenditures	$20,442,063

The updated program costs have also impacted the cost-effectiveness metrics include in the original M&V report. The updated calculations and results should replace the results listed in Section 5.3 of the original report and are as follows:

- Cost of Saved Energy[1]:

$$CSE = \frac{\$15{,}419{,}461 \; x \; 0.1745}{86{,}141{,}853 \;\; kWh} = \textbf{\$0.031/kWh}$$

- Net Reduction in Revenue Requirements

RRR = $31,115,885 - $20,442,063 = **$10,673,823**

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

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