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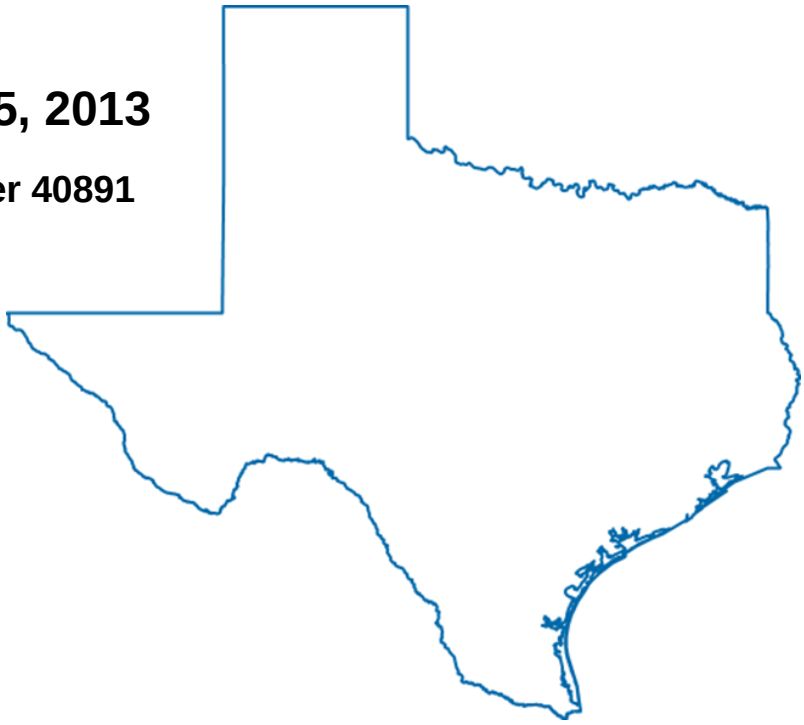
Public Utility Commission of Texas

Annual Statewide Portfolio Evaluation, Measurement, and Verification Report—Program Year 2012 Final

November 5, 2013

Project Number 40891



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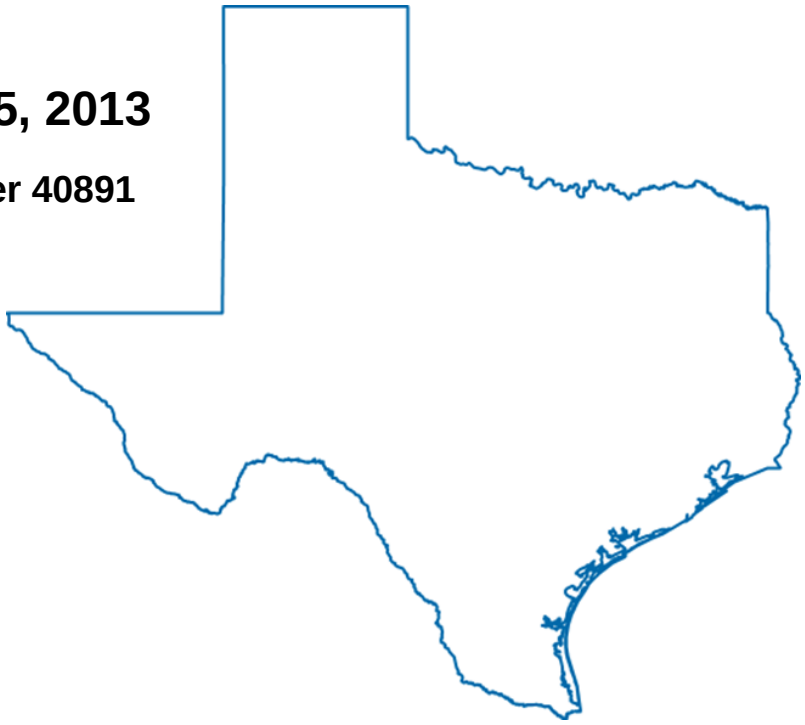

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Acknowledgements

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Acronyms

AEP TCC	American Electric Power Texas Central Company
AEP TNC	American Electric Power Texas North Company
C&I	Commercial and Industrial
CNP	CenterPoint Energy Houston Electric, LLC
DI	Direct Install
ECM	Energy Conservation Measure
EEPR	Energy Efficiency Plan and Report
Entergy	Entergy Texas, Inc.
EPE	El Paso Electric Company
ESNH	ENERGY STAR® New Homes
EM&V	Evaluation, Measurement, and Verification
kW	Kilowatt
kWh	Kilowatt Hour
HPwES	Home Performance with ENERGY STAR
LI/HTR	Low Income/Hard To Reach
LM	Load Management
mcf	1,000 cubic feet
MF	Multifamily
MTP	Market Transformation Program
M&V	Measurement and Verification
NTG	Net-to-Gross
PUCT	Public Utility Commission of Texas
PY	Program Year
QA/QC	Quality Assurance/Quality Control
RFP	Request for Proposals
Sharyland	Sharyland Utilities, L.P.
SOP	Standard Offer Program
Xcel SPS	Southwestern Public Service Company (subsidiary of Xcel Energy)
SWEPCO	Southwestern Electric Power Company
TNMP	Texas New Mexico Power Company
TRM	Technical Reference Manual

1. EXECUTIVE SUMMARY

Independent evaluation, measurement, and verification (EM&V) was conducted for Texas electric investor-owned utilities' Program Year 2012 (PY2012) energy efficiency portfolios.

In 2011, the Texas Legislature enacted SB 1125, which required the Public Utility Commission of Texas (PUCT) to develop an EM&V framework that promotes effective program design and consistent and streamlined reporting. The EM&V framework is embodied in P.U.C. SUBST. R. 25.181 (§25.181), relating to Energy Efficiency Goal (Project No. 39674).

The PUCT selected through the Request for Proposals (RFP) 473-13-00105, Project No. 40891 a third-party EM&V team. This team is led by Tetra Tech and includes Texas A&M Center for Applied Technology, Texas Energy Engineering Services, Inc. (TEESI), The Cadmus Group, Itron, and Johnson Consulting Group (hereafter, "the EM&V team").

The objectives of the EM&V effort are to:

- Document gross and net energy and demand impacts of utilities' individual energy efficiency and load management portfolios
- Determine program cost-effectiveness
- Provide feedback to the PUCT, utilities, and other stakeholders on program portfolio performance
- Prepare and maintain a statewide Technical Reference Manual (TRM).

1.1 METHODOLOGY OVERVIEW

PY2012 is the first program year evaluated as part of the statewide EM&V effort and reflects a reduced level of EM&V (§25.181(q)(12)). Therefore, PY2012 did not include primary data collection except for PUCT and utility program staff interviews to understand program operations and inform the evaluation planning process.[1]

First, the EM&V team conducted program tracking system reviews across all utility programs. This review assessed program tracking system linkages to deemed savings tools or methods used to estimate savings at the measure and site level. Then, projects were sampled across each utility program for comprehensive desk reviews, which reviewed program documentation for accuracy and completeness.

The EM&V reviews:

1. Confirmed that the measures installed are consistent with those listed in the tracking system

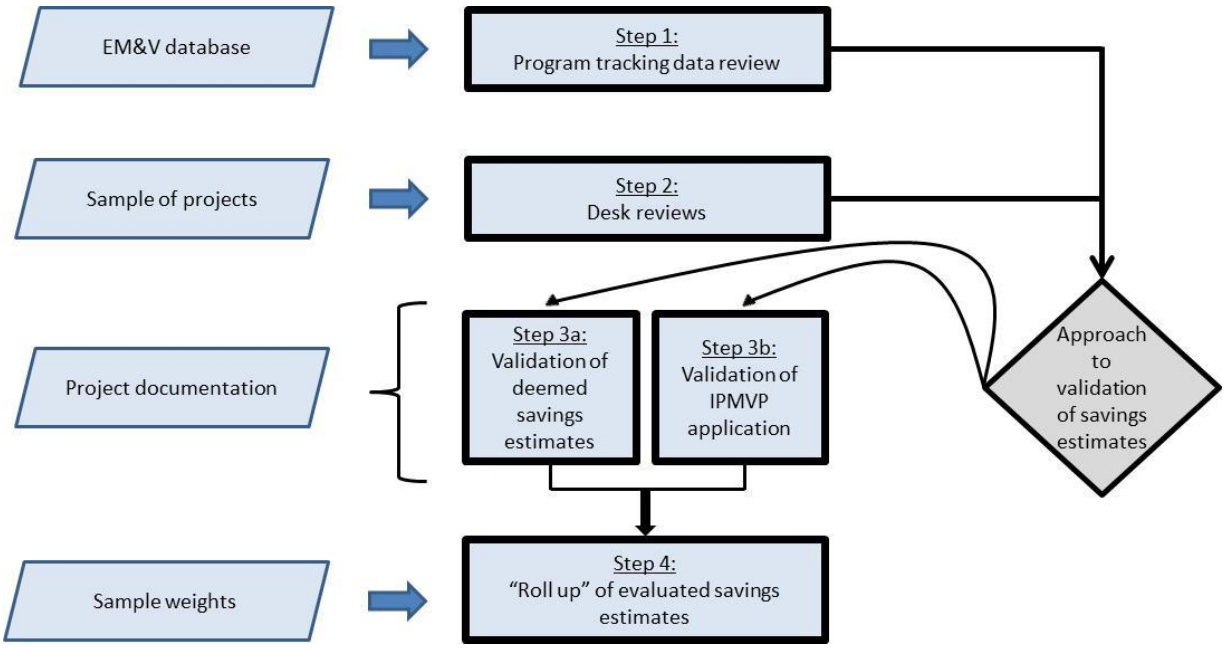
[1] Program Year 2013 EM&V includes interviews with utility staff, customers, Energy Efficiency Service Providers (EESPs), and on-site M&V.

2. Verified that the savings estimates in the tracking system are consistent with the savings calculated in the deemed calculation tools or tables or measurement and verification (M&V) methods used to estimate project savings
3. Reviewed savings assumptions and, when available, utility M&V reports gathered through the supplemental data request for sampled projects.

Energy efficiency program evaluations routinely employ 90% confidence intervals with ±10% precision as the industry standard ("90/10"). The sampling process for desk reviews was designed to achieve a minimum of 90/10 relative precision for evaluated savings estimates at the utility portfolio level.

The evaluated savings are based on project-level realization rate calculations that are then weighted to represent program-level, sector-level, and portfolio-level realization rates. These realization rates incorporate any adjustments for incorrect application of deemed savings values and any equipment details determined through the tracking system and desk reviews. For example, baseline assumptions or hours of use may be corrected through the evaluation review and thus affect the realization rates. A flow chart of the realization rate calculations is below.

Figure 1-1. Realization Rate Flowchart



A complementary component of the realization rate is the sufficiency of program documentation provided to estimate evaluated savings. The EM&V team ranked the uncertainty of the evaluation results based on the level and comprehensiveness of program documentation received to complete the desk reviews.

For the utility program documentation score, the ranking of "good" was given if 90% or more of the evaluated savings estimates received a ranking of low or medium uncertainty due to

program documentation received as indicated in detailed program findings. A ranking of "fair" was given if 70%–89% of the evaluated savings estimates received a ranking of low or medium. A ranking of "limited" was given if less than 70% of savings received an uncertainty ranking of low or medium. In general, a ranking of "good" indicates the utility has established processes to collect sufficient documentation to verify savings; a ranking of "fair" also indicates established processes with some areas of improvements identified; and a ranking of "limited" indicates program documentation improvements across more individual programs and/or high savings programs have been identified.

The EM&V team conducted cost-effectiveness testing using the program administrator cost test for PY2012 claimed and evaluated results. Low-income programs were also calculated using the Savings-to-Investment Ratio (SIR).

1.2 KEY FINDINGS

1.2.1 Evaluated savings

Overall, evaluated savings closely matched utility claimed savings with realization rates close to 100 percent across all of the utilities' portfolios. Statewide, the demand savings realization rate is 101.1 percent and the energy savings realization rate is 100.1 percent. For PY2012, evaluated annual savings from all ten of the utilities' programs were 480,631,457 kWh and 402,061 kW. CenterPoint programs contributed the largest percentage of statewide kW savings, and Oncor programs contributed the largest percentage of statewide kWh savings.

Evaluated savings results are shown below across all utilities first at the portfolio level, followed by commercial sector, residential sector, load management, and pilot results.

A. Portfolio results

The overall kW portfolio realization rates are primarily driven by the load management realization rates, which account for the largest contributor to demand savings for all utilities.

Table 1-1 shows the claimed and evaluated demand savings for each utility's portfolio for PY2012 and the precision levels around the evaluated savings estimates at a 90% confidence interval.

In addition, the sufficiency of program documentation provided to the EM&V team to complete a third-party due diligence review of evaluated demand savings is indicated as good, fair, or limited. As an example, four of the utilities (CenterPoint, El Paso Electric, Oncor and SWEPCO) received the highest documentation score of "good" for kW savings. This was largely a result of the level of information provided to verify load management programs' savings, including baseline and interval meter data, and these programs' large contribution to overall portfolio kW savings.

Table 1-1. Program Year 2012 Claimed and Evaluated Demand Savings—Total Portfolio

Utility	Percent Statewide Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Precision at 90% Confidence	Program Documentation Score
AEP TCC	8.4%	33,430	33,742	100.9%	0.43%	Limited
AEP TNC	1.5%	6,020	6,003	99.7%	0.01%	Fair
CenterPoint	43.1%	173,622	173,401	99.9%	0.10%	Good
El Paso Electric	3.0%	12,124	11,944	98.5%	0.29%	Good
Entergy	4.2%	17,190	16,999	98.9%	1.51%	Limited
Oncor	33.7%	129,496	135,369	104.5%	0.22%	Good
SWEPCO	3.3%	13,326	13,318	99.9%	4.49%	Good
TNMP	1.7%	7,093	7,028	99.1%	0.85%	Limited
Xcel SPS	1.1%	5,325	4,257	79.9%	2.69%	Limited

Table 1-2 shows the claimed and evaluated energy savings for each utility's portfolio for PY2012. While evaluated savings are similar to claimed savings, minor adjustments were made across all utilities' claimed savings.

In addition, the sufficiency of program documentation provided to the EM&V team to complete a third-party due diligence review of evaluated energy savings is indicated as good, fair or limited. The program documentation rankings varied considerably due to varying levels of program documentation across utilities. Only one utility received the highest program documentation score of "good" for kWh savings. Three utilities received "fair" rankings as documentation was generally sufficient with more targeted areas for improvement identified. While five utilities received a program documentation score of "limited," this is not a surprising finding given there has not previously been a statewide program documentation standard for the energy efficiency programs. The PY2012 EM&V research was used to provide specific program documentation recommendations.

Overall, program documentation available to verify nonresidential programs' savings was more comprehensive than program documentation available for residential programs. In general, the primary driver of limited rankings was lack of supporting documentation of residential program inputs into deemed savings calculations (i.e., square feet, pre/post-CFM levels, bulb wattage, or heating type) and project invoices or purchase orders for both residential and nonresidential programs that describe equipment quantities and specifications (i.e., make and model).

Table 1-2. Program Year 2012 Claimed and Evaluated Energy Savings—Total Portfolio

Utility	Percent Statewide Savings (kWh)	2012 Claimed Demand Savings (kWh)	2012 Evaluated Demand Savings (kWh)	Realization Rate (kWh)	Precision at 90% Confidence	Program Documentation Score
AEP TCC	11.0%	53,276,033	52,912,915	99.3%	0.94%	Limited
AEP TNC	1.5%	7,358,573	7,343,672	99.8%	0.05%	Limited
CenterPoint	26.8%	129,665,841	128,854,608	99.4%	0.47%	Fair
El Paso Electric	4.2%	20,700,626	19,946,730	96.4%	0.41%	Fair
Entergy	7.1%	33,692,878	33,884,617	100.6%	0.85%	Limited
Oncor	41.0%	194,826,841	197,236,018	101.2%	0.80%	Good
SWEPCO	3.9%	19,006,169	18,940,265	99.7%	3.21%	Fair
TNMP	2.6%	12,737,358	12,405,961	97.4%	1.83%	Limited
Xcel SPS	1.9%	9,077,223	9,106,671	100.3%	2.28%	Limited

B. Commercial sector results

Statewide PY2012 savings from commercial sector programs were 254,241,172 kWh and 56,114 kW. Realization rates were consistently close to 100 percent. Demand savings realization rates ranged from 96.6 to 100.7 percent and energy savings realization rates ranged from 94.8 to 101.1 percent.

Table 1-3 shows the claimed and evaluated demand savings for each utility's commercial energy efficiency portfolio for PY2012 and the precision levels around the evaluated savings estimates at a 90 percent confidence interval.

Table 1-3. Program Year 2012 Claimed and Evaluated Demand Savings—Commercial Sector

Utility	Percent Statewide Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Precision at 90% Confidence
AEP TCC	9.6%	5,376	5,367	99.8%	0.54%
AEP TNC	1.9%	1,088	1,079	99.2%	0.07%
CenterPoint	29.7%	16,791	16,667	99.3%	1.02%
El Paso Electric	6.2%	3,522	3,476	98.7%	0.16%
Entergy	8.0%	4,485	4,485	100.0%	0.00%

Utility	Percent Statewide Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Precision at 90% Confidence
Oncor	33.7%	18,794	18,922	100.7%	1.52%
SWEPCO	3.2%	1,793	1,788	99.7%	0.00%
TNMP	3.2%	1,848	1,785	96.6%	3.34%
Xcel SPS	4.5%	2,542	2,545	100.1%	0.00%

Table 1-4 shows the claimed and evaluated energy savings for each utility's commercial energy efficiency portfolio for PY2012. While evaluated savings are similar to claimed savings, minor adjustments were made across all utilities' claimed savings.

Table 1-4. Program Year 2012 Claimed and Evaluated Energy Savings—Commercial Sector

Utility	Percent Statewide Savings (kWh)	2012 Claimed Demand Savings (kWh)	2012 Evaluated Demand Savings (kWh)	Realization Rate (kWh)	Precision at 90% Confidence
AEP TCC	8.6%	22,032,523	21,989,820	99.8%	0.58%
AEP TNC	1.6%	4,037,459	4,066,083	100.7%	0.08%
CenterPoint	32.2%	83,028,065	81,924,164	98.7%	0.74%
El Paso Electric	5.8%	15,076,198	14,860,245	98.6%	0.51%
Entergy	6.3%	15,983,280	15,983,280	100.0%	0.01%
Oncor	37.3%	93,700,498	94,761,263	101.1%	1.66%
SWEPCO	3.2%	8,235,942	8,199,087	99.6%	0.00%
TNMP	2.3%	6,202,479	5,878,569	94.8%	3.86%
Xcel SPS	2.6%	6,543,796	6,578,662	100.5%	0.00%

C. Residential sector results

Statewide PY2012 energy savings from residential sector programs were somewhat less than commercial sector programs, with 220,594,691 kWh. However, residential sector programs' demand savings were higher than commercial programs with 67,605 kW. This is primarily due to a higher percent of seasonal peak demand measures in the residential programs than the nonresidential programs. While realization rates were also near 100 percent, there were three utilities with kW realization rates less than 98 percent for their residential programs.

Table 1-5 shows the claimed and evaluated demand savings for each utility's residential energy efficiency portfolio for PY2012 and the precision levels around the evaluated savings estimates at a 90 percent confidence interval.

Table 1-5. Program Year 2012 Claimed and Evaluated Demand Savings—Residential Sector

Utility	Percent Statewide Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Precision at 90% Confidence
AEP TCC	14.1%	9,726	9,526	97.9%	1.48%
AEP TNC	1.6%	1,111	1,103	99.3%	0.00%
CenterPoint	24.1%	16,280	16,268	99.9%	0.26%
El Paso Electric	1.9%	1,356	1,293	95.4%	2.61%
Entergy	10.8%	7,511	7,320	97.5%	3.51%
Oncor	38.6%	25,852	26,091	100.9%	0.27%
SWEPCO	4.1%	2,793	2,795	100.1%	21.37%
TNMP	3.4%	2,320	2,319	100.0%	0.07%
Xcel SPS	1.3%	881	890	101.0%	12.88%

Table 1-6 shows the claimed and evaluated energy savings for each utility's residential energy efficiency portfolio for PY2012. While evaluated savings are similar to claimed savings, minor adjustments were made across all utilities' claimed savings. There is one utility with a kWh realization rate less than 90 percent, but this was due to one program, and the issue has been corrected for PY2013.

Table 1-6. Program Year 2012 Claimed and Evaluated Energy Savings—Residential Sector

Utility	Percent Statewide Savings (kWh)	2012 Claimed Demand Savings (kWh)	2012 Evaluated Demand Savings (kWh)	Realization Rate (kWh)	Precision at 90% Confidence
AEP TCC	13.0%	29,113,127	28,787,341	98.9%	1.67%
AEP TNC	1.4%	3,081,309	3,031,240	98.4%	0.00%
CenterPoint	20.9%	46,213,192	46,084,238	99.7%	0.10%
El Paso Electric	1.9%	4,723,590	4,181,906	88.5%	0.74%
Entergy	8.1%	17,709,598	17,901,337	101.1%	1.61%
Oncor	46.5%	101,126,344	102,474,755	101.3%	0.12%

Utility	Percent Statewide Savings (kWh)	2012 Claimed Demand Savings (kWh)	2012 Evaluated Demand Savings (kWh)	Realization Rate (kWh)	Precision at 90% Confidence
SWEPCO	4.1%	9,085,620	9,078,473	99.9%	6.68%
TNMP	3.0%	6,534,879	6,527,393	99.9%	0.09%
Xcel SPS	1.1%	2,533,428	2,528,009	99.8%	8.21%

D. Load management results

Statewide PY2012 savings from load management programs were 1,085,549 kWh and 276,630 kW.

Table 1-7 shows the claimed and evaluated demand savings for each utility's load management portfolio for PY2012 and the precision levels around the evaluated savings estimates at a 90 percent confidence interval. Evaluated savings were very similar to claimed savings except for one utility. The issue has already been discussed with the utility and the utility has implemented a process change for its load management program. Therefore, future program year realization rates should be higher.

Table 1-7. Program Year 2012 Claimed and Evaluated Demand Savings—Load Management

Utility	Percent Statewide Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Precision at 90% Confidence
AEP TCC	6.5%	17,437	17,957	103.0%	0.00%
AEP TNC	1.3%	3,713	3,712	100.0%	0.00%
CenterPoint	50.8%	140,550	140,466	99.9%	0.00%
El Paso Electric	2.5%	7,035	6,963	99.0%	0.00%
Entergy	1.9%	5,194	5,194	100.0%	0.00%
Oncor	32.7%	84,849	90,356	106.5%	0.00%
SWEPCO	3.0%	8,237	8,237	100.0%	0.00%
TNMP	1.1%	2,925	2,924	100.0%	0.00%
Xcel SPS	0.3%	1,902	822	43.2%	0.00%

Table 1-8 shows the claimed and evaluated energy savings for each utility's load management portfolio for PY2012, which were often above 100 percent of the utility claimed

kWh savings. Adjustments to load management programs savings were primarily due to utilities' averaging kWh savings from curtailment events instead of adding them.

Table 1-8. Program Year 2012 Claimed and Evaluated Energy Savings—Load Management

Utility	Percent Statewide Savings (kWh)	2012 Claimed Demand Savings (kWh)	2012 Evaluated Demand Savings (kWh)	Realization Rate (kWh)	Precision at 90% Confidence
AEP TCC	9.1%	92,950	98,323	105.8%	0.00%
AEP TNC	1.6%	10,741	17,285	160.9%	0.00%
CenterPoint	77.7%	421,622	843,244	200.0%	0.00%
El Paso Electric	2.6%	24,112	27,852	115.5%	0.00%
Entergy	-	-	-	-	-
Oncor	-	-	-	-	-
SWEPCO	9.1%	98,845	98,845	100.0%	0.00%
TNMP	-	-	-	-	-
Xcel SPS	-	-	-	-	-

E. Pilot results

Statewide PY2012 savings from pilots programs were 4,710,045 kWh and 1,710 kW. Only one utility had realization rates less than 100 percent.

Table 1-9 shows the claimed and evaluated demand savings for each utility's set of pilot programs for PY2012 and the precision levels around the evaluated savings estimates at a 90 percent confidence interval. Evaluated savings were very similar to claimed savings.

Table 1-9. Program Year 2012 Claimed and Evaluated Demand Savings—Pilots

Utility	Percent Statewide Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Precision at 90% Confidence
AEP TCC	52.2%	892	892	100.0%	0.00%
AEP TNC	6.4%	109	109	100.0%	0.00%
CenterPoint	0.1%	1	1	100.0%	0.00%
El Paso Electric	12.3%	211	211	100.0%	0.00%
Entergy	-	-	-	-	-

Utility	Percent Statewide Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Precision at 90% Confidence
Oncor	-	-	-	-	-
SWEPCO	29.1%	503	497	98.8%	1.74%
TNMP	-	-	-	-	-
Xcel SPS	-	-	-	-	-

Table 1-10 shows the claimed and evaluated energy savings for each utility's pilot portfolio for PY2012.

Table 1-10. Program Year 2012 Claimed and Evaluated Energy Savings—Pilots

Utility	Percent Statewide Savings (kWh)	2012 Claimed Demand Savings (kWh)	2012 Evaluated Demand Savings (kWh)	Realization Rate (kWh)	Precision at 90% Confidence
AEP TCC	43.2%	2,037,432	2,037,432	100.0%	0.00%
AEP TNC	4.9%	229,064	229,064	100.0%	0.00%
CenterPoint	0.1%	2,962	2,962	100.0%	0.00%
El Paso Electric	18.6%	876,727	876,727	100.0%	0.00%
Entergy	-	-	-	-	-
Oncor	-	-	-	-	-
SWEPCO	33.2%	1,585,761	1,563,860	98.6%	1.80%
TNMP	-	-	-	-	-
Xcel SPS	-	-	-	-	-

1.2.2 Cost-effectiveness results

The overall cost-effectiveness of Texas energy efficiency programs was 2.52 including low-income programs and 2.71 excluding low-income programs from the analysis. With rounding, there is not a difference in statewide cost-effectiveness results based on evaluated and claimed savings.

Cost-effectiveness results are shown below across all utilities first at the portfolio-level, followed by commercial sector, residential sector, low-income programs, load management, and pilot programs.

A. Portfolio Results

Table 1-11 below summarizes the cost-effectiveness of each utility's energy efficiency portfolio both with and without low-income programs. The cost-effectiveness of the utilities' portfolios were fairly consistent, ranging from 2.39 to 3.16 based on evaluated savings results to 2.41 to 3.18 based on claimed savings. Cost-effectiveness increases somewhat across all of the utility portfolios that include low-income programs when these programs are excluded from the analysis. Cost-effectiveness without low-income programs ranged from 2.62 to 3.43 based on evaluated savings and 2.62 to 3.44 based on claimed savings.

Table 1-11. Program Year 2012 Cost-effectiveness Results—Total Portfolio

Utility	Claimed Savings Results	Evaluated Savings Results	Claimed Savings Results w/o low-income	Evaluated Savings Results w/o low-income
AEP TCC	2.66	2.64	2.89	2.86
AEP TNC	3.18	3.16	3.44	3.43
CenterPoint	2.41	2.39	2.63	2.62
El Paso Electric	3.18	3.14	3.18	3.14
Entergy	2.83	2.82	2.83	2.82
Oncor	2.44	2.47	2.62	2.65
SWEPCO	2.47	2.46	2.66	2.65
TNMP	2.5	2.45	2.7	2.64
Xcel SPS	2.89	2.88	3.23	3.21

B. Commercial sector results

Table 1-12 below summarizes the cost-effectiveness of each utility's commercial energy efficiency portfolio.

Commercial sector programs were the most cost-effective programs with an overall cost-effectiveness of 3.42 statewide. Again, the difference between evaluated and claimed savings was small enough that there is no difference in the rounded statewide results. There was more variation in commercial sector cost-effectiveness results, ranging from 2.86 to 4.93 based on evaluated savings and 2.83 to 5.00 based on claimed savings.

Table 1-12. Program Year 2012 Cost-effectiveness Results—Commercial Sector

Utility	Claimed Savings Results	Evaluated Savings Results
AEP TCC	4.29	4.28
AEP TNC	4.40	4.42
CenterPoint	3.80	3.75

Utility	Claimed Savings Results	Evaluated Savings Results
El Paso Electric	5.00	4.93
Entergy	3.51	3.51
Oncor	2.83	2.86
SWEPCO	3.92	3.91
TNMP	3.16	3.01
Xcel SPS	3.88	3.89

C. *Residential sector results*

Table 1-13 below summarizes the cost-effectiveness of each utility's energy residential efficiency portfolio.

Residential sector programs' cost-effectiveness statewide is 2.69 based on evaluated savings and 2.68 based on claimed savings. While most utilities' residential sector results were similar to the statewide average, one utility was substantially less (1.73 based on evaluated savings, 1.76 based on claimed savings) and one utility was substantially higher (3.46 based on evaluated savings, 3.50 based on claimed savings).

Table 1-13. Program Year 2012 Cost-effectiveness Results—Residential Sector

Utility	Claimed Savings Results	Evaluated Savings Results
AEP TCC	2.80	2.77
AEP TNC	3.50	3.46
CenterPoint	2.74	2.73
El Paso Electric	1.76	1.73
Entergy	2.56	2.55
Oncor	2.68	2.71
SWEPCO	2.71	2.71
TNMP	2.73	2.72
Xcel SPS	2.64	2.69

D. *Low-income results*

Table 1-14 below summarizes the cost-effectiveness of each utility's low-income energy efficiency portfolio.

As expected due to the higher program costs associated with serving this residential sector, low-income programs had the lowest cost-effectiveness results statewide at 1.3 (both claimed and evaluated).

Table 1-14. Program Year 2012 Cost-effectiveness Results—Low-income Sector

Utility	Claimed Savings Results	Evaluated Savings Results
AEP TCC	1.36	1.35
AEP TNC	1.77	1.63
CenterPoint	1.16	1.14
El Paso Electric	n/a	n/a
Entergy	n/a	n/a
Oncor	1.39	1.40
SWEPCO	0.80	0.78
TNMP	1.54	1.56
Xcel SPS	1.53	1.54

E. Load management results

Table 1-15 below summarizes the cost-effectiveness of each utility's load management energy efficiency portfolio.

Load management programs had the lowest cost-effectiveness of non-low-income full programs (non-pilots) at 1.36 based on evaluated savings and 1.34 based on claimed savings. However, load management programs serve a different purpose in the utilities' energy efficiency portfolio as they are a supply-side resource to be used when peak demand reduction is needed due to capacity constraints. The majority of the utilities had cost-effectiveness results for their load management programs similar to the statewide result, except for one utility that was substantially lower (0.40 based on evaluated savings, 0.92 based on claimed savings) and one that was substantially higher (3.30 based on evaluated and claimed savings).

Table 1-15. Program Year 2012 Cost-effectiveness Results—Load Management Sector

Utility	Claimed Savings Results	Evaluated Savings Results
AEP TCC	1.70	1.75
AEP TNC	3.30	3.30
CenterPoint	1.32	1.32
El Paso Electric	1.22	1.21
Entergy	1.13	1.13
Oncor	1.31	1.39

Utility	Claimed Savings Results	Evaluated Savings Results
SWEPCO	1.70	1.70
TNMP	1.07	1.07
Xcel SPS	0.92	0.40

F. Pilot results

Table 1-16 below summarizes the cost-effectiveness of each utility's pilot energy efficiency portfolio.

It is not surprising that the pilot programs had the lowest cost-effectiveness statewide results at 0.83 based on evaluated savings and 0.84 based on claimed savings. As discussed with PUCT staff, pilots are not required to pass the program administrator cost test (PACT) their first year of implementation to recognize program start-up costs, but are expected to pass during the second year. Allowing time to pass cost-effectiveness is industry standard, as pilot programs serve an important function in energy efficiency portfolios by exploring the feasibility of programs designed to increase market penetration of new technologies, reach underserved customer segments, and/or explore new distribution channels.

Table 1-16. Program Year 2012 Cost-effectiveness Results—Pilot Sector

Utility	Claimed Savings Results	Evaluated Savings Results
AEP TCC	0.76	0.76
AEP TNC	0.96	0.96
CenterPoint	0.72	0.71
El Paso Electric	1.77	1.77
Entergy	n/a	n/a
Oncor	n/a	n/a
SWEPCO	1.11	1.09
TNMP	0.66	0.66
Xcel SPS	n/a	n/a

1.3 RECOMMENDATIONS

The EM&V team identified recommendations across all of the utilities' portfolios to increase the transparency, accuracy, and evaluability of program savings going forward. Recommendations are provided in the following three areas: (1) program tracking, (2) program documentation, and (3) savings calculations.

1.3.1 Program tracking

Data are tracked and stored by many different parties in many different formats with varying level of detail. The EM&V team's review of PY2012 program tracking data generally found the data were complete and consistent with the utilities' reported savings in the Energy Efficiency Plan and Reports (EEPRs). Identified recommendations are for the utilities to:

- **Share program year results with external contractors[2] and the EM&V team as part of a data QA/QC process before filing the EEPRs with the PUCT.** Utilities did not consistently verify reported numbers with external contractors. Going forward, this should be an established process for both the utilities and external contractors that support the tracking data. Comparing reported savings from both parties would have allowed the utilities to catch any reporting errors more quickly. Doing so may also provide contractors with input where their data extracts or analyses are incorrect.
- **Modify data formats and details to improve data organization and transparency.** While the format of each program's tracking data varied, general recommendations are provided to be applicable to multiple programs. Program tracking systems should include (1) measure-specific information, rather than the measure-category information, (2) measure-related details used to calculate savings for partially deemed measures (e.g., AC SEER, AC tons, and AHRI number for residential air conditioning recipients), and (3) complete customer contact information. In addition, utilities should coordinate with the EM&V team to determine additional required program-specific tracking data fields (i.e., daily peak temperatures for load management programs, PV-related fields—tilt, azimuth, module, inverter quantities—for solar PV programs, etc.). Last, we recommend providing a unique identifier, such as ESIID, with all tracking data submitted to the EM&V team in response to data requests, and communicating any modifications in tracking system format and information to the EM&V team.
- **Work with the EM&V team to determine a consistent definition of participant by program type that should be used statewide.** The EM&V team found that utilities and contractors defined participants differently; therefore, the numbers could not be compared or consistently referenced. For example, one utility may reference a participant by account number, whereas another might identify a participant by a unique measure installed. Once the definitions are established, they should be communicated for consistency in calculations across all stakeholders including the EM&V team, utilities, and implementation contractors.

[2] P.U.C. SUBST. R. 25.181 does not contain a definition of *contractor*. We use this term to refer to external contractors who either implement programs for the utilities and/or maintain program tracking data for the utilities. We use this term to distinguish these entities from Energy Efficiency Service Providers (defined in P.U.C. SUBST. R. 25.181(c)(17)), which are market actors that install energy efficiency measures or perform energy efficiency services through the programs (e.g., a HVAC contractor who installs an efficient unit for an electric customer).

1.3.2 Program documentation

Similar to the variation in the ways data are being tracked across the utilities' programs, program documentation is also tracked and stored by many different parties and in different formats. Generally, project-level documentation is stored by a contractor if the program is implemented external to the utility. Identified recommendations are for the utilities to:

- **Develop and maintain program manuals.** The existence and content of program manuals varied across utility programs. Program manuals, or other documentation of program design and delivery, should be developed for each program and include the following critical elements: program goals and metrics, delivery methods (including any program marketing channels), participation requirements for both customers and EESPs, sample application form(s), required software or savings calculators, incentive delivery, payment processing, data tracking and reporting, and how energy savings are calculated. Additional information the program manual could include are: procedures for complaint resolution, quality control and quality assurance, and program governance. An addendum to the program manual could be an EESP participation agreement that outlines what is expected from EESPs, including customer service standards and project documentation.
- **Improve program documentation across energy efficiency programs, specifically information for measure-level savings verifications such as key project inputs and parameters.** Project-level documentation supporting savings calculations in tracking systems were often not well-documented, and in some cases, not documented at all. Given that the Texas utilities have not yet undergone a comprehensive EM&V effort, this is not surprising since no statewide standards for level of supporting program documentation had previously been established. The EM&V team was not able to replicate savings calculations for some programs, most particularly residential programs. The EM&V team identified a number of specific documentation improvements for nonresidential and residential sector programs such as supporting documentation regarding type of fixtures and quantities, equipment specifications, customer procurement documents that describe both equipment quantities and specifications, utility M&V reports, and sources of savings calculations (i.e., Deemed Savings Manual, National Energy Audit Tool (NEAT)).

1.3.3 Savings calculations

While the EM&V team generally found savings calculations reasonable, near-term updates in savings will improve the accuracy of PY2014 claimed savings. While the statewide Technical Reference Manual (TRM) will address many of the issues identified, the TRM will not be used as the basis of claimed savings until PY2015.[3] Identified recommendations for the utilities are as follows:

- **Update savings inputs to better estimate PY2014 claimed savings and apply updates consistently**. The EM&V team identified a number of specific changes for the nonresidential HVAC savings calculations. In addition, the baseline efficiency for

[3] Please refer to the Approach to Texas Technical Reference Manual, June 12, 2013, the Public Utility Commission of Texas EM&V team.

new homes programs should be updated to be consistent with the latest Texas residential building code (IECC 2009), which several utilities report has already been completed for PY2013. Finally, the EM&V research found that in PY2012, the utilities did not consistently apply changes to the deemed savings manual for the entire program year. We recommend that updates in a program year be applied consistently across all utilities.

1.4 CONCLUSIONS

The EM&V team found that utilities generally have well-established program design and delivery processes, supported by developed program tracking systems, program documentation and savings tools. This finding is supported by the generally healthy realization rates across utility portfolios. At the same time, across several utility programs, the EM&V team had limited documentation to verify claimed savings.

The objective of the EM&V recommendations is to facilitate more accurate, transparent, and consistent savings calculations and program reporting across the Texas energy efficiency programs. The EM&V team recognizes there is a trade-off between these objectives and program administration cost and program participation barriers. The EM&V team discussed these recommendations with the PUCT and utilities to inform statewide recommendations included in the PY2012 Annual Portfolio Report. The reasonable roll-out of recommendations was discussed given several of the recommendations require utility process changes as well as have administrative cost implications.

The recommendations were discussed and prioritized for future program year implementation at the Energy Efficiency Implementation Project (EEIP) meeting held October 22, 2013, consistent with §25.181(q)(9). The EM&V team and PUCT staff are working with each utility to establish an action plan and timeline for the implementation of the recommendations based on the prioritization agreed upon at the EEIP meeting.

2. INTRODUCTION

This document presents the third-party evaluation, measurement, and verification (EM&V) results for the Texas electric investor-owned utilities' energy efficiency portfolios implemented in Program Year 2012 (PY2012).

PY2012 is the first program year evaluated as part of the statewide EM&V effort and reflects a reduced level of EM&V (§25.181(q)(12)). For PY2012, the team conducted program tracking system reviews across all utility programs and desk reviews for sampled projects. These activities were designed to achieve a minimum of 90 percent confidence interval and 10 percent relative precision for gross evaluated savings estimates at the utility portfolio level.

The reviews provided an independent assessment of claimed savings and the accuracy of the program data. Documentation reviewed were tracking data, project files, energy savings calculations (including a review of input assumptions and algorithms to verify claimed program savings), and utilities' existing M&V information.

In addition, the PY2012 EM&V effort was used to identify additional information that may need to be collected or verified for Program Year 2013 (PY2013). PY2013 activities will include a combination of additional desk reviews, engineering calculations, tracking system analysis, participant surveys, market actor surveys, and on-site M&V.

The PY2012 and PY2013 EM&V plans[4] are based on the prioritization for the EM&V effort[5] presented and distributed for comment to the Energy Efficiency Implementation Project and approved by PUCT staff. To briefly summarize, the EM&V team identified 24 program types across utilities that have similar program design, delivery, and target markets. We reviewed each program type and prioritized (high, medium, low) based on the following considerations (Request for Proposals 473-13-00105, Project No. 40891, Scope of Work Task 1B (n)):

- Magnitude of savings—percentage contribution to the portfolio savings
- Level of relative uncertainty in estimated savings
- Level and quality of existing quality assurance and verification data from on-site inspections completed by utilities or their contractors
- Stage of program or programmatic component (e.g., pilot, early implementation, mature)
- Importance to future portfolio performance
- PUCT and Texas utilities' priorities.

[4] *Public Utility Commission of Texas Evaluation, Measurement, and Verification (EM&V) Plans for Texas Utilities' Energy Efficiency and Load Management Portfolios—Program Years 2012 and 2013*, June 12, 2013.

[5] *EM&V Prioritization for Program Years 2012 and 2013* to Katie Rich and Therese Harris, PUCT, from Lark Lee, EM&V project manager, May 1, 2013.

2.1 REPORT ORGANIZATION

Section 3 summarizes the evaluation approach. Sections 4–12 detail the EM&V results for each utility's portfolio. Section 13 discusses evaluation recommendations (Request for Proposals 473-13-00105, Project No. 40891, Scope of Work Task 5).

This report contains several appendices. A visual representation of the EM&V database import, review, and validation process can be found in Appendix A. An example desk review template is in Appendix B. The EM&V team's sampling and impact evaluation methodology are detailed in Appendix C by program categories and/or sectors. The calculations used for the PACT cost-effectiveness methodology are in Appendix D, and the EM&V team's quality assurance plan for the reported evaluated savings are in Appendix E.

3. EVALUATION APPROACH

This section discusses the PY2012 EM&V methodology organized around the following activities:

- Understanding portfolios
- Creating the EM&V database
- Implementing impact evaluations
- Cost-effectiveness testing
- Reporting.

3.1 UNDERSTANDING PORTFOLIOS

One of the first steps in the statewide EM&V effort was to understand the energy efficiency and load management portfolios for each utility and the context in which they operate. This was necessary for the EM&V effort to result in actionable feedback that can be used to improve program performance and reporting accuracy. Information was gathered primarily through meetings, utility staff interviews, program documentation review, and data tracking review. These activities directly informed the evaluation prioritization process and the EM&V plans.

3.1.1 Meetings

Immediately after contract execution, the EM&V team met with PUCT staff to clarify the objectives of the EM&V effort, priorities for the PY2012 and PY2013 evaluations, and use of the EM&V research and results. This initial meeting was followed with informational meetings with utilities and implementation contractors to review program data tracking systems and available data.

A utility EM&V kickoff meeting was then held with staff participating from all ten utilities. The objectives of the utility EM&V kickoff meeting were to confirm the primary objectives of the EM&V effort; reach a common understanding on the technical approach, project deliverables, and timeline; and establish a working relationship with the utilities, including processes for ongoing communication, review of deliverables, and program tracking data requests.

Scheduled biweekly and ad hoc meetings between the EM&V team and PUCT continued throughout the duration of the evaluation. The EM&V team also met with utilities and, when applicable, their implementation contractors, throughout the evaluation period. These meetings included meetings to review and discuss EM&V deliverables as well as ad hoc meetings.

To engage a wide range of stakeholders in the EM&V process in both up-front planning and the end results, an Energy Efficiency Implementation Project (EEIP) meeting was held to review the EM&V planning documents and another meeting will be held to review the PY2012 Annual Portfolio Evaluation Report results.

3.1.2 Utility staff interviews

All ten utilities completed in-depth interviews with the EM&V team in March 2013. These interviews helped the EM&V team gain knowledge of the utilities' territories; energy efficiency staff roles and responsibilities, and the extent to which outside contractors are used; portfolio history, mix of programs, and performance; and program design and delivery processes. The EM&V team conducted additional utility staff interviews as necessary across the course of the evaluation process.

3.1.3 Program documentation and tracking data review

To gain a broader perspective of the overall programs, the EM&V team reviewed §25.181 relating to Energy Efficiency Goal (Project No. 39674), related legislation and filings, 2012 and 2013 Energy Efficiency Program Plans and Reports, 2012 Energy Efficiency Cost Recovery Factor (EECRF) filings, Electric Utility Marketing Managers of Texas (EUMMOT) annual reports, and other information on the EUMMOT maintained website. The EM&V team collected and cataloged program documentation for each utility's program. Types of program-specific documentation reviewed included operating manuals, service provider applications, customer agreements, memoranda of understanding, sample customer reports (e.g., benchmarking), workshop presentations, and tools (e.g., the duct tool).

In addition, the EM&V team reviewed all utilities' program tracking data. The program tracking data served as the basis for sampling and verifying program impacts. The EM&V team conducted a preliminary tracking data review to understand how claimed savings are tracked and calculated and what data are available to the EM&V team, which fed into creating a statewide EM&V database to support evaluation activities (discussed next).

3.2 CREATING THE EM&V DATABASE

Another critical step in this evaluation process was to create a statewide EM&V Database with a streamlined data request process and secure retrieval system (Request for Proposals 473-13-00105, Project No. 40891, Scope of Work Task 1B (d)). Complete PY2012 program data was requested from utilities and integrated into the database. A visual representation of the EM&V database import, review, and validation process can be found in Appendix A.

The EM&V database allowed the EM&V team to complete:

- Due-diligence review of PY2012 claimed savings
- Program tracking system reviews
- Efficient sampling across utilities and programs.

3.3 IMPLEMENTING IMPACT EVALUATIONS

The impact evaluations are used to calculate realization rates. The realization rate is determined by dividing the evaluated savings by the utility claimed savings (Request for Proposals 473-13-00105, Project No. 40891, Scope of Work Task 1B (h)). Utility claimed savings are the EM&V team's replicated savings in the EM&V Database from the tracking systems. In the majority of cases, utility program-level claimed savings match those reported

in each utility's 2013 Energy Efficiency Plan and Report (EEPR). In some cases, the EM&V team's claimed savings do not match the EEPR. When there is a discrepancy, it is footnoted in this report along with the reason for the discrepancy.

For PY2012, the EM&V team performed a tracking system review and series of desk reviews for an initial assessment of the reasonableness of the claimed savings.

Demand side management program evaluations routinely employ 90% confidence intervals with ± 10% as the industry standard ("90/10"). The "90%" in the confidence interval represents a level of certainty about the estimate. If we were to repeatedly obtain new estimates using exactly the same procedure (by drawing a new sample, conducting new interviews, calculating new estimates and new confidence intervals), the confidence intervals would contain the average of all the estimates 90 percent of the time.

PY2012 evaluation activities were designed to achieve 90/10 relative precision for gross evaluated savings estimates at the utility portfolio level based on the sampling process used to select a random sample of participants that received desk reviews. The tracking system and desk reviews are discussed next.

3.3.1 Tracking system and desk reviews

For each program, the EM&V team reviewed the program tracking system and its linkage to any deemed savings tools or methods used to estimate savings at the measure and site level. Then for each utility program, the EM&V Team reviewed a sample of applications entered into the utilities' tracking systems for accuracy and completeness.

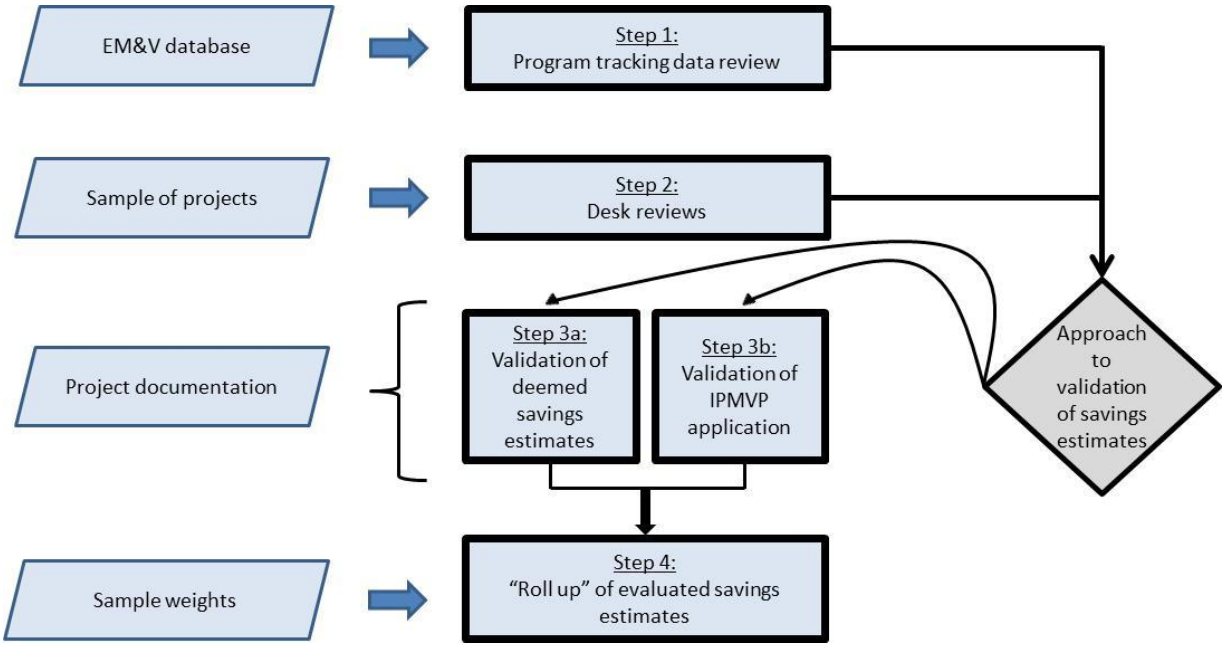
Our review accomplished two primary objectives. First, it ensured that the measures installed are consistent with those listed in the tracking system. Second, the desk reviews verified that the savings estimates in the tracking system are consistent with the savings calculated in the deemed calculation tools or tables or M&V methods used to estimate project savings (Request for Proposals 473-13-00105, Project No. 40891, Scope of Work Task 1B (f)).

The desk reviews included a review of the assumptions used for the savings assumptions and, when available, utility M&V reports gathered through the supplemental data request for sampled projects (Request for Proposals 473-13-00105, Project No. 40891, Scope of Work Task 1B (j)). An example desk review template is in Appendix B.[6]

The evaluated savings are based on project-level realization rate calculations that are then weighted to represent program-level and then portfolio-level realization rates. These realization rates incorporate any adjustments for incorrect application of deemed savings values and any equipment details determined through the tracking system and desk reviews. For example, baseline assumptions or hours of use may be corrected through the evaluation and thus affect the realization rates. In order to calculate evaluated savings, we will apply the realization rate determined from the EM&V sample to the population of projects. A flow chart of the realization rate calculations is below.

[6] The completed desk review template for each sampled project is provided to the utility and the PUCT.

Figure 3-1. Realization Rate Flowchart



The EM&V team's sampling and impact evaluation methodology are detailed in Appendix C by program categories and/or sectors as follows:

- Commercial standard offer programs
- Commercial market transformation programs
- Residential standard offer programs
- Residential market transformation programs
- Low-income/hard-to-reach programs
- Load management programs
- PV/solar programs.

3.3.2 Uncertainty ranking

The EM&V team assigned an "uncertainty" ranking of low, medium, or high to the evaluated savings estimates based on the level of program documentation provided to complete a third-party, due-diligence review of claimed savings.

Uncertainty rankings were assigned as follows:

- **LOW uncertainty:** >=90 percent of sampled projects have sufficient documentation
- **MEDIUM uncertainty:** 70 percent–<90 percent of sampled projects have sufficient documentation, the remaining sampled projects had limited or no documentation. Medium uncertainty was also given to nonresidential programs that had utility M&V

results available to verify savings in place of other supporting documentation with the needed equipment quantity and specification information such as equipment cut sheets.

- **HIGH uncertainty:** <70 percent of sampled projects have sufficient documentation, the remaining sampled projects had limited or no documentation.

Sufficient documentation is defined as the necessary information required to verify savings. For nonresidential programs, this included completed savings calculators, customer invoices, pre- and post-inspection reports, and equipment cut sheets. For residential programs, documentation provided all inputs needed to replicate the savings calculations based on the deemed savings manual or the approved calculation method as well as supporting materials.

Limited documentation is defined as documentation provided to verify some, but not all key inputs to savings calculations.

No documentation is defined as only the savings calculator or measure attributes was provided with no supporting materials.

3.4 COST EFFECTIVENESS TESTING

The EM&V team conducted cost-effectiveness testing using the program administrator cost test (PACT, also known as the Utility Cost Test) using PY2012 actual results except for low-income programs as discussed below. Cost-effectiveness tests were run using a uniform model for all utilities. The EM&V team collected required inputs for the model from several sources, including program tracking data, deemed savings, and the PUCT and utilities. Table 3-1 below lists the required inputs to the cost-effectiveness model and the sources of information (Request for Proposals 473-13-00105, Project No. 40891, Scope of Work Task 1B (i)).

Table 3-1. Cost-effectiveness Model Inputs and Sources

Model Input	Measurement Level	Source
Reported Energy/Demand Savings	Measure Type	EM&V Database
Summer/Winter Peak Coincidence Factors	Measure Type	Deemed savings
Effective Useful Life	Measure Type	Deemed savings
Incentive Payments	Program	EEPRs
Administrative and R&D Costs	Program/Portfolio	EEPRs
EM&V Costs[7]	Program/Portfolio	EM&V team budgets
Performance Bonus[8]	Portfolio	EEPRs
Avoided Costs	Statewide	PUCT (Utilities)

[7] EM&V costs were not known at the time of utilities' original cost-effectiveness analysis.
[8] Performance bonuses as an input into cost-effectiveness testing came into effect in 2013. Therefore, utilities' original cost-effectiveness calculations for PY2012 may not have included performance bonuses.

Model Input	Measurement Level	Source
Weighted Average Cost of Capital	Utility	Utilities
Line Loss Factor (non-ERCOT utilities only)	Utility	Utilities
Realization Rates	Program	Evaluation results

The EM&V team conducted PY2012 cost-effectiveness tests separately using claimed gross savings and evaluated gross savings. The model produces results at the portfolio, sector,[9] program category,[10] and program levels.

All benefits and costs are expressed in program year dollars. Benefits resulting from energy savings occurring in future years are net to program year dollars using the utility's weighted average cost of capital (WACC) as the discount rate.

When tests were conducted at a more disaggregated level than data was available, that data was allocated proportionate to costs (§25.181(h)(6)). For example, the performance bonus was calculated for the overall portfolio and allocated to individual programs proportionate to the programs' costs associated with meeting demand and energy goals. These program costs include program administrative and incentive costs. Portfolio-level costs include the performance bonus, EM&V, administrative, and R&D costs. However, it is important to note that some of these costs were made effective to the revisions to (§25.181), which was made effective on January 1, 2013; therefore, utilities may not have anticipated including all of these costs in their original planning assumptions.

Low-income programs were evaluated using the Savings-to-Investment Ratio (SIR). This model only includes net incentive payments under program costs. The SIR methodology is only used when specifically testing the low-income programs.

Portfolio-level cost-effectiveness analyses are based on the PACT and are shown including and excluding low-income and low-income/hard-to-reach customers.

The calculations used for the PACT cost-effectiveness methodology are in Appendix D.

3.5 REPORTING

There are two EM&V report deliverables per program year—(1) Interim Impact Evaluation Reports, and (2) Annual Portfolio Results. There are also a number of status reports, ad hoc reports, and data collection and sampling deliverables (Request for Proposals 473-13-00105, Project No. 40891, Scope of Work Task 1B (l)).

The Interim Impact Evaluation Reports are delivered separately for each utility and discussed with the PUCT and each utility *prior* to drafting the Annual Portfolio Report. This allows the EM&V team to discuss the impact results with the PUCT and utilities, receive their input, and conduct supplemental analysis if needed prior to the Annual Portfolio Report. The Annual Portfolio Report is a comprehensive report across all utility portfolios.

[9] Sectors are currently defined as Nonresidential, Residential, Hard-to-Reach, and Cross-sector.
[10] Program categories include Market Transformation and Standard Offer.

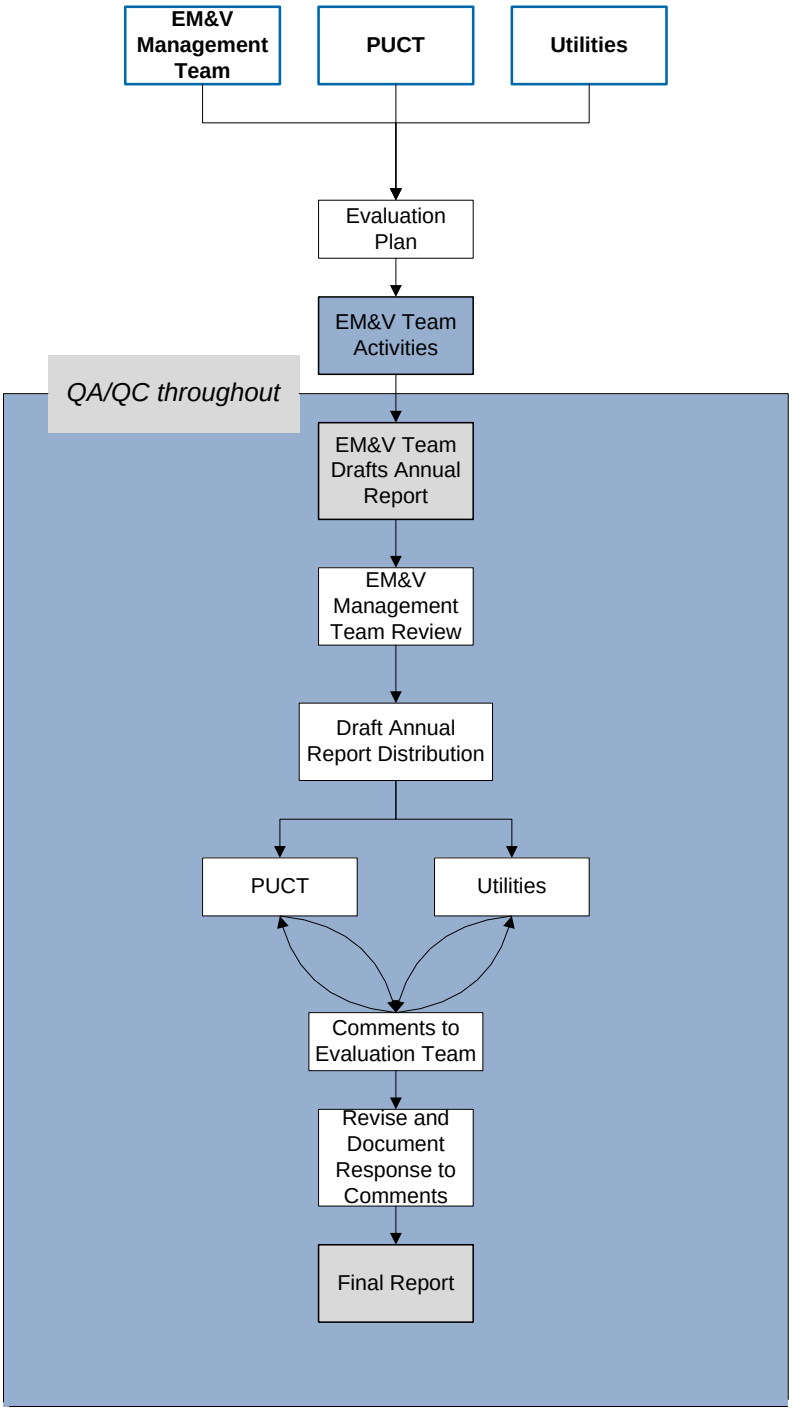
For PY2012, the metrics to be used as the basis for recommendations in the reports (Request for Proposals 473-13-00105, Project No. 40891, Scope of Work Task 1B (m)) is the gross savings realization rate and associated uncertainty ranking.

The EM&V Database is at the core of reporting results. It houses the claimed and evaluated savings. The database allows structured queries to provide results by utilities, program categories and types, measure types, and/or sectors. QA/QC is conducted to ensure that results being entered into and extracted from the database are accurate. The EM&V team's quality assurance plan for the reported evaluated savings are in Appendix E (Request for Proposals 473-13-00105, Project No. 40891, Scope of Work Task 1B (l)).

The EM&V team encourages feedback and comments on EM&V reports. The EM&V team reviews feedback and documents how it was taken into consideration in finalizing deliverables. While the interim impact reports are distributed and reviewed separately for each utility, the EM&V team seeks input from a larger group of stakeholders on the Annual Portfolio Reports. These are presented and discussed at Energy Efficiency Implementation Project (EEIP) meetings between draft and final versions.

The following flow chart describes the general reporting process flow.

Figure 3-2. Reporting Flow Chart



4. IMPACT EVALUATION RESULTS—AMERICAN ELECTRIC POWER TEXAS CENTRAL COMPANY

This section presents the evaluated savings and cost-effectiveness results for American Electric Power Texas Central Company's (AEP TCC) energy efficiency portfolio. The key findings are summarized first, followed by details for each program in the portfolio.

4.1 KEY FINDINGS

4.1.1 Evaluated savings

The PY2012 evaluated energy and demand savings agree closely with PY2012 claimed savings for AEP TCC's portfolio. The kW portfolio level realization rate is 100.9 percent for demand savings. The kWh portfolio level realization rate is 99.3 percent for energy savings. The primary driver of decreases in the realization rates was minor adjustments made to savings for the Residential Standard Offer Program for three measures (air infiltration, ceiling insulation, and duct efficiency). However, these adjustments were offset by minor adjustments upward in the load management program's evaluated savings.

Table 4-1 shows the claimed and evaluated demand savings for AEP TCC's portfolio and broad customer sector/program categories for PY2012.

Table 4-1. AEP TCC Program Year 2012 Claimed and Evaluated Demand Savings

Level of Analysis	Percent Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Completed Desk Reviews	Precision at 90% Confidence
Total Portfolio		**33,430**	**33,742**	**100.9%**	**171**	**0.43%**
Commercial Sector	16.1%	5,376	5,367	99.8%	36	0.54%
Residential Sector	29.1%	9,726	9,526	97.9%	40	1.48%
Load Management	52.2%	17,437	17,957	103.0%	79*	0.00%
Pilots	2.7%	892	892	100.0%	16	0.00%

*The review for the load management program included a review of equations and interval meter data to estimate the baseline usage and resulting level of load curtailment achieved for each event for all participants.

Table 4-2 shows the claimed and evaluated energy savings for AEP TCC's portfolio and broad customer sector/program categories for PY2012.

Table 4-2. AEP TCC Program Year 2012 Claimed and Evaluated Energy Savings

Level of Analysis	Percent Portfolio Savings (kWh)	2012 Claimed Demand Savings (kWh)	2012 Evaluated Demand Savings (kWh)	Realization Rate (kWh)	Completed Desk Reviews	Precision at 90% Confidence
Total Portfolio		**53,276,033**	**52,912,915**	**99.3%**	**171**	**0.94%**
Commercial Sector	41.4%	22,032,523	21,989,820	99.8%	36	0.58%
Residential Sector	54.6%	29,113,127	28,787,341	98.9%	40	1.67%
Load Management	0.2%	92,950	98,323	105.8%	79*	0.00%
Pilots	3.8%	2,037,432	2,037,432	100.0%	16	0.00%

*The review for the load management program included a review of equations and interval meter data to estimate the baseline usage and resulting level of load curtailment achieved for each event for all participants.

Program-level realization rates are discussed in the detailed findings sub-sections. **However, it is important to note that these results should only be viewed qualitatively due to the small sample sizes at the utility-program level. Program-level results should only be used to provide insight into how individual programs are affecting the overall portfolio realization rates.**

In program-level realization rates, we have also included a qualitative rating of low, medium, and high associated with the uncertainty of the verification effort based on program documentation received from the utility. The most favorable rating for uncertainty of “low” was given when thorough and detailed documentation was received to verify the savings. The “high” uncertainty rating was given when the EM&V team received primarily project-level savings calculations without supporting documentation to verify the inputs in the calculations. It is important to note that this uncertainty rating is specific to program documentation received to verify claimed savings and is not an indicator of the reasonableness or accuracy of savings estimates.

There is a low level of uncertainty in the evaluated kW savings due to the high percent of kW savings from the Load Management program. There was sufficient documentation (work papers, interval meter data) provided to the EM&V team to verify claimed kW savings for a census of participants in the load management program.

There is a high level of uncertainty associated with the PY2012 evaluated kWh savings across several SOP offerings (Residential, Not-for-Profit, Commercial) due to insufficient documentation to complete an independent review of savings. For nonresidential market transformation programs, the level of uncertainty of evaluated savings is less. While sufficient documentation was generally provided for projects, program uncertainty rankings fell from low to medium for some programs (Commercial Solutions, SCORE/CitySmart) due to missing information for some of the reviewed projects.

4.1.2 Cost-effectiveness results

AEP TCC's overall portfolio had a cost-effectiveness of 2.64 including low-income programs and 2.86 excluding low-income programs. All categories of programs passed the cost-effectiveness analysis except for pilots.

None of the pilot programs passed individual program-level cost-effectiveness tests. As discussed with PUCT staff, pilots are not required to pass the program administrator cost test (PACT) their first year of implementation to recognize program start-up costs, but are expected to pass during the second year. The A/C Distributor Pilot program was in its first year of implementation and the CoolSaver© and PV in their second. In addition, the High Performance New Homes program did not pass cost-effectiveness.

The more cost-effective programs were Commercial SOP and Residential SOP. The less cost-effective programs, aside from pilots, were High Performance New Homes and AEP Texas CARE$ Energy Efficiency for Not-for-Profit Agencies SOP (AEP Texas CARE$). The AEP Texas CARE$ program has been discontinued.

The PY2012 cost-effectiveness results were largely driven by the Residential SOP, which accounted for 43 percent of total portfolio benefits and only 34 percent of total costs. The pilot programs also had a combined impact on the portfolio-level results, since significant spending went into these programs that produced minimal energy benefits. The pilot category of programs constituted 10 percent of portfolio costs, but only contributed 4 percent of the portfolio's benefits.

Table 4-3. AEP TCC Cost-effectiveness Results

Level of Analysis	Claimed Savings Results	Evaluated Savings Results
Total Portfolio	**2.66**	**2.64**
Total Portfolio excluding low-income programs	**2.89**	**2.86**
Commercial Sector	**4.29**	**4.28**
AEP Texas CARE$ Energy Efficiency for Not-for-Profit Agencies SOP	1.02	1.02
Commercial SOP	4.88	4.83
Commercial Solutions MTP	3.76	3.76
SCORE/CitySmart MTP	4.13	4.16
Residential Sector	**2.80**	**2.77**
Residential SOP	3.37	3.31
Hard-to-Reach SOP	2.38	2.39
High-Performance New Homes MTP	0.86	0.86
Low-Income	**1.36**	**1.35**

Level of Analysis	Claimed Savings Results	Evaluated Savings Results
Targeted Low-Income Energy Efficiency Program	1.36	1.35
Load Management	**1.70**	**1.75**
Load Management SOP	1.70	1.75
Pilots	**0.76**	**0.76**
A/C Distributor Pilot MTP (Nonresidential)	0.00	0.00
A/C Distributor Pilot MTP (Residential)	0.96	0.96
CoolSaver A/C Tune-Up Pilot MTP (Nonresidential)	0.83	0.83
CoolSaver A/C Tune-Up Pilot MTP (Residential)	0.73	0.73
SMART Source Solar PV Pilot MTP (Nonresidential)	0.87	0.87
SMART Source Solar PV Pilot MTP (Residential)	0.73	0.73

4.2 DETAILED FINDINGS—COMMERCIAL

4.2.1 Commercial standard offer

A. AEP Texas CARE$ Energy Efficiency for Not-for-Profit Agencies Standard Offer Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
0.1%	32	32	100.0%	0.2%	124,634	124,634	100.0%	High	3

*Confidence intervals are not reported at the utility program level as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the AEP TCC CARE$ program equaled claimed savings, with 100 percent realization rates for both kW and kWh. There were no adjustments made to any of the savings calculations at the project level.

The EM&V team was not able to verify key inputs and assumptions (e.g., equipment quantity and specifications) for any of the three sites sampled for the desk review because no documentation was provided for those sites. In particular, AEP TCC did not provide the EM&V team with the requested calculators. Since sufficient documentation was provided for fewer than 70 percent of the sampled sites, the uncertainty ranking for these estimates is HIGH.

B. Commercial Standard Offer Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)*	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)*	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews**
7.6%	2,524	2,510	99.4%	18.9%	10,083,704	9,983,876	99.0%	High	20

*Claimed savings vary slightly from the PY2012 EEPR as a partially completed project that was accounted for in the EEPR was excluded from the tracking data.

**Confidence intervals are not reported at the utility program level as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the AEP TCC CSOP program were only slightly lower than the claimed savings in the program tracking system, with realization rates for both kW and kWh of approximately 99 percent.

The drop in realization rate for the AEP TCC CSOP was driven by 3 of the 20 site reviews:

- For the first site, the lighting fixture quantity was overestimated. Based on the review of the invoices, the EM&V team verified that 44 fixtures were installed compared to the ex-ante reported total of 55 fixture installations, which resulted in a reduction in kWh and kW savings (kWh realization rate = 80 percent and kW realization rate = 81 percent).
- For the second site, the roof solar reflectance value was overestimated. The post-retrofit roof solar reflectance value was 0.81 based on the evaluation review of equipment specifications, compared to the 0.85 roof solar reflectance value used for reported savings calculations. This change resulted in a 16 percent reduction in kWh savings and a 7 percent reduction in kW savings (kWh realization rate = 84 percent and kW realization rate = 93 percent).
- For the third site, the HVAC efficiency was underestimated. The rated efficiency of the post-retrofit 10-ton unit was adjusted to 12.5 EER from 11 EER based on the evaluation review of equipment specifications. This resulted in an increase in kWh and kW savings (kWh and KW realization rate = 115 percent).

The EM&V team was not able to verify key inputs and assumptions (e.g., equipment quantity and specifications) for 17 of the 20 sites because no or insufficient documentation was provided for those sites. In particular, AEP TCC did not provide the EM&V team with the requested invoices or pre/post inspection reports. Since sufficient documentation was provided for fewer than 70 percent of the sampled sites, the uncertainty ranking for these savings estimates is considered HIGH.

4.2.2 Commercial market transformation

A. Commercial Solutions Market Transformation Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
2.7%	890	890	100.0%	6.7%	3,545,154	3,545,154	100.0%	Medium	5

*Confidence intervals are not reported at the utility program level as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the AEP TCC Commercial Solutions MTP were equal to the claimed savings, with realization rates for both kW and kWh equaling 100 percent. There were no adjustments to any of the savings calculations.

The desk reviews were completed for a sample of five projects. The EM&V team was not able to verify key inputs and assumptions (e.g., equipment quantity and specifications) for one of the five sites because insufficient documentation was provided for the site. In particular, AEP TCC did not provide the EM&V team with the requested invoice for the site, and the EM&V team was unable to verify the fixture quantities or types. Since sufficient documentation was provided for 80 percent of the sampled sites, the uncertainty ranking for these estimates is MEDIUM.

B. SCORE/CitySmart Market Transformation Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
5.8%	1,930	1,936	100.3%	15.5%	8,279,031	8,336,156	100.7%	Medium	8

*Confidence intervals are not reported at the utility program level as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the AEP TCC Score/CitySmart MTP were slightly higher than the claimed savings, with realization rates for both kW and kWh slightly exceeding 100 percent.

The realization rates for the AEP TCC Score/CitySmart MTP were mainly driven by savings adjustments to one site. For this site, the ballasts per fixture for a particular room were changed from one to two; however, post inspection notes clearly stated these fixtures could not be confirmed for lamp and ballast type and no other documentation was provided to document such a change. The change in fixture type resulted in increased savings (kWh and kW realization rate = 110 percent).

The desk reviews were completed for a sample of eight projects. The EM&V team was not able to verify key inputs and assumptions (e.g., equipment quantity and specifications) for two of the eight sites because insufficient documentation was provided for those sites. In particular, AEP TCC did not provide the EM&V team with the requested invoices or pre-inspection reports for the sites. For these sites, we were unable to verify the fixture quantities or types. Since sufficient documentation was provided for 75 percent of the sampled sites, the uncertainty ranking for these estimates is MEDIUM.

4.3 DETAILED FINDINGS—RESIDENTIAL

4.3.1 Residential Standard Offer Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)*	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)*	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews**
22.0%	7,360	7,193	97.7%	40.3%	21,493,996	21,147,942	98.4%	High	15

*Claimed savings vary slightly from the PY2012 EEPR due to differences in air infiltration measure impact calculations within the program tracking provided to the EM&V team and AEP TCC's reporting.

**Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the RES SOP were slightly lower than claimed savings, with realization rates for both kW and kWh just under 100 percent.

Realization rates for the RES SOP were mainly driven by savings adjustments to the following measures:

- **Air infiltration.** Variation in application of specific eligibility criteria introduced in early 2012 has led to an adjustment of air infiltration savings for several utility programs. For this program, we adjusted savings for 116 records that did not meet the Deemed Savings Manual eligibility criteria: 115 where the initial leakage is above 4.0 CFM50 per square foot and 1 where the final ventilation rate is lower than the minimum requirement.
- **Ceiling insulation.** The EM&V team identified ten records where savings did not match those recalculated using the Deemed Savings Manual. While kW matched for five of these projects, their kWh savings were 2.8 times the value calculated from the Deemed Savings Manual. The reported kW and kWh for the other five instances deviated from 100 percent, without any consistent scaling factor.
- **Duct efficiency.** The EM&V team identified 42 instances where savings did not exactly match those calculated using the Deemed Savings Manual Duct Efficiency calculator. This resulted in a minor impact in savings.

The EM&V team was unable to verify savings through the desk review process for any of the sampled projects for RES SOP due to a lack of key measure attribute assumptions (i.e., square feet, pre/post-CFM levels, bulb wattage, or heating type) provided in the supplemental

data received. Since sufficient documentation was provided for fewer than 70 percent of the sampled sites, the uncertainty ranking for these estimates is HIGH.

4.3.2 Hard-to-Reach Standard Offer Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)*	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)*	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews**
4.9%	1,650	1,658	100.4%	9.8%	5,236,507	5,266,355	100.6%	Medium	10

*Claimed savings vary slightly from the PY2012 EEPR due to differences in air infiltration measure impact calculations within the program tracking provided to the EM&V team and AEP TCC's reporting.

**Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the HTR SOP were nearly identical to claimed savings, with realization rates for both kW and kWh slightly higher than 100 percent.

Realization rates for the HTR SOP were mainly driven by savings adjustments to the following measures:

- **Air infiltration.** Variation in application of specific eligibility criteria introduced in early 2012 has led to an adjustment of air infiltration savings for several utility programs. For this program, we adjusted savings for 126 records that did not meet the Deemed Savings Manual eligibility criteria. In all cases, the initial leakage is above 4.0 CFM50 per square foot.
- **Ceiling insulation.** The EM&V team identified one record where savings are greater than those calculated using the Deemed Savings Manual. Similar to the Res SOP, there was one record where the kWh savings were 2.8 times the value calculated using the Deemed Savings Manual and the kW savings matched.
- **Duct efficiency.** The EM&V team identified eight instances where savings did not exactly match those calculated using the Deemed Savings Manual Duct Efficiency calculator. This resulted in a minor impact in savings.
- **Lighting—CFLs.** The EM&V team identified one record where savings did not match those calculated using the Deemed Savings Manual. For this record, the reported savings appear to deviate from the EM&V team calculations by a factor of 1.4.

Desk reviews were completed for seven out of ten sampled projects for which sufficient measure information was provided through the supplemental data request. The EM&V team identified a few discrepancies between measure assumptions through this process, specific to air infiltration and CFL measures.

However, the EM&V team was unable to verify savings through the desk review process for three of the sampled projects for HTR SOP due to a lack of key measure attribute

assumptions provided in the supplemental data received. Since sufficient documentation was provided for 70 percent of the sampled sites, the uncertainty ranking for these estimates is MEDIUM.

4.3.3 Residential market transformation

A. High-Performance New Homes Market Transformation Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
0.9%	317	317	100.0%	2.1%	1,121,880	1,121,880	100.0%	High	5

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for AEP TCC's ENERGY STAR® New Homes MTP were the same as the claimed savings; thus, realization rates for both kW and kWh are 100 percent.

The first phase of impact evaluation the EM&V team completed was a tracking system review. No issues were found during this phase.

The second phase of the impact evaluation was to complete desk reviews for a select sample of projects. In order to complete a comprehensive desk review for this program, the EM&V team requested all project documentation associated with each sampled project, including the application, reports of QA/QC or M&V activity if conducted, documentation for how the as-built home compares to the base home, and modeling and energy savings information. What the EM&V team received for each project was a ten-page Building Summary report for the as-built home. While this report was helpful in understanding the components going into the as-built home, the EM&V team did not receive any information about the base home, or how energy savings or incentives were calculated. This additional information is critical inputs to calculating savings to verify energy savings and incentive payouts.

Ideally, the EM&V team would have reviewed AEP TCC's stated algorithms and compared the claimed savings against those algorithms in a documented program manual or, at the very least, against a home built to code. Because the EM&V team received insufficient documentation for all sampled sites, we were not able to verify key inputs and assumptions (e.g., base home inputs). However, we did build our own code home and compared the IECC 2009 code requirements to those inputs provided in the Building Summary report provided by AEP TCC. For all sampled homes, our analysis showed that blower door air test results (heating and cooling infiltration) met or exceeded standards. Heating and cooling efficiency levels barely exceeded standards set by ENERGY STAR, attic insulation levels did meet IECC 2009 code, above grade walls exceeded the R-Rating set for Texas by the Department of Energy (DOE), and windows and doors significantly exceeded the Texas DOE U-Rating.

Recognizing the new homes program takes a whole-building approach to energy savings, we did not adjust savings based on the various component comparisons. Due to insufficient supporting documentation for all sampled homes, the uncertainty ranking for both the kW and kWh savings is HIGH. However, since the drafting of this report, the EM&V team has had discussions with the implementer to discuss savings calculations for this program. Based on these discussions, the EM&V team is confident that the implementer will provide documentation for the PY2013 evaluation efforts (and beyond) that will take the uncertainty ranking for this program from HIGH to LOW.

4.3.4 Targeted Low-Income Energy Efficiency Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
1.2%	398	359	90.0%	2.4%	1,260,744	1,251,163	99.2%	High	10

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the AEP TCC Targeted Low-Income program were lower than the claimed savings, with realization rates for kW at 90 percent and kWh at 99 percent.

Realization rates for the AEP TCC Targeted Low-Income program were mainly driven by savings adjustments to the following measures:

- **Air infiltration.** Variation in application of specific eligibility criteria introduced in early 2012 has led to an adjustment of air infiltration savings for several utility programs. For this program, we adjusted savings for 15 records that did not meet the Deemed Savings Manual eligibility criteria where leakage is reduced by less than 10 percent. Additionally, there were 84 records where reported energy and demand savings did not align with values calculated by the EM&V team using the Deemed Savings Manual methodology, due to a calculation error in the implementation contractor's database that produced lower aggregate savings than were calculated by the EM&V team.
- **Refrigerator replacement.** For targeted low-income programs, claimed savings calculations were based on algorithms that differed from the Deemed Savings Manual in some cases. Using these alternative calculations, the EM&V team was able to achieve a near 100 percent match to the reported savings; however, a few small discrepancies remained due to a calculation error in the implementation contractor's database that produced lower aggregate savings than were calculated by the EM&V team. This resulted in an overall realization rate of 105.3 percent for refrigerators.
- **Ceiling fan.** All ceiling fan energy savings appear to be scaled to a constant 99.9481 percent of Deemed Savings Manual-calculated values across all utilities. No demand

savings are included for ceiling fans. These were adjusted by the EM&V team using the Deemed Savings Manual.

- **Central AC.** For targeted low-income programs, claimed savings calculations were based on algorithms that differed from the Deemed Savings Manual. These data were provided by the implementation contractor. However, for AC units with SEER 16 and above, savings tables were only provided for one weather zone and so the EM&V team extrapolated for other weather zones. However, using the alternative calculation for all efficiencies, discrepancies remained. *This measure is the most significant driver in the low kW realization rate.*

- **Window AC.** For targeted low-income programs, claimed savings calculations were based on algorithms that differed from the Deemed Savings Manual. Using the alternative calculation provided by the implementation contractor, savings matched for all observations within the tracking system.

- **Duct efficiency.** Claimed savings calculations were based on algorithms that differed from the Deemed Savings Manual and the related Duct Efficiency calculation tool. Using the alternative calculation provided by the implementation contractor, savings matched for all observations in the tracking system.

For several measures, it is noted that the EM&V team compared to calculations provided by the implementation contractor versus the Deemed Savings Manual. Low-income programs have different implementation requirements than non-low-income energy efficiency programs. The Public Utility Regulatory Act (PURA) §39.905(f) addresses general provisions for low-income programs. For low-income programs, we recommend improved documentation on savings calculation approaches that represent alternate calculations than those in the Deemed Savings Manual for refrigerators and HVAC measures.

Desk reviews were completed for only two of the ten sampled projects for which sufficient measure information was provided through the supplemental data request. The EM&V team identified only one discrepancy through this process, where one CFL measure's wattage range was incorrectly assigned. The EM&V team was unable to verify savings through the desk review process for the remainder of the sampled projects due to a lack of key measure attribute assumptions provided in the supplemental data received. Since insufficient documentation was provided for more than 70 percent of the sampled sites, the uncertainty ranking for these estimates is HIGH.

4.4 DETAILED FINDINGS—LOAD MANAGEMENT

4.4.1 Load Management Standard Offer Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
52.2%	17,437	17,957	103.0%	0.2%	92,950	98,323	105.8%	Low	79

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

The Load Management SOP findings presented are for both the legacy and the expanded program. It was not clear in the work papers provided to the EM&V team which participant was associated with which program element.

The PY2012 evaluation activities found that the individual participant load-impact calculations in the work papers supplied to the EM&V team were very similar to those validated by using the individual customer interval-load data.

4.5 DETAILED FINDINGS—PILOTS

4.5.1 A/C Distributor Pilot Market Transformation Program (Residential)

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
0.1%	38	38	100.0%	0.3%	147,466	147,466	100.0%	High	2

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for AEP TCC's A/C Distributor Pilot MTP were the same as the claimed savings; thus, realization rates for both kW and kWh are 100 percent.

The first phase of impact evaluation the EM&V team completed was a tracking system review. No issues were found during this phase.

The second phase of the impact evaluation was to complete desk reviews for a select sample of projects. In order to complete a comprehensive desk review for this program, the EM&V team requested all project documentation associated with each sampled project, including the customer application and invoice, any calculators used, and reports of QA/QC or M&V activity if conducted. What the EM&V team received for each project was a two-page Field Inspection Form with very basic information and four pictures—one of the building/home at the site itself, one of the street sign, one of the unit, and one of the name plate information associated with that particular unit. This project documentation did not include seasonal energy efficiency

ratio (SEER) or tonnage information, both critical inputs to calculating savings to allow for comparison to the Deemed Savings Manual.

Ideally, the EM&V team would have reviewed AEP TCC's stated algorithms and compared the claimed savings against those algorithms and the Deemed Savings Manual. Because the EM&V team received insufficient documentation for all sampled sites, we were not able to verify key inputs and assumptions (e.g., equipment SEER and tonnage). As a result, the uncertainty ranking for both the kW and kWh savings is HIGH.

4.5.2 CoolSaver A/C Tune-Up Market Transformation Program (Nonresidential)

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)*	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)*	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews**
0.7%	237	237	100.0%	0.8%	425,486	425,486	100.0%	Low	2

*Claimed savings vary slightly from the PY2012 EEPR when reviewing impacts by sector; however, total CoolSaver savings combining the two sectors match the combined sector CoolSaver reports within the EEPRs.

**Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for AEP TCC's CoolSaver A/C Tune-Up MTP were the same as the claimed savings; thus, realization rates for both kW and kWh are 100 percent.

The first phase of impact evaluation the EM&V team completed was a tracking system review. No issues were found during this phase.

The second phase of the impact evaluation was to complete desk reviews for a select sample of projects. In order to complete a comprehensive desk review for this program, the EM&V team requested all project documentation associated with each sampled project, including the customer application and invoice, any calculators used, and reports of QA/QC or M&V activity if conducted. What the EM&V team received for each project was an invoice from the contractor, the Incentive Check Request, and the Tune-up Form. The implementer also provided program documentation including the Contractor Manual, Contractor FAQs, and the CoolSaver 2013 M&V Plan. This project documentation included enough information that critical inputs to calculating savings could be determined and compared to the CoolSaver 2013 M&V Plan. The challenge the EM&V team did come across is that the contractor invoices and Tune-Up Forms did not indicate that the condenser coil was cleaned or that the airflow was adjusted to proper CFM/ton per the CoolSaver A/C Tune-up Program Manual. These tasks may have been performed, but supporting documents do not clearly indicate whether this was done. Because key parameters for savings calculations were identified, this ambiguous documentation did not affect savings.

Because the EM&V team received sufficient documentation for all sampled sites, we were able to verify key inputs and assumptions. As a result, the uncertainty ranking for these estimates is LOW.

4.5.3 CoolSaver A/C Tune-Up Market Transformation Program (Residential)

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)*	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)*	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews**
1.2%	417	417	100.0%	2.0%	1,079,784	1,079,784	100.0%	Low	2

*Claimed savings vary slightly from the PY2012 EEPR when reviewing impacts by sector; however, total CoolSaver savings combining the two sectors match the combined sector CoolSaver reports within the EEPRs.

**Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for AEP TCC's CoolSaver A/C Tune-up Pilot MTP (residential) were the same as the claimed savings; thus, realization rates for both kW and kWh are 100 percent.

The first phase of impact evaluation the EM&V team completed was a tracking system review. No issues were found during this phase.

The second phase of the impact evaluation was to complete desk reviews for a select sample of projects. In order to complete a comprehensive desk review for this program, the EM&V team requested all project documentation associated with each sampled project, including the customer application and invoice, any calculators used, and reports of QA/QC or M&V activity if conducted. What the EM&V team received for each project was an invoice from the contractor, the Incentive Check Request, and the Tune-up Form. The implementer also provided program documentation including the Contractor Manual, Contractor FAQs, and the CoolSaver 2013 M&V Plan. This project documentation included enough information that critical inputs to calculating savings could be determined and compared to the CoolSaver 2013 M&V Plan. The challenge the EM&V team did come across is that the contractor invoices and Tune-Up Forms did not indicate that the condenser coil was cleaned or that the airflow was adjusted to proper CFM/ton per the CoolSaver A/C Tune-up Program Manual. These tasks may have been performed, but supporting documents do not clearly indicate that this was done. Because key parameters for savings calculations were identified, this ambiguous documentation did not affect savings.

Because the EM&V team received sufficient documentation for all sampled sites, we were able to verify key inputs and assumptions. As a result, the uncertainty ranking for the estimates is LOW.

4.5.4 SMART Source Solar PV Market Transformation Program (Nonresidential)

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
0.3%	109	109	100.0%	0.4%	210,240	210,240	100.0%	Low	5

*Confidence intervals are not reported at the utility program level as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the SMART Source Solar PV MTP (nonresidential) matched claimed or reported savings from program administrators exactly because the evaluation activities found no evidence of differences between installed and tracked system capacity. This finding was based on our desk review of five installations. Evaluated savings estimates are based solely on installed capacity (DC) reported in the tracking system multiplied by the approved deemed savings calculations of 1,600 kWh and 0.83 kW per kW of capacity.

The EM&V team was able to verify 100 percent of the installed system capacity ratings in the tracking system based on our review of a sample of either inspection reports or final invoices. Installed capacity is the only input to the evaluated savings calculations for this program year so the overall uncertainty ranking for inputs to this savings estimate is considered LOW.

It should be noted that for PY2013, prospective evaluated savings from this program will be based on PvWatts simulations and metered data. These simulations will account for available sunlight and panel orientation in the local utility area. If these simulations were applied for PY2012 program installation data, savings realization would have been less than 100 percent:

- kWh Realization Rate if using simulation: 80 percent
- kW Realization Rate if using simulation: 82 percent

The prospective kWh realization rates using simulations are much closer to what should be expected in PY2013 since AEP TCC's service area near the gulf coast has the lowest solar resource of the state. The PvWatts simulation program is likely to produce lower estimates of demand savings from the PV installations due to the following factors, which are considered in the simulation program more conservatively than in the deemed savings calculation:

1. Wiring losses—driven largely by:
    a. PV module nameplate DC rating adjustments for temperature and actual capacity.
    b. Module Mismatch Loss—panels are connected in series to build voltage and are limited by the current of the worst performing panel.
    c. AC & DC Wiring Losses—resistive losses in the wires on both the DC side (before the inverter) and AC side (after the inverter) decrease performance.
2. Inverter efficiency losses when converting AC to DC power.
3. Shading—from nearby panels, buildings, or trees.
4. Soiling—build-up of dirt or other particulates on the panels that block sunlight from reaching the PV cells.
5. System availability—how often the system is "up" and not offline due to maintenance, failures, etc.
6. Equipment degradation over time—PV cells lose efficiency over time at commonly accepted rates of 0.5–1 percent, primarily due to short circuit current (I_{sc}) losses caused by ultraviolet (UV) absorption at or near the top of the silicon surface.

4.5.5 SMART Source Solar PV Market Transformation Program (Residential)

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
0.3%	90	90	100.0%	0.3%	174,456	174,456	100.0%	Low	5

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the SMART Source Solar PV MTP (residential) matched claimed or reported savings from program administrators exactly because the evaluation activities found no evidence of differences between installed and tracked system capacity. This finding was based on our desk review of five installations. Evaluated savings estimates are based solely on installed capacity (DC) reported in the tracking system multiplied by the approved deemed savings calculations of 1,600 kWh and 0.83 kW per kW of capacity.

The EM&V team was able to verify 100 percent of the installed system capacity ratings in the tracking system based on our review of a sample of either inspection reports or final invoices. Installed capacity is the only input to the evaluated savings calculations for this program year so the overall uncertainty ranking for inputs to this savings estimate is considered LOW.

It should be noted that for PY2013, prospective evaluated savings from this program will be based on PvWatts simulations and metered data. These simulations will account for available sunlight and panel orientation in the local utility area. If these simulations were applied for PY2012, savings realization would have been less than 100 percent:

- kWh Realization Rate if using simulation: 82 percent
- kW Realization Rate if using simulation: 81 percent

The prospective kWh realization rate using simulation are much closer to what should be expected in PY2013 since AEP TCC's service area near the gulf coast has the lowest solar resource of the state. The PvWatts simulation program is likely to produce lower estimates of demand savings from the PV installations due to factors that are considered in the simulation program more conservatively than in the deemed savings calculation (see nonresidential solar PV detailed findings for these factors).

5. IMPACT EVALUATION RESULTS—AMERICAN ELECTRIC POWER TEXAS NORTH COMPANY

This section presents the evaluated savings and cost-effectiveness results for American Electric Power Texas North Company's (AEP TNC) energy efficiency portfolio. The key findings are summarized first, followed by details for each program in the portfolio.

5.1 KEY FINDINGS

5.1.1 Evaluated savings

PY2012 evaluated energy and demand savings agree closely with PY2012 claimed savings for AEP TNC's portfolio. The kW portfolio level realization rate is 99.7 percent for demand savings. The kWh portfolio level realization rate is 99.8 percent for energy savings. The realization rates are slightly less than 100 percent primarily due to minor adjustments made in savings for the Residential Standard Offer Program for three measures (air infiltration, ceiling insulation and duct efficiency). The residential kWh downward adjustments were partially offset by increases in commercial sector and load management evaluated savings.

Table 5-1 shows the claimed and evaluated demand savings for AEP TNC's portfolio and broad customer sector/program categories for PY2012.

Table 5-1. AEP TNC Program Year 2012 Claimed and Evaluated Demand Savings

Level of Analysis	Percent Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Completed Desk Reviews	Precision at 90% Confidence
Total Portfolio		**6,020**	**6,003**	**99.7%**	**74**	**0.01%**
Commercial Sector	18.1%	1,088	1,079	99.2%	32	0.07%
Residential Sector	18.4%	1,111	1,103	99.3%	20	0.00%
Load Management	61.7%	3,713	3,712	100.0%	7*	0.00%
Pilots	1.8%	109	109	100.0%	15	0.00%

*The review for the load management program included a review of equations and interval meter data to estimate the baseline usage and resulting level of load curtailment achieved for each event for all participants.

Table 5-2 shows the claimed and evaluated energy savings for AEP TNC's portfolio and broad customer sector/program categories for PY2012.

Table 5-2. AEP TNC Program Year 2012 Claimed and Evaluated Energy Savings

Level of Analysis	Percent Portfolio Savings (kWh)	2012 Claimed Demand Savings (kWh)	2012 Evaluated Demand Savings (kWh)	Realization Rate (kWh)	Completed Desk Reviews	Precision at 90% Confidence
Total Portfolio		**7,358,573**	**7,343,672**	**99.8%**	**74**	**0.05%**
Commercial Sector	54.9%	4,037,459	4,066,083	100.7%	32	0.08%
Residential Sector	41.9%	3,081,309	3,031,240	98.4%	20	0.00%
Load Management	0.1%	10,741	17,285	160.9%	7*	0.00%
Pilots	3.1%	229,064	229,064	100.0%	15	0.00%

*The review for the load management program included a review of equations and interval meter data to estimate the baseline usage and resulting level of load curtailment achieved for each event for all participants.

Program-level realization rates are discussed in the detailed findings sub-sections. **However, it is important to note that these results should only be viewed qualitatively due to the small sample sizes at the utility-program level. Program-level results should only be used to provide insight into how individual programs are affecting the overall portfolio realization rates.**

In program-level realization rates, we have also included a qualitative rating of low, medium, and high associated with the uncertainty of the verification effort based on program documentation received from the utility. The most favorable rating for uncertainty of “low” was given when thorough and detailed documentation was received to verify the savings. The “high” uncertainty rating was given when the EM&V team received primarily project-level savings calculations without supporting documentation to verify the inputs in the calculations. It is important to note that this uncertainty rating is specific to program documentation received to verify claimed savings and is not an indicator of the reasonableness or accuracy of savings estimates.

There is a low level of uncertainty in the evaluated kW savings due to the high percent of kW savings from the Load Management program. There was sufficient documentation (work papers, interval meter data) provided to the EM&V team to verify claimed kW savings for a census of participants in the load management program.

There is a high level of uncertainty associated with the PY2012 evaluated kWh savings across several SOP offerings (Residential, Not-for-Profit, Commercial) due to insufficient documentation to complete an independent review of savings. For nonresidential market transformation programs, the level of uncertainty of evaluated savings is lower as sufficient documentation was generally provided for projects. Program uncertainty rankings fell from low to medium for Commercial Solutions due to missing information for some of the reviewed projects.

5.1.2 Cost-effectiveness results

AEP TNC's overall portfolio had a cost-effectiveness of 3.16 including low-income programs and 3.43 excluding low-income programs. All categories of programs passed the cost-effectiveness analysis except for pilots.

Two of the three pilots did not pass program-level cost-effectiveness testing. As discussed with PUCT staff, pilots are not required to pass the program administrator cost test (PACT) their first year of implementation to recognize program start-up costs, but are expected to pass during the second year. The A/C Distributor Pilot programs was in its first year of implementation and the PV pilots in their second year (nonresidential passed and residential did not).

The more cost-effective programs were Commercial SOP, Commercial Solutions MTP, and SCORE/CitySmart MTP. The less cost-effective programs, aside from pilots, were the Targeted Low-Income Energy Efficiency Program and AEP Texas CARE$ Energy Efficiency for Not-for-Profit Agencies SOP (AEP Texas CARE$). The AEP Texas CARE$ program has already been cancelled.

The PY2012 cost-effectiveness results were largely driven by the commercial sector, which accounted for 47 percent of total portfolio benefits and only 33 percent of total costs.

Table 5-3. AEP TNC Cost-effectiveness Results

Level of Analysis	Claimed Savings Results	Evaluated Savings Results
Total Portfolio	**3.18**	**3.16**
Total Portfolio excluding low-income programs	**3.44**	**3.43**
Commercial Sector	**4.40**	**4.42**
AEP Texas CARE$ Energy Efficiency for Not-for-Profit Agencies SOP	0.99	1.00
Commercial SOP	7.66	7.58
Commercial Solutions MTP	4.15	4.15
SCORE/CitySmart MTP	4.46	4.53
Residential Sector	**3.50**	**3.46**
Residential SOP	3.93	3.88
Hard-to-Reach SOP	2.77	2.76
Low-Income	**1.77**	**1.63**
Targeted Low-Income Energy Efficiency Program	1.77	1.63
Load Management	**3.30**	**3.30**
Load Management SOP	3.30	3.30
Pilots	**0.96**	**0.96**
A/C Distributor Pilot MTP (Residential)	0.70	0.70

Level of Analysis	Claimed Savings Results	Evaluated Savings Results
SMART Source Solar PV Pilot MTP (Nonresidential)	1.22	1.22
SMART Source Solar PV Pilot MTP (Residential)	0.87	0.87

5.2 DETAILED FINDINGS—COMMERCIAL

5.2.1 Commercial standard offer

A. AEP Texas CARE$ Energy Efficiency for Not-for-Profit Agencies Standard Offer Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
0.4%	27	27	101.3%	1.2%	91,837	92,682	100.9%	High	3

*Confidence intervals are not reported at the utility program level as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the AEP TNC CARE$ program were slightly higher than the claimed savings, with realization rates for both kW and kWh slightly exceeding 100 percent.

For one site, the HVAC efficiency value used was incorrect. The EM&V team adjusted the savings using the correct EER value: pre-EER changed to 8.9 based on applicable code value in the calculator and post EER value of 11 from the cut sheets, which resulted in an increase in kWh and kW savings (kWh and KW realization rate = 103 percent).

The EM&V team was not able to verify key inputs and assumptions (e.g., equipment quantity and specifications) for one of the three sites because no or insufficient documentation was provided for those sites. In particular, AEP TNC CARE$ did not provide the EM&V team with the requested invoices or pre/post inspection reports. Since sufficient documentation was provided for fewer than 70 percent of the sample sites, the uncertainty ranking for these estimates is HIGH.

B. Commercial Standard Offer Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
4.1%	245	243	99.1%	14.0%	1,031,610	1,020,572	98.9%	High	20

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the AEP TNC CSOP program were slightly lower than the claimed savings, with realization rates for both kW and kWh slightly below 100 percent.

The realization rate for the AEP TNC CSOP program was mainly driven by two sites. For the first site, the fixture type was adjusted from T5 21W to T5 28W based on the review of the lighting cut sheet, which resulted in a reduction in kWh and kW savings (kWh realization rate = 99.8 percent and kW realization rate = 99.9 percent).

For the second site, the fixture quantity was overestimated. The EM&V team adjusted the fixture quantity for the facility based on the review of the invoice provided, which resulted in a reduction in kWh and kW savings (kWh and KW realization rates = 57 percent).

The EM&V team was not able to verify key inputs and assumptions (e.g., equipment quantity and specifications) for 17 of the 20 sites because no or insufficient documentation was provided for those sites. In particular, AEP TNC did not provide the EM&V team with the requested invoices or pre/post inspection reports. Since sufficient documentation was provided for fewer than 70 percent of the sampled sites, the uncertainty ranking for these estimates is HIGH.

5.2.2 Commercial market transformation

A. Commercial Solutions Market Transformation Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
6.7%	406	406	100.0%	22.3%	1,641,298	1,641,298	100.0%	Medium	5

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the AEP TNC Commercial Solutions MTP were equal to the claimed savings, with realization rates for both kW and kWh equaling 100 percent. There were no adjustments to any of the savings calculations.

The desk reviews were completed for a sample of five projects. The EM&V team was not able to verify key inputs and assumptions (e.g., equipment quantity and specifications) for one of the five sites because limited documentation was provided for the site. In particular, AEP TNC did not provide the EM&V team with the requested invoices for the site. For this site, we were unable to verify the fixture quantities or types. Since sufficient documentation was provided for 80 percent of the sampled sites, the uncertainty ranking for these estimates is MEDIUM.

B. SCORE/CitySmart Market Transformation Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
6.8%	410	403	98.4%	17.3%	1,272,714	1,311,532	103.1%	Medium	4

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the AEP TNC Score/CitySmart MTP were lower for kW and higher for kWh than the claimed savings, with a realization rate for kW at 98 percent and with a realization rate for kWh at 103 percent.

The realization rate for the AEP TNC Score/CitySmart MTP was mainly driven by savings adjustments to one site. For this site, the Chiller annual savings were understated and peak demands overstated. Based on the review of the calculator received, M&V report and project memo, the EM&V team was unable to match the projects claimed savings to the calculator received, which resulted in decreased kW savings (kW realization rate = 95 percent) and increased kWh savings (kWh realization rate = 114 percent).

The desk reviews were completed for a sample of four projects. The EM&V team was not able to verify key inputs and assumptions (e.g., equipment quantity and specifications) for one of the four sites because insufficient documentation was provided for the site. In particular, AEP TNC did not provide the EM&V team with the requested invoices for the site. For this site, we were unable to verify the equipment quantities or types. Since sufficient documentation was provided for 75 percent of the sampled sites, the uncertainty ranking for these estimates is MEDIUM.

5.3 DETAILED FINDINGS—RESIDENTIAL

5.3.1 Residential Standard Offer Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)*	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)*	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews**
12.5%	754	748	99.2%	27.8%	2,048,054	2,018,152	98.5%	High	10

*Claimed savings vary slightly from the PY2012 EEPR due to differences in air infiltration measure impact calculations within the program tracking provided to the EM&V team and AEP TCC's reporting.

**Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the AEP TNC RES SOP were slightly lower than claimed savings, with realization rates for both kW and kWh slightly less than 100 percent.

Realization rates for the AEP TNC RES SOP were mainly driven by savings adjustments to the following measures:

- **Air infiltration.** Variation in application of specific eligibility criteria introduced in early 2012 has led to adjustment of air infiltration savings for several utility programs. For this program, we adjusted savings for 35 records that did not meet the Deemed Savings Manual eligibility criteria—35 where the initial leakage is above 4.0 CFM50 per square foot. Additionally, three other records do not match the EM&V team's evaluated savings, which appear to be scaled up by a factor of 2.09.
- **Air conditioners.** The EM&V team identified one record where savings did not match those calculated using the Deemed Savings Manual. For this record, the reported kW and kWh appear to deviate from the EM&V team calculation by factors of 0.11 and 0.2, respectively.
- **Duct efficiency.** The EM&V team identified 12 instances where savings did not exactly match those calculated using the Deemed Savings Manual Duct Efficiency calculator. This resulted in a minor impact in savings.
- **Ceiling insulation.** The EM&V team identified four records where savings did not match those calculated using the Deemed Savings Manual. While kW matched for one of these projects, its kWh savings was 2.1 times the value calculated from the deemed savings manual. The reported kW and kWh for the other three instances deviated from 100 percent, without any consistent scaling factor
- **ENERGY STAR® windows.** The EM&V team identified one record where savings did not match those recalculated using the Deemed Savings Manual. For this record, the reported kWh and kW savings appear to deviate from the EM&V team calculation by a factor of 2.35 and 0.89 respectively.

The EM&V team was unable to verify savings through the desk review process for any of the ten sampled projects for AEP TNC RES SOP due to a lack of key measure attribute assumptions (i.e., square feet, pre/post-CFM levels, bulb wattage, or heating type) provided

in the supplemental data received. Since sufficient documentation was provided for fewer than 70 percent of the sampled sites, the uncertainty ranking for these estimates is HIGH.

5.3.2 Hard-to-Reach Standard Offer Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
5.2%	313	312	99.8%	11.7%	857,691	851,516	99.3%	High	5

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the HTR SOP were slightly lower than claimed savings, with realization rates for both kW and kWh slightly less than 100 percent.

Realization rates for the HTR SOP were mainly driven by savings adjustments to the following measures:

- **Air infiltration.** Variation in application of specific eligibility criteria introduced in early 2012 has led to adjustment of air infiltration savings for several utility programs. For this program, we adjusted savings for 16 records that did not meet the Deemed Savings Manual eligibility criteria—15 where the initial leakage is above 4.0 CFM50 per square foot and 1 where final ventilation rate was lower than the minimum requirement. Additionally, one other record did not match the EM&V team's evaluated kWh savings, which appear to be scaled up by a factor of 2.09.
- **Ceiling insulation.** The EM&V team identified one record where savings did not match those recalculated using the Deemed Savings Manual. For this record, the reported savings appear to deviate from the EM&V team calculation by a factor of 1.43.
- **Lighting—CFLs.** The EM&V team identified ten records where savings did not match those recalculated using the Deemed Savings Manual. For these records, the reported savings appear to deviate from the EM&V team calculations, though not by a uniform scaling factor.
- **Duct efficiency.** The EM&V team identified 13 instances where savings did not exactly match those calculated using the Deemed Savings Manual Duct Efficiency calculator. This resulted in a minor impact to savings.

The EM&V team was not able to verify savings through the desk review process for any of the sampled projects for HTR SOP due to a lack of key measure attribute assumptions provided in the supplemental data received. Since sufficient documentation was provided for fewer than 70 percent of the sampled sites, the uncertainty ranking for these estimates is HIGH.

5.3.3 Targeted Low-Income Energy Efficiency Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
0.7%	44	43	98.3%	2.4%	175,564	161,572	92.0%	High	5

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the AEP TNC Targeted Low-Income program were slightly lower than claimed savings, with realization rates for both kW and kWh less than 100 percent.

Realization rates for the AEP TNC Targeted Low-Income program were mainly driven by savings adjustments to the following measures:

- **Refrigerator replacement.** For targeted low-income programs, claimed savings calculations were based on algorithms that differed from the Deemed Savings Manual in some cases. Using these alternative calculations, the EM&V team was able to achieve a near 100 percent match to the reported savings; however, a few discrepancies remained due to a calculation error in the implementation contractor's database that produced lower aggregate savings than were calculated by the EM&V team.
- **Ceiling fan.** All ceiling fan energy savings appear to be scaled to a constant 99.9481 percent of DSM-calculated values, across all utilities. No demand savings are included in the tracking system for ceiling fans; however, the EM&V team calculated these savings according to the Deemed Savings Manual.
- **Central AC.** For targeted low-income programs, claimed savings calculations were based on algorithms that differed from the Deemed Savings Manual in some cases. Using the alternative calculation, the EM&V team found no difference in savings for the central AC installations.
- **Window AC.** For targeted low-income programs, claimed savings calculations were based on algorithms that differed from the Deemed Savings Manual in some cases. Using the alternative calculation, savings matched for nearly all observations within the tracking system; however, a few small discrepancies remained, reflecting deviation from the claimed savings due to errors in the reporting format of unit age. For two observations, the year of installation was reported rather than the unit age, resulting in erroneously rounding the unit lifetime to 15 years.
- **Duct efficiency.** For targeted low-income programs, claimed savings calculations were based on algorithms that differed from the Deemed Savings Manual and the related Duct Efficiency calculation tool. Using the alternative calculation, savings matched for all observations in the tracking system.
- **Lighting—CFLs.** For targeted low-income programs, claimed savings calculations were based on algorithms that differed from the Deemed Savings Manual for TNC

lighting measures. Using the alternative calculation, savings matched for all observations in the tracking system.

- **Solar Screens.** The EM&V team identified two records where energy savings did not match those recalculated using the Deemed Savings Manual. For these records, the reported kWh appears to deviate from the EM&V team calculation by a factor of 0.96.
- **Showerheads.** The EM&V team identified two records where claimed savings appear to include other hot water-savings measures (i.e., water heater jacked insulation [100 kWh], pipe insulation [40 kWh]). As the reported savings for these projects differ by increments of 140 kWh and 40 kWh, we assume showerhead savings were combined in reporting, and have been recalculated in reporting evaluated savings using the Deemed Savings Manual methodology solely for showerhead measures.

For several measures, it is noted that the EM&V team compared calculations provided by the implementation contractor to the Deemed Savings Manual. Low-income programs have different implementation requirements than non-low-income energy efficiency programs. The Public Utility Regulatory Act (PURA) §39.905(f) addresses general provisions for low-income programs. For low-income programs, we recommend improved documentation on savings calculation approaches that represent alternate calculations than those in the Deemed Savings Manual for refrigerators and HVAC measures.

Desk reviews were completed for only one project, for which sufficient measure information was provided through the supplemental data request. The EM&V team identified only one discrepancy through this process, where one CFL measure's wattage range was incorrectly assigned.

The EM&V team was unable to verify savings through the desk review process for the majority of the sampled projects due to a lack of key measure attribute assumptions provided in the supplemental data received. Since insufficient documentation was provided for more than 70 percent of the sampled sites, the uncertainty ranking for these estimates is HIGH.

5.4 DETAILED FINDINGS—LOAD MANAGEMENT

5.4.1 Load Management Standard Offer Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)*	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews**
61.7%	3,713	3,712	100.0%	0.1%	10,741	17,285	160.9%	Low	7

*Claimed kW savings match the PY2012 EEPR; however, there is a slight variance in claimed kWh savings from the EEPR.

**Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

The program findings presented here are for both the legacy and the expanded Load Management SOP. It was not clear in the work papers provided to the EM&V team which participant was associated with which program element.

The PY2012 evaluation activities found that the individual participant peak load impact calculations in the work papers supplied to the EM&V team were very similar to those validated by using the individual customer interval load data.

5.5 DETAILED FINDINGS—PILOTS

5.5.1 A/C Distributor Pilot Market Transformation Program (Residential)

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
0.3%	16	16	100.0%	0.7%	48,920	48,920	100.0%	High	5

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for AEP TNC's A/C Distributor Pilot MTP were the same as the claimed savings; thus, realization rates for both kW and kWh are 100 percent.

The first phase of impact evaluation the EM&V team completed was a tracking system review. No issues were found during this phase.

The second phase of the impact evaluation was to complete desk reviews for a select sample of projects. In order to complete comprehensive desk reviews for this program, the EM&V team requested all project documentation associated with each sampled project, including the customer application and invoice, any calculators used, and reports of QA/QC or M&V activity if conducted. What the EM&V team received for each project was a two-page Field Inspection Form with very basic information and three pictures—one of the site address, one of the unit itself, and one of the name plate information associated with that particular unit. This project

documentation did not include seasonal energy efficiency ratio (SEER) or tonnage information, both critical inputs to calculating savings to allow for comparison to the Deemed Savings Manual.

Ideally, the EM&V team would have reviewed AEP TNC's stated algorithms and compared the claimed savings against those algorithms and the Deemed Savings Manual. Because the EM&V team received insufficient documentation for all sampled sites, we were not able to verify key inputs and assumptions (e.g., equipment SEER and tonnage). Since sufficient documentation was provided for fewer than 70 percent of the sampled sites, the uncertainty ranking for these estimates is HIGH.

5.5.2 SMART Source Solar PV Market Transformation Program (Nonresidential)

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
0.8%	49	49	100.0%	1.3%	94,896	94,896	100.0%	Low	4

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings matched claimed or reported savings from program administrators because the evaluation activities found no evidence of differences between installed and tracked system capacity. This finding was based on our desk review of four installations. Evaluated savings estimates are based solely on installed capacity (DC) reported in the tracking system multiplied by the approved deemed savings calculations of 1,600 kWh and 0.83 kW per kW of capacity.

The EM&V team was able to verify 100 percent of the installed system capacity ratings in the tracking system based on our review of a sample of either inspection reports or final invoices to confirm reported system capacity. Installed capacity is the only input to the evaluated savings calculations for this program year so the overall uncertainty ranking for inputs to this savings estimate is considered LOW.

It should be noted that for PY2013, prospective evaluated savings from this program will be based on PvWatts simulations and metered data. These simulations will account for available sunlight and panel orientation in the local utility area. If these simulations were applied for PY2012 program installation data, demand savings realization would have been less than 100 percent as follows:

- Prospective kWh Realization Rate if using simulation: 99 percent
- Prospective kW Realization Rate if using simulation: 87 percent

These prospective realization rates using simulation results are much closer to what should be expected in PY2013. The kWh realization rate is expected to be nearly 100 percent. The

PvWatts simulation program is likely to produce lower estimates of demand savings from the PV installations due to the following factors, which are considered in the simulation program more conservatively than in the deemed savings calculation:

1. Wiring losses—driven largely by:
    a. PV module nameplate DC rating adjustments for temperature and actual capacity.
    b. Module Mismatch Loss—panels are connected in series to build voltage and are limited by the current of the worst performing panel.
    c. AC & DC Wiring Losses—resistive losses in the wires on both the DC side (before the inverter) and AC side (after the inverter) decrease performance.
2. Inverter efficiency losses when converting AC to DC power.
3. Shading—from nearby panels, buildings, or trees.
4. Soiling—build-up of dirt or other particulates on the panels that block sunlight from reaching the PV cells.
5. System availability—how often the system is "up" and not offline due to maintenance, failures, etc.
6. Equipment degradation over time—PV cells lose efficiency over time at commonly accepted rates of 0.5–1 percent, primarily due to short circuit current (I_{sc}) losses caused by ultraviolet (UV) absorption at or near the top of the silicon surface.

5.5.3 SMART Source Solar PV Market Transformation Program (Residential)

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
0.7%	44	44	100.0%	1.2%	85,248	85,248	100.0%	Medium	6

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings matched claimed or reported savings from program administrators because the evaluation activities found no evidence of differences between installed and tracked system capacity. This finding was based on our desk review of six installations. Evaluated savings estimates are based solely on installed capacity (DC) reported in the tracking system multiplied by the approved deemed savings calculations of 1,600 kWh and 0.83 kW per kW of capacity.

The EM&V team was only able to verify 79 percent of the installed system capacity ratings in the tracking system based on our review of a sample of either inspection reports or final invoices to confirm reported system capacity. Two sites did not have an inspection report and the final invoice did not list system capacity or module type to verify installed capacity. Installed capacity is the only input to the deemed savings calculations so the uncertainty ranking is MEDIUM.

It should be noted that for PY2013, prospective evaluated savings from this program will be based on PvWatts simulations and metered data. These simulations will account for available sunlight and panel orientation in the local utility area. If these simulations were applied for PY2012 program installation data, demand savings realization would have been less than 100 percent as follows:

- Prospective kWh Realization Rate if using simulation: 94 percent
- Prospective kW Realization Rate if using simulation: 86 percent

These prospective realization rates using simulations are much closer to what should be expected in PY2013. The PvWatts simulation program is likely to produce lower estimates of demand savings from the PV installations due to factors that are considered in the simulation program more conservatively than in the deemed savings calculation (see nonresidential solar PV detailed findings).

6. IMPACT EVALUATION RESULTS—CENTERPOINT ENERGY HOUSTON ELECTRIC, LLC

This section presents the evaluated savings and cost-effectiveness results for CenterPoint Energy Houston Electric, LLC's (CenterPoint) energy efficiency portfolio. The key findings are summarized first, followed by details for each program in the portfolio.

6.1 KEY FINDINGS

6.1.1 Evaluated savings

PY2012 evaluated savings agree closely with PY2012 claimed savings for CenterPoint's energy efficiency portfolio. The overall portfolio level realization rate is 99.9 percent for demand savings and 99.4 percent for energy savings. The close to 100 percent portfolio realization rates are a result of consistently high realization rates across programs.

The overall kW portfolio realization rate is driven by the load management realization rate, which accounts for the majority of demand savings. The kWh portfolio realization rate is less than 100 percent primarily due to the commercial sector realization rate of 98.7 percent, which accounts for two-thirds of total energy savings. Commercial sector program savings adjustments were only needed for a few of the sampled projects. Commercial project adjustments included changes to inputs in savings calculators such as baseline, facility types, or quantities and reconciling tracking system and calculator savings numbers.

Table 6-1 shows the claimed and evaluated demand savings for CenterPoint's portfolio and broad customer sector/program categories for PY2012.

Table 6-1. CenterPoint Program Year 2012 Claimed and Evaluated Demand Savings

Level of Analysis	Percent Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Completed Desk Reviews	Precision at 90% Confidence
Total Portfolio		**173,622**	**173,401**	**99.9%**	**511**	**0.10%**
Commercial Sector	9.7%	16,791	16,667	99.3%	64	1.02%
Residential Sector	9.4%	16,280	16,268	99.9%	108	0.26%
Load Management	81.0%	140,550	140,466	99.9%	339*	0.00%
Pilots	0.0%	1	1	100.0%	0	0.00%

*The review for the load management program included a review of equations and interval meter data to estimate the baseline usage and resulting level of load curtailment achieved for each event for all participants

Table 6-2 shows the claimed and evaluated energy savings for CenterPoint's portfolio and broad customer sector/program categories for PY2012.

Table 6-2. CenterPoint Program Year 2012 Claimed and Evaluated Energy Savings

Level of Analysis	Percent Portfolio Savings (kWh)	2012 Claimed Demand Savings (kWh)	2012 Evaluated Demand Savings (kWh)	Realization Rate (kWh)	Completed Desk Reviews	Precision at 90% Confidence
Total Portfolio		**129,665,841**	**128,854,608**	**99.4%**	**511**	**0.47%**
Commercial Sector	64.0%	83,028,065	81,924,164	98.7%	64	0.74%
Residential Sector	35.6%	46,213,192	46,084,238	99.7%	108	0.10%
Load Management	0.30%	421,622	843,244	200.0%	339*	0.00%
Pilots	0.0%	2,962	2,962	100.0%	0	0.00%

*The review for the load management program included a review of equations and interval meter data to estimate the baseline usage and resulting level of load curtailment achieved for each event for all participants

Program-level realization rates are discussed in the detailed findings sub-sections. **However, it is important to note that these results should only be viewed qualitatively due to the small sample sizes at the utility-program level. Program-level results should only be used to provide insight into how individual programs are affecting the overall portfolio realization rates.**

In program-level realization rates, we have also included a qualitative rating of low, medium, and high associated with the uncertainty of the verification effort based on program documentation received from the utility. The most favorable rating for uncertainty of "low" was given when thorough and detailed documentation was received to verify the savings. The "high" uncertainty rating was given when the EM&V team received primarily project-level savings calculations without supporting documentation to verify the inputs in the calculations. It is important to note that this uncertainty rating is specific to program documentation received to verify claimed savings and is not an indicator of the reasonableness or accuracy of savings estimates.

There is a very high level of uncertainty associated with the PY2012 residential evaluated kWh savings due to limited documentation to complete an independent review of savings across several of the residential programs including ENERGY STAR® New Homes, Residential and Small Commercial SOP, and Hard-to-Reach SOP.

For nonresidential sector programs, the level of uncertainty of evaluated savings is less as most nonresidential sector programs had low or medium levels of uncertainty. While sufficient documentation was generally provided for nonresidential projects, program uncertainty rankings fell from low to medium for some programs (Commercial SOP, SCORE MTP) due to missing information for some of the reviewed projects. There is a lower level of uncertainty in

the evaluated kW savings due to the high percent of kW savings from the load management program. There was sufficient documentation (work papers, interval meter data) provided to the EM&V team to verify claimed kW savings for a census of participants in the load management program.

6.1.2 Cost-effectiveness results

CenterPoint's overall portfolio had a cost-effectiveness of 2.39 including low-income programs and 2.62 excluding low-income programs. All categories of programs passed the cost-effectiveness analysis except for pilots. The pilot category did not pass because of the Retail Electric Provider (REP) Pilot. PY2012 was the first year of the REP pilot. As discussed with PUCT staff, pilots are not required to pass the program administrator cost test (PACT) until their second year of implementation to recognize program start-up costs. In addition, the Energy Wise Resource Action MTP and Home Performance with ENERGY STAR® MTP did not pass the PACT in PY2012. CenterPoint has identified program changes to increase and pass cost-effectiveness in future program years.[11]

The more cost-effective programs were Large Commercial SOP and ENERGY STAR® New Homes MTP. The less cost-effective programs were Energy Wise Resource Action MTP, Home Performance with ENERGY STAR® MTP, and the Retail Electric Provider Pilot MTP. The PY2012 cost-effectiveness results were largely driven by all Commercial Sector Programs, especially Large Commercial SOP, as well as ENERGY STAR® New Homes MTP. The Large Commercial SOP accounted for 38 percent of the portfolio's benefits, using only 22 percent of overall program costs. Similarly, ENERGY STAR® New Homes MTP achieved 24 percent of the portfolio's benefits using only 12 percent of the overall budget. The less cost-effective programs also impacted results, as they used 9 percent of the program budget between the three programs but contributed less than 1 percent of portfolio benefits.

Table 6-3. CenterPoint Cost-effectiveness Results

Level of Analysis	Claimed Savings Results	Evaluated Savings Results
Total Portfolio	**2.41**	**2.39**
Total Portfolio excluding low-income programs	**2.63**	**2.62**
Commercial Sector	**3.80**	**3.75**
Large Commercial SOP	4.31	4.24
Retro-Commissioning MTP	3.18	3.15
Texas SCORE MTP	2.52	2.52
Residential Sector	**2.74**	**2.73**
Residential and Small Commercial SOP	1.92	1.91
Hard-to-Reach SOP	1.45	1.44

[11] PUC Docket No. 41540, CenterPoint Energy Houston Electric, LLC's Response to Public Utility Commission of Texas First Request for Information, June 27, 2013.

Level of Analysis	Claimed Savings Results	Evaluated Savings Results
A/C Distributor MTP	1.94	1.94
ENERGY STAR® New Homes MTP	4.93	4.93
Energy Wise Resource Action MTP	0.39	0.39
Home Performance with ENERGY STAR® MTP	0.00	0.00
Multi-Family Water & Space Heating MTP	1.28	1.28
Low-Income	**1.16**	**1.14**
Agencies in Action MTP	1.16	1.14
Load Management	**1.32**	**1.32**
Large Commercial Load Management SOP	1.32	1.32
Pilots	**0.72**	**0.71**
Advanced Lighting Commercial Program	1.58	1.57
Advanced Lighting Residential Program	1.48	1.45
Retail Electric Provider Pilot MTP	0.13	0.13

6.2 DETAILED FINDINGS—COMMERCIAL

6.2.1 Commercial standard offer

A. Large Commercial Standard Offer Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings* (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings* (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews**
6.8%	11,761	11,687	99.4%	48.5%	62,888,411	61,800,441	98.3%	Medium	30

*Claimed savings vary slightly from the PY2012 EEPR as a partially completed project that was accounted for in the EEPR was excluded from the tracking data.

**Confidence intervals are not reported at the utility program level as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the CSOP program were only slightly lower than claimed savings taken from the program tracking system, with realization rates slightly less than 100 percent for both demand and energy savings.

The realization rates were driven by adjustments to claimed energy and peak savings made at 3 of the 30 sampled sites. Details on the adjustments are provided below.

Lower savings were estimated at two sites due to the use of a new construction baseline. These projects were identified as replace-on-burnout (ROB) type applications in the tracking

system. However, the baseline efficiency selected in the calculator was not consistent with the applicable standard. The EM&V team adjusted the calculator application by selecting the New Construction option in the calculator and, as a result, savings at both sites were reduced.

For another site, lower site savings were estimated due to inconsistent savings totals in the tracking system and calculator. The project submitted was for installation of a windows film installation measure. The reported savings in the tracking system did not match the windows film calculator savings. Additionally, the EM&V team reviewed the project documentation and confirmed that the windows film was the only installed measure, which resulted in an increase in kW savings and a reduction in kWh savings (kW realization rate = 119 percent and kWh realization rate = 45 percent).

The EM&V team was able to verify key inputs and assumptions (e.g., equipment quantity and specifications) because sufficient documentation was provided for 23 of the 30 sampled sites. Sufficient documentation included equipment invoices, cut sheets, and/or pre/post inspection reports for a majority of their sites. The EM&V team was unable to verify key inputs for seven of the thirty sites because no or insufficient documentation was provided for those sites. The uncertainty ranking for this program savings estimate is assessed as MEDIUM because sufficient documentation was provided for greater than 70 percent but fewer than 90 percent of the sampled sites.

6.2.2 Commercial market transformation

A. Retro-Commissioning Market Transformation Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
0.9%	1,605	1,555	96.9%	4.9%	6,403,982	6,403,982	100.0%	Medium	5

*Confidence intervals are not reported at the utility program level as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the CenterPoint Retro-Commissioning MTP were lower than the claimed savings for kW at a 97 percent realization rate, while kWh was a 100 percent realization rate.

The realization rate for the CenterPoint Retro-Commissioning MTP was mainly driven by savings adjustments to one site. For this site, three (AHU VFD, Chiller Pump VFD, and Duct Leakage Reduction) of the eight measures did not provide documentation for how kW's were calculated (documentation was provided for kWh), and therefore, these were evaluated from the information that was provided. The evaluated savings resulted in the site's decreased savings (kWh realization rate = 100 percent and kW realization rate = 90 percent).

The desk reviews were completed for a sample of projects. The EM&V team was not able to verify key inputs and assumptions (e.g., equipment loads and run hours during peak periods) for one of the five sites because insufficient documentation was provided for the site. In particular, CenterPoint did not provide the EM&V team with the requested calculators and referenced input assumptions such as weather bins. Since sufficient documentation was provided for 80 percent of the sampled sites, the uncertainty ranking for these estimates is MEDIUM.

B. Texas SCORE Market Transformation Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
1.9%	3,364	3,364	100.0%	8.6%	11,206,857	11,206,857	100.0%	Medium	20

*Confidence intervals are not reported at the utility program level as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the CenterPoint Score MTP were equal to the claimed savings, with realization rates for both kW and kWh equaling 100 percent. There were no adjustments to any of the savings calculations.

The desk reviews were completed for a sample of projects. The EM&V team was not able to verify key inputs and assumptions (e.g., equipment quantity and specifications) for 5 of the 20 sites because limited documentation was provided for the site. In particular, CenterPoint was not able to provide the EM&V team with invoices as they were not collected as part of the program in 2012. Since sufficient documentation was provided for 75 percent of the sampled sites, the uncertainty ranking for these estimates is MEDIUM.

6.3 DETAILED FINDINGS—RESIDENTIAL

6.3.1 Residential and Small Commercial Standard Offer Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
0.5%	843	843	100.0%	1.2%	1,495,554	1,490,356	99.7%	High	10

*Confidence intervals are not reported at the utility program level as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the CenterPoint Residential and Small Commercial SOP were slightly lower than claimed kWh savings, with a realization rate for kWh slightly less than 100 percent.

Realization rates for the CenterPoint Residential and Small Commercial SOP were mainly driven by savings adjustments to the following measures:

- **ENERGY STAR® Windows.** The EM&V team identified one record where savings did not match those recalculated using the Deemed Savings Manual. For this record, the reported savings appear to deviate from the EM&V team calculation by a factor of 3.55.
- **Duct Efficiency.** The EM&V team identified one instance where savings did not exactly match those calculated using the Deemed Savings Manual Duct Efficiency calculator. This resulted in a minor impact in savings.
- **Air Infiltration.** Variation in application of specific eligibility criteria introduced in early 2012 has led to adjustment of air infiltration savings for several utility programs. For this program, we adjusted savings for two records that did not meet the Deemed Savings Manual eligibility criteria—two where the initial leakage is above 4.0 CFM50 per square foot.
- **Ceiling Insulation.** The EM&V team identified two records where savings did not match those recalculated using the Deemed Savings Manual. While kW matched for both of these projects, their kWh savings were 4.4 times the value calculated from the deemed savings manual.

The EM&V team was unable to verify savings through the desk review process for any of the sampled projects for CenterPoint Residential and Small Commercial SOP due to a lack of key measure attribute assumptions (i.e., square feet, pre/post-CFM levels, bulb wattage, or heating type) provided in the supplemental data received. Since sufficient documentation was provided for fewer than 70 percent of the sampled sites, the uncertainty ranking for these estimates is HIGH.

6.3.2 Hard-to-Reach Standard Offer Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
1.1%	1,966	1,965	99.9%	3.1%	4,018,911	3,977,918	99.0%	High	10

*Confidence intervals are not reported at the utility program level as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the CenterPoint HTR SOP were slightly lower than claimed savings, with realization rates for both kW and kWh slightly less than 100 percent.

Realization rates for the CenterPoint HTR SOP were mainly driven by savings adjustments to the following measures:

- **Air infiltration.** Variation in application of specific eligibility criteria introduced in early 2012 has led to adjustment of air infiltration savings for several utility programs.

For this program, we adjusted savings for ten records that did not meet the Deemed Savings Manual eligibility criteria—nine where the initial leakage is above 4.0 CFM50 per square foot, and one where final ventilation rate is lower than the minimum requirement.

- **Ceiling insulation.** The EM&V team identified 15 records where savings did not match those recalculated using the Deemed Savings Manual. While kW matched for 12 of these projects, their kWh savings were 4.4 times the value calculated from the deemed savings manual. The reported kW and kWh for the other three instances deviated from 100 percent, without any consistent scaling factor.
- **Lighting—CFLs.** The EM&V team identified one record where savings did not match those recalculated using the Deemed Savings Manual. For this record, the reported savings appear to deviate downward from the EM&V team calculations by a factor of 1.16.
- **Duct efficiency.** The EM&V team identified three instances where savings did not exactly match those calculated using the Deemed Savings Manual Duct Efficiency calculator. This resulted in a minor impact in savings.
- **New homes.** The EM&V team applied the realization rate from the ENERGY STAR® New Homes MTP program. Evaluated savings for that program were the same as the claimed savings; thus, realization rates for both kW and kWh are 100 percent. For that program, we would have ideally reviewed CenterPoint's stated algorithms and compared the claimed savings against those algorithms in a documented program manual or, at the very least, against a home built to code. Because the EM&V team received insufficient documentation for all sampled sites, we were not able to verify key inputs and assumptions (e.g., base home inputs). However, we did build our own code home and compared the IECC 2009 code requirements to those inputs provided in the component summary documents provided by CenterPoint.

The EM&V team was unable to verify savings through the desk review process for any of the sampled projects for CenterPoint HTR SOP due to a lack of key measure attribute input assumptions provided in the supplemental data received. Since sufficient documentation was provided for fewer than 70 percent of the sampled sites, the uncertainty ranking for these estimates is HIGH.

6.3.3 Residential market transformation

A. A/C Distributor Market Transformation Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
1.1%	1,980	1,980	100.0%	4.9%	6,326,545	6,326,545	100.0%	Low	10

*Confidence intervals are not reported at the utility program level as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for CenterPoint's A/C Distributor MTP were the same as the claimed savings; thus, realization rates for both kW and kWh are 100 percent.

The second phase of the impact evaluation was to complete desk reviews for a select sample of projects. In order to complete a comprehensive desk review for this program, the EM&V team requested all project documentation associated with each sampled project, including the customer application and invoice, any calculators used, and reports of QA/QC or M&V activity if conducted. For each project, the EM&V team received a Request for Payment form, a printed summary of what was input to the database, a customer invoice, and a Certificate of Product Ratings, which included the unit's cooling capacity, energy efficiency ratio (EER) and seasonal energy efficiency ratio (SEER) ratings.

The EM&V team reviewed CenterPoint's project documentation and compared the claimed savings against those in the Deemed Savings Manual. Because the EM&V team received sufficient documentation for all sampled sites, we were able to verify key inputs and assumptions (e.g., equipment SEER and tonnage). As a result, the uncertainty ranking for both the kW and kWh savings is LOW.

B. ENERGY STAR® New Homes Market Transformation Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
5.8%	10,145	10,145	100.0%	20.5%	26,565,600	26,565,600	100.0%	High	25

*Confidence intervals are not reported at the utility program level as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for CenterPoint's ENERGY STAR® New Homes MTP were the same as the claimed savings; thus, realization rates for both kW and kWh are 100 percent.

The first phase of impact evaluation the EM&V team completed was a tracking system review. No issues were found during this phase.

The second phase of the impact evaluation was to complete desk reviews for a select sample of projects.

In order to complete a comprehensive desk review for this program, the EM&V team requested all project documentation associated with each sampled project, including the application, reports of QA/QC or M&V activity if conducted, documentation for how the as-built home compares to the base home, and modeling and energy savings information. What the EM&V team received for each project was a multi-page document with REM/Rate inputs, and a summary of the savings and incentive, HVAC, duct, HERS rating, and square feet components. While this information was helpful in understanding some of the major components going into the as-built home, at the time this report was written, the EM&V team had not received any information about the base home, or how energy savings or incentives were calculated. This additional information contains critical inputs to calculating savings to allow for comparison and to verify energy savings and incentive payouts.

Ideally, the EM&V team would have reviewed CenterPoint's stated algorithms and compared the claimed savings against those algorithms in a documented program manual or, at the very least, against a home built to code. Because the EM&V team received insufficient documentation for all sampled sites, we were not able to verify key inputs and assumptions (e.g., base home inputs). However, we did build our own code home and compared the IECC 2009 code requirements to those inputs provided in the component summary documents provided by CenterPoint. For the 25 sampled homes, our analysis showed that HERS scores ranged from 59 to 71, which is a reasonable range. Additionally, all sampled homes had blower door air test results (heating and cooling infiltration) below the 7 ACH @ 50 pascals standards, which is what would be expected.

Recognizing the new homes program takes a whole-building approach to energy savings, we did not make adjustments to savings based on the various component comparisons. Due to insufficient supporting documentation for all sampled homes, the uncertainty ranking for both the kW and kWh savings is HIGH. However, since the drafting of this report, the EM&V team has had discussions with the implementer to discuss savings calculations for this program. Based on these discussions, the EM&V team is confident that the implementer will provide documentation for the PY2013 evaluation efforts (and beyond) that will take the uncertainty ranking for this program from HIGH to LOW.

C. Multi-Family Water & Space Heating Market Transformation Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
0.3%	464	464	100.0%	1.7%	2,197,512	2,197,512	100.0%	High	2

*Confidence intervals are not reported at the utility program level as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the CenterPoint Multi-Family Water & Space Heating MTP were equal to the claimed savings, with realization rates for both kW and kWh equaling 100 percent. There were no adjustments to any of the savings calculations.

The desk reviews were completed for a sample of projects. The EM&V team was not able to verify key inputs and assumptions (e.g., equipment quantity and specifications) for one of the two sites because insufficient documentation was provided for the site. In particular, while CenterPoint did provide the EM&V team with the requested invoices, make and model numbers were not included. The EM&V team was able to verify deemed savings based on the tank size and EF values provided in a separate spreadsheet. Although the units meet the new 2009 IECC/ASHRAE 90.1–2010 minimum EF values, the deemed savings values used were not reflective of the baseline changes that occurred in August 2012 with the code change. Because this code change occurred mid-year, the EM&V team evaluated the savings using the 2007 IECC based deemed savings values. However, these deemed values should be updated for PY2013 within the deemed savings manual for Commercial applications which are under the new code change. Since sufficient documentation was provided for 50 percent of the sampled sites, the uncertainty ranking for these estimates is HIGH.

D. Energy Wise Resource Action Market Transformation Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
0.0%	51	51	100.0%	1.1%	1,411,240	1,411,240	100.0%	Low	10

*Confidence intervals are not reported at the utility program level as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for CenterPoint's Energy Wise Resource Action MTP were the same as the claimed savings; thus, realization rates for both kW and kWh are 100 percent.

The EM&V team first completed a tracking system review. Tracking system data is generally in agreement with the data in the project documentation, which is solely based on returned surveys and the coding of those surveys. The only discrepancy found across the ten surveys reviewed was with ID 28600, where an error was found on the last Scantron, in group 2 question 10; there was data in the cell, but the question was not answered so the cell should have been blank. All other data was the same. Savings were not affected as a result of this discrepancy.

In order to complete a comprehensive desk review for this program, the EM&V team requested all project documentation associated with each sampled project, including the survey instrument, survey coding key, coded data, any calculators used, and any available program manuals. The EM&V team received the survey instrument, survey coding key, coded data and information about how savings are attributed to the program, which allowed us to verify the savings with a LOW level of uncertainty across all sampled sites.

E. Home Performance with ENERGY STAR® Market Transformation Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
0.0%	1	1	100.0%	0.0%	2,962	2,962	100.0%	Unranked	0

*Confidence intervals are not reported at the utility program level as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for CenterPoint's Home Performance with ENERGY STAR® MTP were the same as the claimed savings; thus, realization rates for both kW and kWh are 100 percent.

CenterPoint's Home Performance with ENERGY STAR® MTP was new in PY2012, and only a limited geographic area was targeted to test the program plan and develop the necessary contractors to implement the program across the service territory. As a result, only one project was completed through this program. Because of this, only a tracking system review was completed for this program, comparing the savings calculated using the 2012 Deemed Savings Manual. As planned, no desk reviews were completed.

6.3.4 Low-income market transformation

A. Agencies in Action Market Transformation Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
0.4%	696	685	98.4%	2.1%	2,672,377	2,629,886	98.4%	Low	35

*Confidence intervals are not reported at the utility program level as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the CenterPoint Agencies in Action MTP were slightly lower than claimed savings, with realization rates for both kW and kWh slightly less than 100 percent.

Realization rates for the CenterPoint Agencies in Action MTP were mainly driven by savings adjustments to the following measure:

- **Air infiltration.** Variation in application of specific eligibility criteria introduced in early 2012 has led to adjustment of air infiltration savings for several utility programs. For this program, the EM&V team was unable to verify whether the minimum final ventilation criteria were satisfied due to the lack of a home shield type in the racking system data. We assumed all measures met these criteria; additionally, all measures were verified to meet the initial leakage and 10 percent leakage reduction criteria. Within the tracking system data, savings were not based upon the 2012 values. The tracking system calculated savings based upon an estimated leakage rate reduction

used to screen participants. The EM&V team used the values and found a realization rate of 134.5 percent for the air infiltration measure.

- **Lighting—CFLs.** Savings within the tracking system used a CFL savings table from 2011. The EM&V team updated the table to the 2012 values and therefore, the realization rate for this measure was not 100 percent.
- **Refrigerator replacement.** For targeted low-income programs, claimed savings calculations were based on algorithms that differed from the Deemed Savings Manual. Using these alternative calculations, the EM&V team was able to achieve a near 100 percent match to the reported savings; however, a few small discrepancies remained due to a calculation error in the implementation contractor's database that produced lower aggregate savings than were calculated by the EM&V team.
- **Window AC.** The EM&V team identified several instances where differences in rounding occurred between the tracking system data and the calculated savings. In some cases, the calculated savings using reported input assumptions resulted in slightly fewer or slightly more significant digits than corresponding savings reported in the tracking system. Reasons for these differences in rounding were unclear (other than if reported savings had used input assumptions with slightly different significant digits at a point in time prior to entry in the EM&V database). The EM&V team did not explicitly round any of their calculations.

Desk reviews were completed for 35 projects, for which sufficient measure information was provided through the supplemental data request. Since sufficient documentation was provided for more than 70 percent of the sampled sites, the uncertainty ranking for these estimates is LOW. The EM&V team identified a few discrepancies through this process associated with the following measures:

- **Solar screens.** The EM&V team identified discrepancies in square footage reported in the tracking system compared to those presented in the participant documentation.
- **Lighting—CFLs.** The EM&V team identified a few instances where CFL quantities in the tracking system deviated from those presented in the participant documentation.
- **Refrigerator replacement.** One instance was found where a refrigerator replacement measure was reported in the tracking system, though participant documentation indicated this measure was provided to the participant but was ultimately left uninstalled.

We are recommending CenterPoint improve documentation on the savings calculation approach for low-income programs as we received alternate calculations than those in the Deemed Savings Manual refrigerators and HVAC measures. Even with the provided documentation, the EM&V team was still unable to match 100 percent for refrigerators.

6.4 DETAILED FINDINGS—LOAD MANAGEMENT

6.4.1 Large Commercial Load Management Standard Offer Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
81.0%	140,550	140,466	99.9%	0.3%	421,622	843,244	200.0%	Low	339

*Confidence intervals are not reported at the utility program level as these results should only be viewed qualitatively due to the very small sample sizes.

The table above compares savings claimed by CenterPoint to evaluated savings estimates. The PY2012 evaluation activities found that the individual participant load impact calculations in the work papers supplied to the EM&V team were virtually identical to those validated by using the individual customer interval load data.

The high kWh realization rate is because the reported energy savings were based on averaging of the two events, when they should have been added together.

6.5 DETAILED FINDINGS—PILOTS

6.5.1 Advanced Lighting Commercial Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings* (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings* (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
0.0%	61	61	100.0%	2.0%	2,528,815	2,512,884	99.4%	Low	9

*Confidence intervals are not reported at the utility program level as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated kW savings for the CenterPoint Advanced Lighting Commercial MTP were equal to the claimed kW savings, with realization rates for kW equaling 100 percent. There were no adjustments to the kW savings calculations. The evaluated kWh savings were slightly lower than the claimed savings, with realization rates for kWh slightly less than 100 percent.

The kWh realization rate for the CenterPoint Advanced Lighting Commercial MTP was mainly driven by savings adjustments to one[12] site. For this site, the building size utilized within the

[12] This project included the savings results for four unique sites (each with a unique address). Only one calculator was provided which included all four sites with a combined building size as the new construction baseline condition. Therefore, all sites were evaluated as part of this desk review. Reported and evaluated savings include all four site addresses; however, the desk review count was not increased as only one desk review report was generated.

final project calculator was not consistent with the area as indicated on the site drawings. Based on the review of the drawings provided, the EM&V team changed the building area from 843,841 square feet to 830,114 square feet, which resulted in decreased savings (kWh realization rate = 98 percent). This is a new construction project and the baseline load is established as the product of the maximum code-allowed lighting power density for the type of building and the illuminated floor areas. Therefore, the change (reduction) in building illuminated floor area moved the baseline to which the savings are compared.

The desk reviews were completed for a sample of projects. The EM&V team was able to verify key inputs and assumptions (e.g., equipment quantity and specifications) for six of the six sites because sufficient documentation was provided for the sites. Since sufficient documentation was provided for 100 percent of the sampled sites, the uncertainty ranking for these estimates is LOW.

6.5.2 Advanced Lighting Residential Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)*	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews**
0.1%	135	136	100.2%	1.2%	1,525,453	1,485,181	97.4%	Low	6

*Claimed savings vary slightly from the PY2012 EEPR. The evaluation team received data accounting for all invoices paid out in PY2012 with the exception of one carry-over project from PY2011 that was paid in PY2012.

**Confidence intervals are not reported at the utility program level as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated kW savings for the CenterPoint Advanced Lighting Residential MTP were slightly higher than the claimed kW savings, with realization rates for kW slightly exceeding 100 percent. The evaluated kWh savings were slightly lower than the claimed savings, with realization rates for kWh at 97 percent.

The realization rate for the CenterPoint Advanced Lighting Residential MTP was mainly driven by savings adjustments to all[13] new lamps with fractional wattages. The wattages for these lamp types were inconsistently and/or incorrectly rounded to whole numbers. Based on the review of the lamp types provided, the EM&V team changed the fractional lamp types to their respective fractional wattages, which resulted in slightly increased kW savings (kW realization rate = 100.2 percent) and decreased kWh savings (kWh realization rate = 97.4 percent).

Desk reviews were completed for a sample of projects. The EM&V team was able to verify key inputs and assumptions (e.g., equipment quantity and specifications) for nearly 100 percent of the sites because sufficient documentation was provided for the sites. Since

[13] New lamps with fractional wattages as provided by Ecova included: LED 2.3W Decorative, LED 14.5W R30, LED 8.3W R20, LED 14.6W R30, LED 10.5W R30, LED 9.5W R30, LED 2.6W R16, LED 4.5W PAR16, LED 4.5W R16 and LED 7.8W R30.

sufficient documentation was provided for 100 percent of the sampled sites, the uncertainty ranking for these estimates is LOW.

7. IMPACT EVALUATION RESULTS—EL PASO ELECTRIC COMPANY

This section presents the evaluated savings and cost-effectiveness results for El Paso Electric Company's (El Paso Electric) energy efficiency portfolio. The key findings are summarized first, followed by details for each program in the portfolio.

7.1 KEY FINDINGS

7.1.1 Evaluated savings

PY2012 evaluated savings are somewhat less than PY2012 claimed savings for El Paso Electric's energy efficiency portfolio. The overall portfolio level realization rate is 98.5 percent for demand savings and 96.4 percent for energy savings.

The portfolio realization rates are primarily driven below 100 percent due to the lower realization rate seen for the residential sector. As discussed in detailed program-level findings, the appliance recycling program's evaluated savings were less than two-thirds of the claimed savings, which had a sizeable impact on the overall realization rate, since this program accounts for 11 percent of total portfolio energy savings. The overall kW portfolio realization rate is higher than kWh due to the high load management realization rate, which accounts for the majority of demand savings.

Table 7-1 shows the claimed and evaluated demand savings for El Paso Electric's portfolio and broad customer sector/program categories for PY2012.

Table 7-1. El Paso Electric Program Year 2012 Claimed and Evaluated Demand Savings

Level of Analysis	Percent Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Completed Desk Reviews	Precision at 90% Confidence
Total Portfolio		**12,124**	**11,944**	**98.5%**	**112**	**0.29%**
Commercial Sector	29.0%	3,522	3,476	98.7%	34	0.16%
Residential Sector	11.2%	1,356	1,293	95.4%	64	2.61%
Load Management	58.0%	7,035	6,963	99.0%	11*	0.00%
Pilots	1.7%	211	211	100.0%	3	0.00%

*The review for the load management program included a review of equations and interval meter data to estimate the baseline usage and resulting level of load curtailment achieved for each event for all participants.

Table 7-2 shows the claimed and evaluated energy savings for El Paso Electric's portfolio and broad customer sector/program categories for PY2012.

Table 7-2. El Paso Electric Program Year 2012 Claimed and Evaluated Energy Savings

Level of Analysis	Percent Portfolio Savings (kWh)	2012 Claimed Demand Savings (kWh)	2012 Evaluated Demand Savings (kWh)	Realization Rate (kWh)	Completed Desk Reviews	Precision at 90% Confidence
Total Portfolio		**20,700,626**	**19,946,730**	**96.4%**	**112**	**0.41%**
Commercial Sector	72.8%	15,076,198	14,860,245	98.6%	34	0.51%
Residential Sector	22.8%	4,723,590	4,181,906	88.5%	64	0.74%
Load Management	0.1%	24,112	27,852	115.5%	11*	0.00%
Pilots	4.2%	876,727	876,727	100.0%	3	0.00%

*The review for the load management program included a review of equations and interval meter data to estimate the baseline usage and resulting level of load curtailment achieved for each event for all participants.

Program-level realization rates are discussed in the detailed findings sub-sections. **However, it is important to note that these results should only be viewed qualitatively due to the small sample sizes at the utility-program level. Program-level results should only be used to provide insight into how individual programs are affecting the overall portfolio realization rates.**

In program-level realization rates, we have also included a qualitative rating of low, medium, and high associated with the uncertainty of the verification effort based on program documentation received from the utility. The most favorable rating for uncertainty of "low" was given when thorough and detailed documentation was received to verify the savings. The "high" uncertainty rating was given when the EM&V team received primarily project-level savings calculations without supporting documentation to verify the inputs in the calculations. It is important to note that this uncertainty rating is specific to program documentation received to verify claimed savings and is not an indicator of the reasonableness or accuracy of savings estimates.

Overall, there is a reduced level of uncertainty associated with the PY2012 evaluated demand and energy savings as sufficient documentation was received to complete an independent review of savings for every program except for Commercial SOP. Some programs (Hard-to-Reach Solutions, Commercial Solutions, and Residential Solutions) fell from low to medium uncertainty rankings due to missing information for some of the reviewed projects, although sufficient documentation was provided for the majority of projects.

7.1.2 Cost-effectiveness results

El Paso Electric's overall portfolio had a cost-effectiveness of 3.14. All programs passed the cost-effectiveness analysis.

All of the commercial sector programs were highly cost-effective. The less cost-effective programs were the Load Management, Appliance Recycling, and the LivingWise® programs. The PY2012 cost-effectiveness results were largely driven by all Commercial Sector Programs. These programs contributed a combined 71 percent of the portfolio's savings using only 45 percent of portfolio costs. Of these, Large C&I Solutions MTP contributed the most benefits.

Table 7-3. El Paso Electric Cost-effectiveness Results

Level of Analysis	Claimed Savings Results	Evaluated Savings Results
Total Portfolio	**3.18**	**3.14**
Total Portfolio excluding low-income programs	**3.18**	**3.14**
Commercial Sector	**5.00**	**4.93**
Commercial SOP	7.98	7.98
Large C&I Solutions MTP	6.09	5.93
Small Commercial Solutions MTP	4.36	4.32
Texas SCORE MTP	3.68	3.68
Residential Sector	**1.76**	**1.73**
Appliance Recycling MTP	2.37	1.46
LivingWise MTP	1.53	1.53
Residential Solutions MTP	2.40	2.40
Hard-to-Reach Solutions MTP	1.42	1.64
Load Management	**1.22**	**1.21**
Load Management SOP	1.22	1.21
Pilots	**1.77**	**1.77**
PV/Solar Pilot MTP	1.81	1.81
Rebate Pilot MTP	1.65	1.65

7.2 DETAILED FINDINGS—COMMERCIAL

7.2.1 Commercial Standard Offer Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
2.4%	290	290	100.0%	7.1%	1,460,869	1,460,869	100.0%	High	6

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the El Paso CSOP were equal to the claimed savings, with realization rates for both kW and kWh equaling 100 percent. There were no adjustments to any of the savings calculations.

The EM&V team was not able to verify key inputs and assumptions (e.g., equipment quantity and specifications) for five of the six sites because no or insufficient documentation was provided for those sites. In particular, El Paso Electric was not able to provide the EM&V team with the requested invoices or pre/post inspection reports. For one of the six sites, the EM&V team was unable to verify lighting fixture quantities and types. For four of the sites, we were unable to verify the fixture quantities. Since sufficient documentation was provided for fewer than 70 percent of the sampled sites, the uncertainty ranking for these estimates is HIGH.

7.2.2 Commercial market transformation

A. Large C&I Solutions Market Transformation Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
13.5%	1,637	1,595	97.4%	31.5%	6,522,220	6,356,556	97.5%	Medium	15

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the Large C&I Solutions MTP were lower than the claimed savings, with a realization rate for kW at 97 percent and a realization rate for kWh at 98 percent.

The realization rates for the Large C&I Solutions MTP were mainly driven by savings adjustments to two sites.

- For the first site, one of the fixture types selected was incorrect and overstated the fixture wattage slightly.

- For the second site[14], the hot water aerators were initially estimated with savings using deemed values. However, these are not PUCT approved deemed values. Therefore, the EM&V team evaluated savings using M&V Option A as key parameters (flow rates and temperatures) were taken during equipment installations by the implementation contractor. The change in methodology resulted in the respective sites decreased savings (the first site's kWh and kW realization rate = 98 percent; the second site's kWh realization rate = 91 percent and kW realization rate = 93 percent).

The desk reviews were completed for a sample of 15 projects. The EM&V team was not able to verify key inputs and assumptions (e.g., equipment quantity and specifications) for three of the 15 sites because insufficient documentation was provided for those sites. In particular, El Paso Electric did not provide the EM&V team with the requested invoices. Since sufficient documentation was provided for 80 percent of the sampled sites, the uncertainty ranking for these estimates is MEDIUM.

B. Small Commercial Solutions Market Transformation Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)*	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)*	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews**
7.4%	903	899	99.6%	19.3%	3,991,127	3,940,839	98.7%	Low	10

*Claimed savings vary from the PY2012 EEPR. Per discussions with the contractor, a database transition affected tracked savings. Differences could not be reconciled through the EM&V data verification process.

**Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the El Paso Electric Small Commercial Solutions MTP were slightly lower than the claimed savings, with realization rates for both kW and kWh slightly below 100 percent.

The realization rate for the El Paso Electric Small Commercial Solutions MTP was mainly driven by savings adjustments to one site. For this site, the building type was categorized incorrectly in the lighting calculator, which overstated operating hours. The building type was changed from "Food Sale, Non-24 Hour Supermarket Retail" to "Retail/Strip Shopping and Non-Enclosed Mall" resulting in the site's decreased savings (this site's kWh realization rate = 84 percent and kW realization rate = 95 percent).

The desk reviews were completed for a sample of projects. The EM&V team was able to verify key inputs and assumptions (e.g., equipment quantity and specifications) for ten of the ten sites because sufficient documentation was provided for the sites. Since sufficient

[14] This project included savings for over 100 unique site addresses. Only one unique site address was evaluated as part of this desk review. Reported and evaluated savings were included here for only that one site address.

documentation was provided for 100 percent of the sampled sites, the uncertainty ranking for these estimates is LOW.

C. Texas SCORE Market Transformation Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
5.7%	692	692	100.0%	15.0%	3,101,982	3,101,982	100.0%	Low	3

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the El Paso Electric Score MTP were equal to the claimed savings, with realization rates for both kW and kWh equaling 100 percent. There were no adjustments to any of the savings calculations.

The desk reviews were completed for a sample of projects. The EM&V team was able to verify key inputs and assumptions (e.g., equipment quantity and specifications) for three of the three sites because sufficient documentation was provided. Since sufficient documentation was provided for 100 percent of the sampled sites, the uncertainty ranking for these estimates is LOW.

7.3 DETAILED FINDINGS—RESIDENTIAL

7.3.1 Residential market transformation

A. Appliance Recycling Market Transformation Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
2.5%	301	158	52.6%	8.9%	1,843,969	1,165,388	63.2%	Low	10

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for El Paso Electric's Appliance Recycling MTP were lower than the claimed savings, with a realization rate of 52.6 percent for kW and 63.2 percent for kWh.

The realization rates for this program are driven by savings adjustments made to all measures. In completing the PY2012 tracking system and desk reviews, the EM&V team could not identify the source of the deemed savings values used to calculate claimed savings for El Paso Electric's Appliance Recycling Program. Through correspondence with El Paso Electric regarding the source of the claimed savings, the EM&V team learned that El Paso

Electric used values of 0.192 kW and 1,176 kWh per unit to calculate the program's claimed savings in PY2012. While the values used for the PY2012 claimed savings appear reasonable, they had not been approved by the Commission for use in Texas nor were they based on program year M&V results as required in §25.181.

For PY2012, the EM&V team used the most similar Texas approved deemed saving values as the basis to calculate the program realization rate and evaluated savings. This is the retrofit replacement of existing residential units with ENERGY STAR® units.[15] The analysis in the table above shows the downward effect this had on the program realization rates and resulting evaluated savings because the approved deemed values were less than the values El Paso Electric used to calculate the PY2012 claimed savings.

Because the EM&V team had significant correspondence with El Paso Electric and received sufficient documentation for all sampled sites, we were able to verify key inputs and assumptions. As a result, the uncertainty ranking for these estimates is LOW.

B. LivingWise Market Transformation Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
0.5%	60	60	100.0%	7.4%	1,531,707	1,531,707	100.0%	High	10

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for El Paso Electric's LivingWise MTP were the same as the claimed savings; thus, realization rates for both kW and kWh are 100 percent.

The first phase of impact evaluation the EM&V team completed was a tracking system review. Tracking system data is generally in agreement with the data in the project documentation, which is solely based on returned surveys and the coding of those surveys. The only discrepancy found across the ten surveys reviewed was on the tenth sheet. This question is "How many full bathrooms are in your home?" There was no input in the Excel document for this question, but the Scantron showed an answer of 2. All other data was the same between both documents. Savings were not affected as a result of this discrepancy.

The second phase of the impact evaluation was to complete desk reviews for a select sample of projects. In order to complete a comprehensive desk review for this program, the EM&V team requested all project documentation associated with each sampled project, including the survey instrument, survey coding key, coded data, any calculators used, and any available program manuals. What the EM&V team received for each project was the survey instrument, survey coding key, and coded data. The EM&V team also received from the implementer the

[15] "Deemed Savings, Installation & Efficiency Standards" prepared by Frontier Associates, January 2013 update.

LivingWise Program Summary Report for 2011–2012. While this project documentation did include information about savings attributable to each kit component, it did not include information about how savings were calculated for the program overall.

Ideally, the EM&V team would have reviewed El Paso Electric's stated algorithms and compared the claimed savings against the original data received. Because the EM&V team received insufficient documentation for all sampled sites, we were not able to verify key inputs and assumptions. Since insufficient documentation was provided for fewer than 70 percent of the sampled sites, the uncertainty ranking for these estimates is HIGH.

C. Residential Solutions Market Transformation Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)*	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews**
3.4%	413	413	100.0%	2.7%	569,206	569,206	100.0%	Low	9

*Claimed kWh savings vary from the PY2012 EEPR. Per discussions with the contractor, a database transition affected tracked savings. Differences could not be reconciled through the EM&V data verification process.

**Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for El Paso Electric's Residential Solutions MTP were the same as the claimed savings; thus, realization rates for both kW and kWh are 100 percent

The first phase of impact evaluation the EM&V team completed was a tracking system review. No issues were found during this phase.

The second phase of the impact evaluation was to complete desk reviews for a select sample of projects. In order to complete a comprehensive desk review for this program, the EM&V team requested all project documentation associated with each sampled project, including the customer application and invoice, any calculators used, and reports of QA/QC or M&V activity if conducted. What the EM&V team received for each project was the DG-700 pre and post pressure flow gauge measurements, customer invoices, savings calculation sheets, and the duct efficiency calculator.

The EM&V team reviewed El Paso Electric's stated algorithms and compared the claimed savings against those algorithms and the Deemed Savings Manual. Because the EM&V team received sufficient documentation for all sampled sites, we were able to verify key inputs and assumptions. Since sufficient documentation was provided for all sampled sites, the uncertainty ranking for these estimates is LOW.

7.3.2 Hard-to-Reach Solutions Market Transformation Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)*	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)*	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews**
4.8%	582	662	113.7%	3.8%	778,708	915,605	117.6%	Low	35

*Claimed savings vary from the PY2012 EEPR. Per discussions with the contractor, a database transition affected tracked savings. Differences could not be reconciled through the EM&V data verification process.

**Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the El Paso Electric Hard-to-Reach Solutions MTP were higher than claimed savings, with realization rates for both kW and kWh above 110 percent.

Realization rates for the HTR Solution MTP were driven by three specific projects. For each of these projects, the measure description in the database provided was listed as “other.” The supplemental data files for each of these projects indicated that there were two measures installed for each of these projects. The details are provided below:

- **Project 1.** The demand and energy savings claimed in the database for this project were 0.34 kW and 521 kWh, respectively. The measures included in the supplemental data were infiltration and duct efficiency. The data review calculated savings attributed to the infiltration measure of 0.03 kW and 28 kWh. There were not enough measure attributes provided to calculate the duct efficiency savings.
- **Project 2.** The demand and energy savings claimed in the database for this project were 0.41 kW and 246 kWh, respectively. The measures included in the supplemental data were wall and ceiling insulation. The data review calculated savings attributed to the wall insulation measure of 0.41 kW and 246 kWh, which match the database total for the project. The data review calculated savings attributed to the ceiling insulation measure of 1.28 kW and 1,525 kWh, which were not included in the database total for the project.
- **Project 3.** The demand and energy savings claimed in the database for this project were 0.72 kW and 850 kWh, respectively. The measures included in the supplemental data were ceiling and wall insulation. The data review calculated savings attributed to the ceiling insulation measure of 0.72 kW and 850 kWh, which match the database total for the project. The data review calculated savings attributed to the wall insulation measure of 0.30 kW and 183 kWh, which were not included in the database total for the project.

All of the other measure savings calculated in the data review matched the project totals from the database provided. Therefore, the realization rate adjustment to the claimed savings is based wholly on the presence of additional measures from the supplemental data that do not appear to have been included in the database of project savings.

The EM&V team was able to verify savings through the desk review process for 35 of the sampled projects for the HTR Solutions MTP. Since sufficient tracking documentation was

provided for more than 90 percent of the sampled sites, the uncertainty rankings for these estimates is LOW.

7.4 DETAILED FINDINGS—LOAD MANAGEMENT

7.4.1 Load Management Standard Offer Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
58.0%	7,035	6,963	99.0%	0.1%	24,112	27,852	115.5%	Low	11

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

The realization rate for the Load Management SOP for kW savings was near 100 percent, the realization rate for kWh exceeded 100 percent.

The PY2012 evaluation activities found that the individual participant load impact calculations in the work papers supplied to the EM&V team were similar to those validated by using the individual customer interval load data. The drivers of the small differences in the calculated and reported impacts are not evident.

7.5 DETAILED FINDINGS—PILOTS

7.5.1 PV/Solar Pilot Market Transformation Program (Nonresidential)

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)*	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)*	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews**
1.1%	139	139	100.0%	1.3%	268,083	268,083	100.0%	Low	1

*Claimed savings vary from EEPRs for two reasons. First, EPE only claimed PV savings under the residential sector, whereas the tracking data included nonresidential and residential applications. Second, EPE assumed a 55% capacity attribution for its Solar PV Program based on availability data for generation from fixed-tilt PV systems at the time of EPE's system peak. This assumption reduced the tracked kW impacts, as reflected in the reported EEPR values.

**Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings matched EM&V Database claimed savings exactly; the evaluation activities found no evidence of differences between installed and tracked system capacity. This finding was based on a desk review of a single installation. Evaluated savings estimates are based solely on installed capacity (DC) reported in the tracking system multiplied by the approved deemed savings calculations of 1,600 kWh and 0.83 kW per kW of capacity.

The evaluation team was able to verify 100 percent of the installed system capacity ratings in the tracking system based on our review of a sample of either inspection reports or final invoices to confirm reported system capacity. Installed capacity is the only input to the evaluated savings calculations for this program year so the overall uncertainty ranking for inputs to this savings estimate is considered LOW.

It should be noted that for PY2013, prospective evaluated savings from this program will be based on PvWatts simulations and metered data. These simulations will account for available sunlight and panel orientation in the local utility area. If these simulations were applied for PY2012 program installation data, demand savings realization would have been less than 100 percent:

- Prospective kWh Realization Rate if using simulation: 108 percent
- Prospective kW Realization Rate if using simulation: 90 percent

These realization rates using simulation results are much closer to what should be expected in PY2013 prospective realization rates. The kWh realization rate is expected to be slightly greater than 100 percent since the El Paso Electric service area is far from the cloudier gulf coast and has the best solar resource (sunny days) in the state. The PvWatts simulation program is likely to produce lower estimates of demand savings from the PV installations due to the following factors that are considered in the simulation program more conservatively than in the deemed savings calculation:

1. Wiring losses, driven largely by:
    a. PV module nameplate DC rating adjustments—for temperature and actual capacity.
    b. Module Mismatch Loss—panels are connected in series to build voltage and are limited by the current of the worst performing panel.
    c. AC & DC Wiring Losses—resistive losses in the wires on both the DC side (before the inverter) and AC side (after the inverter) decrease performance.
2. Inverter efficiency losses when converting AC to DC power.
3. Shading—from nearby panels, buildings, or trees.
4. Soiling—build-up of dirt or other particulates on the panels that block sunlight from reaching the PV cells.
5. System availability—how often the system is “up” and not offline due to maintenance, failures, etc.
6. Equipment degradation over time—PV cells lose efficiency over time at commonly accepted rates of 0.5–1 percent, primarily due to short circuit current (I_{sc}) losses caused by ultraviolet (UV) absorption at or near the top of the silicon surface.

In PY2012, The kW realization rate is based on the maximum solar output during the peak period. This peak would occur between 1:00 and 2:00 p.m. Mountain Daylight Savings Time (MDT). If the definition of the peak hour were later, the kW realization rate and evaluated demand savings would be lower. If the peak period were between 4:00 and 5:00 p.m., the kW realization rate would be 0.39.

El Paso Electric assumed a 55 percent capacity attribution for its PY2012 Solar PV Program based on available data for generation from fixed-tilt PV systems at the time of El Paso Electric’s system peak. The prospective kW realization rate versus this reduced attribution

would be 163 percent, and for the 4:00 to 5:00 p.m. period would 71 percent. However, this calculation is based on a prototypical single system facing south when actual orientation of program projects are likely to vary from this ideal.

7.5.2 PV/Solar Pilot Market Transformation Program (Residential)

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)*	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)*	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews**
0.5%	63	63	100.0%	0.6%	121,726	121,726	100.0%	Low	2

*Claimed savings vary from EEPRs for two reasons. First, EPE only claimed PV savings under the residential sector, whereas the tracking data included nonresidential and residential applications. Second, EPE assumed a 55% capacity attribution for its Solar PV Program based on availability data for generation from fixed-tilt PV systems at the time of EPE's system peak. This assumption reduced the tracked kW impacts, as reflected in the reported EEPR values.

**Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings matched claimed or reported savings from program administrators exactly because the evaluation activities found no evidence of differences between installed and tracked system capacity. This finding was based on our desk review of two installations. Evaluated savings estimates are based solely on installed capacity (DC) reported in the tracking system multiplied by the approved deemed savings calculations of 1,600 kWh and 0.83 kW per kW of capacity.

The evaluation team was able to verify 100 percent of the installed system capacity ratings in the tracking system based on our review of a sample of either inspection reports or final invoices. Installed capacity is the only input to the evaluated savings calculations for this program year so the overall uncertainty ranking for inputs to this savings estimate is considered LOW.

It should be noted that for PY2013, prospective evaluated savings from this program will be based on PvWatts simulations and metered data. These simulations will account for available sunlight and panel orientation in the local utility area. If these simulations were applied for PY2012 program installation data, demand savings realization would have been less than 100 percent:

- Prospective kWh Realization Rate if using simulation: 103 percent
- Prospective kW Realization Rate if using simulation: 90 percent

These realization rates using simulation are much closer to what should be expected in PY2013 prospective realization rates. The prospective kWh realization rate is expected to be at or slightly above 100 percent since the El Paso Electric service area is far from the cloudier gulf coast and has the best solar resource (sunny days) in the state. The PvWatts simulation program is likely to produce lower estimates of demand savings from the PV installations due

to factors that are considered in the simulation program more conservatively than in the deemed savings calculation (see nonresidential solar PV detailed findings).

The kW realization rate is based on the maximum solar output during the peak period. This peak would occur between 1:00 and 2:00 p.m. Mountain Daylight Savings Time (MDT). If the definition of the peak hour were later, the kW realization rate and evaluated demand savings would be lower. If the peak period were between 4:00 and 5:00 p.m., the kW realization rate would be 52 percent.

El Paso Electric assumed a 55 percent capacity attribution for its PY2012 Solar PV Program based on available data for generation from fixed-tilt PV systems at the time of El Paso Electric's system peak. The prospective kW realization rate versus this reduced attribution would be 163 percent, and for the 4:00 to 5:00 p.m. period would 95 percent. This later in the day prospective realization rate is higher than for the single nonresidential system because both of the desk-reviewed sites are oriented southwest and so generate more energy in the later afternoon than equivalent systems facing south.

7.5.3 Rebate Pilot Market Transformation Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
0.1%	9	9	100.0%	2.4%	486,917	486,917	100.0%	Unranked	0

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

The El Paso Electric Rebate Pilot MTP provided incentives for multiple projects and savings for PY2012. Only a tracking system review was completed for the El Paso Electric Rebate Pilot MTP for PY2012.

8. IMPACT EVALUATION RESULTS—ENTERGY TEXAS, INC.

This section presents the evaluated savings and cost-effectiveness results for Entergy Texas, Inc.'s (Entergy) energy efficiency portfolio. The key findings are summarized first, followed by details for each program in the portfolio.

8.1 KEY FINDINGS

8.1.1 Evaluated savings

The overall PY2012 portfolio level realization rate is 98.9 percent for demand savings and 100.6 percent for energy savings.

The overall kW portfolio realization rate is driven downward by the residential sector realization rate of 97.5 percent, which accounts for 44 percent of demand savings. The kWh portfolio realization rate is just over 100 percent due to the residential sector realization rate of 101.1 percent, which accounts for over half of the total energy savings. As discussed in the detailed program-level findings, evaluated kWh and kW savings for the Residential SOP differ from claimed savings due to minor savings adjustments.

Table 8-1 shows the claimed and evaluated demand savings for Entergy's portfolio and broad customer sector/program categories for PY2012.

Table 8-1. Entergy Program Year 2012 Claimed and Evaluated Demand Savings

Level of Analysis	Percent Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Completed Desk Reviews	Precision at 90% Confidence
Total Portfolio		**17,190**	**16,999**	**98.9%**	**100**	**1.51%**
Commercial Sector	26.1%	4,485	4,485	100.0%	24	0.00%
Residential Sector	43.7%	7,511	7,320	97.5%	40	3.51%
Load Management	30.2%	5,194	5,194	100.0%	36*	0.00%

*The review for the load management program included a review of equations and interval meter data to estimate the baseline usage and resulting level of load curtailment achieved for each event for all participants.

Table 8-2 shows the claimed and evaluated energy savings for Entergy's portfolio and broad customer sector/program categories for PY2012.

Table 8-2. Entergy Program Year 2012 Claimed and Evaluated Energy Savings

Level of Analysis	Percent Portfolio Savings (kWh)	2012 Claimed Demand Savings (kWh)	2012 Evaluated Demand Savings (kWh)	Realization Rate (kWh)	Completed Desk Reviews	Precision at 90% Confidence
Total Portfolio		**33,692,878**	**33,884,617**	**100.6%**	**100**	**0.85%**
Commercial Sector	47.4%	15,983,280	15,983,280	100.0%	24	0.01%
Residential Sector	52.6%	17,709,598	17,901,337	101.1%	40	1.61%
Load Management	0.0%	0	0	n/a	36*	n/a

*The review for the load management program included a review of equations and interval meter data to estimate the baseline usage and resulting level of load curtailment achieved for each event for all participants.

Program-level realization rates are discussed in the detailed findings sub-sections. **However, it is important to note that these results should only be viewed qualitatively due to the small sample sizes at the utility-program level. Program-level results should only be used to provide insight into how individual programs are affecting the overall portfolio realization rates.**

In program-level realization rates, we have also included a qualitative rating of low, medium, and high associated with the uncertainty of the verification effort based on program documentation received from the utility. The most favorable rating for uncertainty of "low" was given when thorough and detailed documentation was received to verify the savings. The "high" uncertainty rating was given when the EM&V team received primarily project-level savings calculations without supporting documentation to verify the inputs in the calculations. It is important to note that this uncertainty rating is specific to program documentation received to verify claimed savings and is not an indicator of the reasonableness or accuracy of savings estimates.

There is a low level of uncertainty in the evaluated kW savings due to the high percent of kW savings from the Load Management program. There was sufficient documentation (work papers, interval meter data) provided to the EM&V team to verify claimed kW savings for a census of participants in the load management program.

There is a high level of uncertainty associated with the PY2012 residential evaluated kWh savings due to insufficient documentation to complete an independent review of savings across several of the residential programs including ENERGY STAR® New Homes program, Residential SOP, and Hard-to-Reach SOP .

For the commercial sector, the level of uncertainty of evaluated demand and energy savings is reduced as sufficient documentation was provided for the majority of nonresidential projects. Program uncertainty rankings fell from low to medium for Texas SCORE and Commercial Solutions due to missing information for some of the reviewed projects.

8.1.2 Cost-effectiveness results

Entergy's overall portfolio had a cost-effectiveness of 2.82. All programs passed the cost-effectiveness analysis.

The more cost-effective programs included the Commercial Solutions MTP, SCORE/CitySmart MTP, and Residential SOP. The less cost-effective programs were Load Management SOP and Home Performance with ENERGY STAR® MTP. The PY2012 cost-effectiveness results were largely driven by the Residential SOP and Commercial Sector programs, which contributed the highest amounts of benefits.

Table 8-3. Entergy Cost-effectiveness Results

Level of Analysis	Claimed Savings Results	Evaluated Savings Results
Total Portfolio	**2.83**	**2.82**
Total Portfolio excluding low-income programs	**2.83**	**2.82**
Commercial Sector	**3.51**	**3.51**
Commercial Solutions MTP	3.55	3.55
SCORE/CitySmart MTP	3.48	3.48
Residential Sector	**2.56**	**2.55**
Residential SOP	3.40	3.40
Hard-to-Reach SOP	1.96	1.94
ENERGY STAR® Homes MTP	1.77	1.77
Home Performance with ENERGY STAR® MTP	1.38	1.38
Load Management	**1.13**	**1.13**
Load Management SOP	1.13	1.13

8.2 DETAILED FINDINGS—COMMERCIAL

8.2.1 Commercial market transformation

A. Commercial Solutions Market Transformation Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
9.8%	1,683	1,683	100.0%	23.3%	7,866,417	7,866,417	100.0%	Medium	12

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the Entergy Commercial Solutions MTP were equal to the claimed savings, with realization rates for both kW and kWh equaling 100 percent. There were no adjustments to any of the savings calculations.

The desk reviews were completed for a sample of projects. The EM&V team was not able to verify key inputs and assumptions (e.g., equipment quantity and specifications) for two of the 12 sites because insufficient documentation was provided for those sites. In particular, Entergy did not provide the EM&V team with the requested invoices for the sites. Since sufficient documentation was provided for 83 percent of the sampled sites, the uncertainty ranking for these estimates is MEDIUM.

B. SCORE/CitySmart Market Transformation Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
16.3%	2,802	2,802	100.0%	24.1%	8,116,863	8,116,863	100.0%	Medium	12

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the Entergy Score/CitySmart MTP were equal to the claimed savings, with realization rates for both kW and kWh equaling 100 percent. There were no adjustments to any of the savings calculations.

The desk reviews were completed for a sample of projects. The EM&V team was not able to verify key inputs and assumptions (e.g., equipment quantity and specifications) for three of the 12 sites because insufficient documentation was provided for those sites. In particular, Entergy did not provide the EM&V team with the requested invoices for the sites. Since sufficient documentation was provided for 75 percent of the sampled sites, the uncertainty ranking for these estimates is MEDIUM.

8.3 DETAILED FINDINGS—RESIDENTIAL

8.3.1 Residential Standard Offer Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
27.8%	4,779	4,605	96.4%	32.8%	11,042,536	11,260,074	102.0%	High	20

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the Entergy RES SOP were slightly different from claimed savings, with realization rates for kW slightly less than 100 percent and kWh slightly more than 100 percent.

Realization rates for the Entergy RES SOP were mainly driven by savings adjustments to the following measures:

- **Air infiltration.** Variation in application of specific eligibility criteria introduced in early 2012 has led to an adjustment of air infiltration savings for several utility programs. For this program, we adjusted savings for 89 records that did not meet the Deemed Savings Manual eligibility criteria where the initial leakage is above 4.0 CFM50 per square foot. An additional two records did not match the evaluated savings, where reported savings are zero.
- **Ceiling insulation.** The EM&V team identified one record where savings did not match those calculated using the Deemed Savings Manual. The reported savings for these instances deviated upward from the Deemed Savings Manual by factors of 25.88 for kWh and 6.35 for kW.
- **Duct efficiency.** The EM&V team identified 31 instances where savings did not exactly match those calculated using the Deemed Savings Manual Duct Efficiency calculator. This resulted in a minor impact in savings. However, in the desk reviews, one of the five sampled customers had "slab" for the foundation type in the tracking system, but the application form indicated the foundation was "crawlspace/basement." This increased the savings for the sampled project approximately 20 percent.

Five of the 20 desk review projects had sufficient measure information provided through the supplemental data request to verify savings. The EM&V team identified a few discrepancies between measure assumptions through this process, specific to duct efficiency measures.

However, the EM&V team was unable to verify savings through the desk review process for the remaining 15 sampled projects for Entergy RES SOP due to a lack of key inputs and assumptions provided in the supplemental data received. Since sufficient documentation was provided for less than 70 percent of the sampled sites, the uncertainty ranking for these estimates is HIGH.

8.3.2 Hard-to-Reach Standard Offer Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
10.2%	1,759	1,741	99.0%	12.2%	4,095,008	4,069,209	99.4%	High	10

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the Entergy HTR SOP were slightly lower than claimed savings, with realization rates for kW and kWh just under 100 percent.

Realization rates for the Entergy HTR SOP were mainly driven by savings adjustments to the following measures:

- **Air infiltration.** Variation in application of specific eligibility criteria introduced in early 2012 has led to an adjustment of air infiltration savings for several utility programs. For this program, we adjusted savings for 69 records that did not meet the Deemed Savings Manual eligibility criteria: 68 where the initial leakage is above 4.0 CFM50 per square foot, and 1 where the final ventilation rate is lower than the minimum requirement. An additional two records did not match the evaluated savings, where reported savings are zero.
- **Duct efficiency.** The EM&V team identified 17 instances where savings did not exactly match those calculated using the Deemed Savings Manual Duct Efficiency calculator. This resulted in a minor impact to savings.

The EM&V team was unable to verify savings through the desk review process for any of the sampled projects for Entergy HTR SOP due to a lack of key measure attribute assumptions provided in the supplemental data received. Since sufficient documentation was provided for fewer than 70 percent of the sampled sites, the uncertainty ranking for these estimates is HIGH.

8.3.3 ENERGY STAR® Homes Market Transformation Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
3.8%	655	655	100.0%	5.3%	1,783,236	1,783,236	100.0%	High	5

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for Entergy's ENERGY STAR® Homes MTP were the same as the claimed savings; thus, realization rates for both kW and kWh are 100 percent.

The first phase of impact evaluation the EM&V team completed was a tracking system review. No issues were found during this phase.

The second phase of the impact evaluation was to complete desk reviews for a select sample of projects. In order to complete a comprehensive desk review for this program, the EM&V team requested all project documentation associated with each sampled project, including the application, reports of QA/QC or M&V activity if conducted, documentation for how the as-built home compares to the base home, and modeling and energy savings information (including any modeling or savings calculations being conducted outside of the REM/Rate software). What the EM&V team received for each project was a ten-page Building Summary

report for the as-built home and the implementer's ENERGY STAR® New Homes Program Predictive Savings Tool v2.1 document. This information was helpful in understanding the software used and flow of data in and out of that software, as well as the components going into the as-built home. However, the information is not complete, as there is still missing information about how the Beacon software uses the REM/Rate file, what alterations are made that result in different energy consumption numbers, and how peak kW was calculated. Another missing documentation piece was information about how incentives were calculated.

Ideally, the EM&V team would have reviewed Entergy's stated algorithms and compared the claimed savings against those algorithms in a documented program manual or, at the very least, against a home built to code. Because the EM&V team received insufficient documentation for all sampled sites, we were not able to verify key inputs and assumptions (e.g., base home inputs). However, we did build our own code home and compared the IECC 2009 code requirements to those inputs provided in the Building Summary report provided by AEP TCC. For all sampled homes, our analysis showed that blower door air test results (heating and cooling infiltration) meet or exceeded standards. Heating and cooling efficiency levels barely exceeded standards set by ENERYG STAR®, attic insulation levels did meet IECC 2009 code, above grade walls exceeded the R-Rating set for Texas by the Department of Energy (DOE), and windows and doors significantly exceeded the Texas DOE U-Rating.

Recognizing the new homes program takes a whole-building approach to energy savings, we did not make adjustments to savings based on the various component comparisons. Due to insufficient supporting documentation for all sampled homes, the uncertainty ranking for both the kW and kWh savings is HIGH.

8.3.4 Home Performance with ENERGY STAR® Market Transformation Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)*	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews**
1.9%	318	318	100.0%	2.3%	788,818	788,818	100.0%	Low	5

*Claimed kWh savings vary from the PY2012 EEPR. Per discussions with the contractor, their data tracking savings differs from what was reported in the EEPR.

**Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for Entergy's Home Performance with ENERGY STAR® MTP were the same as the claimed savings; thus, realization rates for both kW and kWh are 100 percent.

The first phase of impact evaluation the EM&V team completed was a tracking system review. No issues were found during this phase.

The second phase of the impact evaluation was to complete desk reviews for a select sample of projects. In order to complete a comprehensive desk review for this program, the EM&V

team requested all project documentation associated with each sampled project, including the customer application and invoice, any calculators used, and reports of QA/QC or M&V activity if conducted. The EM&V team received for each project various QA/QC photos, measure savings document sheets, customer invoices, the savings calculator, and the duct efficiency calculator.

The EM&V team reviewed Entergy's stated algorithms and compared the claimed savings against those algorithms and the Deemed Savings Manual. Because the EM&V team received sufficient documentation for all sampled sites, we were able to verify key inputs and assumptions and the uncertainty ranking for these estimates is LOW.

8.4 DETAILED FINDINGS—LOAD MANAGEMENT

8.4.1 Load Management Standard Offer Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
30.2%	5,194	5,194	100.0%	0.0%	0	0	n/a	Low	36

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

The PY2012 evaluation activities found that the individual participant load impact calculations in the work papers supplied to the EM&V team were very similar to those validated by using the individual customer interval load data.

9. IMPACT EVALUATION RESULTS—ONCOR

This section presents the evaluated savings and cost-effectiveness results for Oncor's energy efficiency portfolio. The key findings are summarized first, followed by details for each program in the portfolio.

9.1 KEY FINDINGS

9.1.1 Evaluated savings

PY2012 evaluated savings are slightly higher than PY2012 claimed savings for Oncor's energy efficiency portfolio. The overall portfolio level realization rate is 104.5 percent for demand savings and 101.2 percent for energy savings.

The overall kW portfolio realization rate is primarily driven by the load management realization rate of 106.5 percent, which accounts for the majority of demand savings. The kWh portfolio realization rate is just over 100 percent due to the residential sector and commercial sector realization rates over 100 percent. As discussed in the detailed program-level findings, evaluated kWh savings were higher than claimed savings due to minor savings adjustments across several programs including residential SOP, commercial SOP and Government Facilities.

Table 9-1 shows the claimed and evaluated demand savings for Oncor's portfolio and broad customer sector/program categories for PY2012.

Table 9-1. Oncor Program Year 2012 Claimed and Evaluated Demand Savings

Level of Analysis	Percent Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Completed Desk Reviews	Precision at 90% Confidence
Total Portfolio		**129,496**	**135,369**	**104.5%**	**386**	**0.22%**
Commercial Sector	14.5%	18,794	18,922	100.7%	56	1.52%
Residential Sector	20.0%	25,852	26,091	100.9%	121	0.27%
Load Management	65.5%	84,849	90,356	106.5%	209*	0.00%

*The review for the load management program included a review of equations and interval meter data to estimate the baseline usage and resulting level of load curtailment achieved for each event for all participants.

Table 9-2 shows the claimed and evaluated energy savings for Oncor's portfolio and broad customer sector/program categories for PY2012.

Table 9-2. Oncor Program Year 2012 Claimed and Evaluated Energy Savings

Level of Analysis	Percent Portfolio Savings (kWh)	2012 Claimed Demand Savings (kWh)	2012 Evaluated Demand Savings (kWh)	Realization Rate (kWh)	Completed Desk Reviews	Precision at 90% Confidence
Total Portfolio		**194,826,841**	**197,236,018**	**101.2%**	**386**	**0.80%**
Commercial Sector	48.1%	93,700,498	94,761,263	101.1%	56	1.66%
Residential Sector	51.9%	101,126,344	102,474,755	101.3%	121	0.12%
Load Management	0.0%	0	0	n/a	209*	n/a

*The review for the load management program included a review of equations and interval meter data to estimate the baseline usage and resulting level of load curtailment achieved for each event for all participants.

Program-level realization rates are discussed in the detailed findings sub-sections. **However, it is important to note that these results should only be viewed qualitatively due to the small sample sizes at the utility-program level. Program-level results should only be used to provide insight into how individual programs are affecting the overall portfolio realization rates.**

In program-level realization rates, we have also included a qualitative rating of low, medium, and high associated with the uncertainty of the verification effort based on program documentation received from the utility. The most favorable rating for uncertainty of "low" was given when thorough and detailed documentation was received to verify the savings. The "high" uncertainty rating was given when the EM&V team received primarily project-level savings calculations without supporting documentation to verify the inputs in the calculations. It is important to note that this uncertainty rating is specific to program documentation received to verify claimed savings and is not an indicator of the reasonableness or accuracy of savings estimates.

Overall, there is a reduced level of uncertainty associated with the PY2012 evaluated demand and energy savings as sufficient documentation was received to complete an independent review of savings for most programs across the portfolio. Six programs received a low uncertainty ranking. Two programs (Education Facilities, Government Facilities) fell from low to medium uncertainty due to missing information for one of the reviewed projects, although though sufficient documentation was provided for the majority of projects. While Targeted Weatherization received a high uncertainty ranking, this was due to missing information for some of the sampled projects as sufficient documentation was received for other sampled projects.

9.1.2 Cost-effectiveness results

Oncor's overall portfolio had a cost-effectiveness of 2.47 including low-income programs and 2.65 excluding low-income programs. All programs passed the cost-effectiveness analysis.

The more cost-effective programs were Basic Commercial SOP and Home Energy Efficiency SOP. The less cost-effective programs were Commercial Load Management SOP, Targeted Weatherization Low Income SOP, and Air Conditioning MTP (Nonresidential). The PY2012 cost-effectiveness results were largely driven by the Home Energy Efficiency SOP, which contributed 30 percent of portfolio benefits using only 23 percent of portfolio costs. The Basic Commercial SOP also drove results, accounting for 13 percent of portfolio savings for only 7 percent of portfolio costs.

Table 9-3. Oncor Cost-effectiveness Results

Level of Analysis	Claimed Savings Results	Evaluated Savings Results
Total Portfolio	**2.44**	**2.47**
Total Portfolio excluding low-income programs	**2.62**	**2.65**
Commercial Sector	**2.83**	**2.86**
Commercial SOP (Basic)	4.56	4.59
Commercial SOP (Custom)	2.88	2.93
Air Conditioning MTP	1.43	1.43
Educational Facilities MTP	1.75	1.75
Government Facilities MTP	1.84	1.84
Residential Sector	**2.68**	**2.71**
Home Energy Efficiency SOP	3.15	3.16
Hard-to-Reach SOP	2.19	2.25
Air Conditioning MTP	1.86	1.86
ENERGY STAR® Homes MTP	1.90	1.90
Low-Income	**1.39**	**1.40**
Targeted Weatherization LI SOP	1.39	1.40
Load Management	**1.31**	**1.39**
Commercial Load Management SOP	1.31	1.39

9.2 DETAILED FINDINGS—COMMERCIAL

9.2.1 Commercial standard offer

A. Commercial Standard Offer Program (Basic)

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
4.4%	5,662	5,687	100.4%	16.3%	31,667,675	31,864,015	100.6%	Low	20

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the Oncor CSOP (Basic) were slightly higher than the claimed savings, with realization rates for both kW and kWh slightly exceeding 100 percent.

Changes to the realization rate for the Oncor CSOP (Basic) were driven by changes to evaluated savings at one site as follows:

- For this site, the tracker savings did not match the calculated savings using the same inputs. This resulted in a kWh realization rate of 107 percent and a kW realization rate of 106 percent.

The EM&V team was able to verify key inputs and assumptions (e.g., equipment quantity and specifications) for all of the sites because sufficient documentation was provided by Oncor. This included pre/post-inspection reports and cut sheets. The uncertainty levels in these savings estimates at the program level is considered to be LOW because sufficient documentation was provided for greater than 90 percent of the sampled sites.

B. Commercial Standard Offer Program (Custom)

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
5.8%	7,490	7,290	101.3%	22.9%	44,524,025	45,383,338	101.9%	Low	20

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the Oncor CSOP (Custom) were slightly higher than the claimed savings, with realization rates for both kW and kWh at 101 and 102 percent respectively.

The realization rate for the Oncor Custom program was driven mainly by four sites:

- For the first site (Lighting end use), the tracking database savings did not match the calculator savings, which resulted in reduced kWh and kW savings (kWh realization rate = 167 percent and kW realization rate = 162 percent).
- For the second site (HVAC end use), savings were reduced due to additional fan usage. The savings calculator notes that DX units were removed and additional energy usage was not estimated for cooling the space, which the DX units were serving. Cooling is still required in the spaces DX units were serving and, with the removal of DX units, additional fan energy would be required to keep the space conditioned even if chillers were expected to bear the primary cooling load. The EM&V team accounted for this additional fan energy usage, which resulted in reduced kWh and kW savings (kWh realization rate = 86 percent and kW realization rate = 87 percent).
- For the third site, savings were lower due to a change in the baseline. This is a custom new construction project and the Calcsmart tool used the ASHRAE 1999 Standard to estimate baseline usage. The evaluation team changed the HVAC

baseline efficiency for this custom new construction project to be consistent with the latest commercial code, i.e., IECC 2009 Code. This change resulted in reduced kWh and kW savings (kWh realization rate = 99 percent and kW realization rate = 98 percent).

- For the fourth site, savings were lower due to use of full load efficiency ratings to estimate energy savings. The HVAC savings calculator used full load efficiency (EER values) to calculate both kW and Kwh savings. Energy kWh savings should be calculated using partial load efficiency (IEER values). EM&V team estimated kWh savings using the partial load efficiency, which resulted in reduction of kWh savings. (kWh realization rate = 99 percent).

The EM&V team was able to verify key inputs and assumptions (e.g., equipment quantity and specifications) because sufficient documentation was provided for 19 of the 20 sites. Oncor was able to provide the EM&V team with invoices, cut sheets, or pre/post inspection reports for a majority of their sites. The EM&V team was unable to verify key inputs for 1 of the 20 sites because insufficient documentation was provided for those sites. Since sufficient documentation was provided for 90 percent of the sampled sites, the uncertainty ranking for these estimates is LOW.

9.2.2 Commercial market transformation

A. Air Conditioning Market Transformation Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
0.2%	252	252	100.0%	0.4%	692,356	692,356	100.0%	Low	5

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for Oncor's Air Conditioning MTP were the same as the claimed savings; thus, realization rates for both kW and kWh are 100 percent.

The first phase of impact evaluation the EM&V team completed was a tracking system review. Tracking system data was generally in agreement with the data in the project documentation. However, for the sampled geothermal cooling tower measure, the EM&V team did discover that the Measure Attribute Report reflected 3,093,288 tons, which seemed unreasonable. In reviewing the Customer Site Inspection Report, we were able to determine that this number is actually the AHRI reference number. Savings are not affected based on this finding.

In order to complete a comprehensive desk review for this program, the EM&V team requested all project documentation associated with each sampled project, including the customer application and invoice, any calculators used, and reports of QA/QC or M&V activity if conducted. The EM&V team received for each project project-specific documentation including, a Measure Attribute Report, measure calculators, and a Customer Site Inspection

(if applicable). The documentation included EER and tonnage information that were critical inputs to calculating savings. As a result, the uncertainty ranking for both the kW and kWh savings is LOW.

B. Educational Facilities Market Transformation Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
3.3%	4,273	4,273	100.0%	6.0%	11,704,592	11,704,592	100.0%	Medium	6

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the Oncor Educational Facilities MTP were equal to the claimed savings, with realization rates for both kW and kWh equaling 100 percent. There were no adjustments to any of the savings calculations.

The desk reviews were completed for a sample of projects. While the EM&V team was not able to verify key inputs and assumptions (e.g., equipment quantity and specifications) with the requested invoices for two sites, we were able to do so through M&V reports that allowed us to verify the fixture quantities and types. Since utility M&V reports provided sufficient documentation, the uncertainty ranking for these estimates is MEDIUM.

C. Government Facilities Market Transformation Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
0.9%	1,117	1,120	100.2%	2.6%	5,111,850	5,116,962	100.1%	Medium	5

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the Oncor Government Facilities MTP were slightly higher for kW and kWh than the claimed savings, with realization rates for both slightly exceeding 100 percent.

The realization rate for the Oncor Government Facilities MTP was mainly driven by savings adjustments to one site. For this site, the Solar PV annual savings and peak demands were slightly understated. Based on the review of the M&V report, the EM&V team reviewed system level metering results, which resulted in increased kW and kWh savings as compared to deemed values.

The desk reviews were completed for a sample of projects. The EM&V team was not able to verify key inputs and assumptions (e.g., equipment quantity and specifications) for one of the five sites because insufficient documentation was provided for the site. In particular, Oncor did not provide the EM&V team with the requested invoices for the site. For this site, we were unable to verify the fixture quantities or types. Since sufficient documentation was provided for 80 percent of the sampled sites, the uncertainty ranking for these estimates is MEDIUM.

9.3 DETAILED FINDINGS—RESIDENTIAL

9.3.1 Residential standard offer

A. Home Energy Efficiency Standard Offer Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
12.2%	15,835	15,907	100.5%	30.7%	59,894,661	60,134,240	100.4%	Low	20

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the Oncor Home Energy Efficiency (HEE) SOP were nearly identical to claimed savings, with realization rates for both kW and kWh slightly higher than 100 percent.

Realization rates for the Oncor HEE SOP were mainly driven by savings adjustments to the following measures:

- **Air infiltration.** One infiltration measure could not be verified because all the data inputs were blank, except for the “Min Leakage Before Retrofit” input. One other infiltration measure had an adjustment that was explained through supplemental data received.
- **Ceiling insulation.** One ceiling insulation measure had savings that did not agree with the deemed savings manual. One other ceiling insulation measure had an adjustment that was explained through supplemental data received.
- **Duct efficiency.** One duct efficiency measure calculation could not be performed because all the data inputs were blank in the tracking system; however, these data were provided in the accompanying forms. One other duct efficiency measure had an adjustment that was explained through supplemental data received.

Desk reviews were completed for all sampled projects for which sufficient measure information was provided through the supplemental data request. The EM&V team found a few minor discrepancies in this process for one infiltration measure. Since sufficient documentation was provided for more than 90 percent of the sampled sites, the uncertainty ranking for these estimates is LOW.

9.3.2 Hard-to-Reach Standard Offer Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
6.1%	7,950	8,042	101.1%	17.1%	33,277,620	34,302,571	103.1%	Low	44

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the Oncor Hard-to-Reach SOP were nearly identical to claimed savings, with realization rates for both kW and kWh slightly higher than 100 percent.

Realization rates for the Oncor Hard-to-Reach SOP were mainly driven by savings adjustments to three ceiling insulation measures where the square footage or heating type was incorrectly recorded in the tracking system.

Desk reviews were completed for all sampled projects for which sufficient measure information was provided through the supplemental data request. The EM&V team found a few minor discrepancies in this process for one infiltration measure. Since sufficient documentation was provided for more than 90 percent of the sampled sites, the uncertainty ranking for these estimates is LOW.

9.3.3 Targeted Weatherization LI Standard Offer Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
0.5%	631	708	112.1%	2.0%	3,956,697	4,040,579	102.1%	High	44

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the Oncor Targeted Weatherization LI SOP were higher than claimed savings, with realization rates for kW at 112 percent and kWh at 102 percent.

Realization rates for the Oncor Targeted Weatherization LI SOP were mainly driven by savings adjustments to the following measures:

- **Ceiling insulation.** The EM&V team identified three records where savings did not match those recalculated using the Deemed Savings Manual. For these records, the reported savings appear to deviate downward from the EM&V team calculation by factors of 2.1 for two of the records, and 1.48 for the other record.
- **Ceiling fan.** No demand savings had been reported for these measures. The EM&V team calculated demand savings based on the Deemed Savings Manual.

- **Lighting—CFLs.** The EM&V team identified a difference in one wattage range reported in Oncor's tracking system ("19–21 watts") compared to the range used in the Deemed Savings Manual ("17–21 watts"). By using Deemed Savings Manual calculations, savings are approximately 33 percent higher than those reported by Oncor.
- **Air source heat pumps.** The EM&V team identified 19 records where kWh savings did not match those recalculated using the Deemed Savings Manual. For these records, reported kWh savings appeared to deviate from the EM&V team calculations by factors ranging from 0.28–0.29 for kWh. The team identified another four records for which kW savings deviated between 0.74 and 1.15 compared to the Deemed Savings Manual.

Desk reviews were completed for 25 of the 44 projects. For these 25 projects, there was sufficient measure information provided through the supplemental data request. The EM&V team identified only one discrepancy through this process, where one CFL measure's wattage range was incorrectly assigned. The EM&V team was unable to verify savings through the desk review process for approximately half of the sampled projects due to a lack of key inputs and assumptions provided in the supplemental data received. Since insufficient documentation was provided for more than 70 percent of the sampled sites, the uncertainty ranking for these estimates is HIGH.

9.3.4 Residential market transformation

A. Air Conditioning Market Transformation Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
0.7%	878	878	100.0%	1.4%	2,664,881	2,664,881	100.0%	Low	8

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for Oncor's Air Conditioning MTP were the same as the claimed savings; thus, realization rates for both kW and kWh are 100 percent.

The first phase of impact evaluation the EM&V team completed was a tracking system review. No issues were found during this phase.

The second phase of the impact evaluation was to complete desk reviews for a select sample of projects. In order to complete a comprehensive desk review for this program, the EM&V team requested all project documentation associated with each sampled project, including the customer application and invoice, any calculators used, and reports of QA/QC or M&V activity if conducted. What the EM&V team received for each project was invoice and payment information, measure attribute files, and project documentation. Oncor correspondence also indicated that none of the EM&V team's sampled sites had been selected for inspection by Oncor. This project documentation included key parameter information (e.g., SEER and

tonnage), allowing the EM&V team to calculate savings and compare to the Deemed Savings Manual.

There was one anomaly found in the project documentation: for this project, a heat pump project, the tonnage recorded (and verified) was 6.13. In the Deemed Savings Manual, the highest tonnage is five. Oncor's project documentation reflects energy savings for a 5-ton heat pump unit. The EM&V team will discuss with Oncor whether this project should have been eligible for an incentive through the residential program, and if eligible, will review savings for higher tonnage units for inclusion in the TRM.

Because the EM&V team received sufficient documentation for all sampled sites, we were able to verify key inputs and assumptions (e.g., equipment SEER and tonnage). As a result, the uncertainty ranking for both the kW and kWh savings is LOW.

B. ENERGY STAR® Homes Market Transformation Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
0.4%	557	557	100.0%	0.7%	1,332,485	1,332,485	100.0%	High	5

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for Oncor's ENERGY STAR® Homes MTP were the same as the claimed savings; thus, realization rates for both kW and kWh are 100 percent.

The first phase of impact evaluation the EM&V team completed was a tracking system review. No issues were found during this phase.

The second phase of the impact evaluation was to complete desk reviews for a select sample of projects. In order to complete a comprehensive desk review for this program, the EM&V team requested all project documentation associated with each sampled project, including the application, reports of QA/QC or M&V activity if conducted, documentation for how the as-built home compares to the base home, and modeling and energy savings information. What the EM&V team received for each project was certification information, payment information, and a summary of the HVAC, duct, HERS rating, and square feet components. While this information was helpful in understanding some of the major components going into the as-built home, the EM&V team did not receive any information about the base home, or how energy savings or incentives were calculated. This additional information contains critical inputs to calculating savings to allow for comparison and to verify energy savings and incentive payouts. Additionally, the EM&V team only received supplemental data for four of the five sampled homes.

Ideally, the EM&V team would have reviewed Oncor's stated algorithms and compared the claimed savings against those algorithms in a documented program manual or, at the very

least, against a home built to code. Because the EM&V team received insufficient documentation for all sampled sites, we were not able to verify key inputs and assumptions (e.g., base home inputs). However, we did build our own code home and compared the IECC 2009 code requirements to those inputs provided in the component summary documents provided by Oncor. For the four sampled homes, our analysis showed that HERS scores ranged from 61 to 71, which is a reasonable range. However, the heating and cooling specs were below ENERGY STAR® standards.

Recognizing the new homes program takes a whole-building approach to energy savings, we did not make adjustments to savings based on the various component comparisons. Due to insufficient supporting documentation for all sampled homes and no documentation provided for one sampled home, the uncertainty ranking for both the kW and kWh savings is HIGH.

9.4 DETAILED FINDINGS—LOAD MANAGEMENT

9.4.1 Commercial Load Management Standard Offer Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
65.5%	84,849	90,356	106.5%	0.0%	0	0	n/a	Low	209

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

The table above compares savings claimed by Oncor to evaluated savings estimates. Evaluated savings for the Oncor Commercial Load Management program were slightly higher than the claimed savings, with a kW realization rate of 106 percent.

The PY2012 evaluation activities found that the individual participant load impact calculations in the work papers supplied to the Texas Evaluation Team were very similar to those validated by using the individual customer interval load data. However, the reported savings in the work papers were not consistent with the program level reported savings. The reported number of program participants was 157 but the work papers and interval data that were provided to the evaluation team contained 209 participants. The evaluated savings estimates in the table above are based on the work papers and interval data provided to the Evaluation team. It is not evident what is driving the discrepancy between the calculated and the reported impacts.

10. IMPACT EVALUATION RESULTS—SOUTHWESTERN ELECTRIC POWER COMPANY

This section presents the evaluated savings and cost-effectiveness results for Southwestern Electric Power Company's (SWEPCO) energy efficiency portfolio. The key findings are summarized first, followed by details for each program in the portfolio.

10.1 KEY FINDINGS

10.1.1 Evaluated savings

PY2012 evaluated demand and energy savings are very similar to PY2012 claimed energy savings for SWEPCO's portfolio. The portfolio level kW realization rate is 99.9 percent for demand savings.

The kWh portfolio realization rate is 99.7 percent. Minor savings adjustments, discussed in the detailed program-level findings, were made for the Commercial SOP, Home Savers, and Small Business Direct Install.

Table 10-1 shows the claimed and evaluated demand savings for SWEPCO's portfolio and broad customer sector/program categories for PY2012.

Table 10-1. SWEPCO Program Year 2012 Claimed and Evaluated Demand Savings

Level of Analysis	Percent Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Completed Desk Reviews	Precision at 90% Confidence
Total Portfolio		**13,326**	**13,318**	**99.9%**	**78**	**4.49%**
Commercial Sector	13.5%	1,793	1,788	99.7%	30	0.00%
Residential Sector	21.0%	2,793	2,795	100.1%	27	21.37%
Load Management	61.8%	8,237	8,237	100.0%	10*	0.00%
Pilots	3.8%	503	497	98.8%	11	1.74%

*The review for the load management program included a review of equations and interval meter data to estimate the baseline usage and resulting level of load curtailment achieved for each event for all participants

Table 10-2 shows the claimed and evaluated energy savings for SWEPCO's portfolio and broad customer sector/program categories for PY2012.

Table 10-2. SWEPCO Program Year 2012 Claimed and Evaluated Energy Savings

Level of Analysis	Percent Portfolio Savings (kWh)	2012 Claimed Demand Savings (kWh)	2012 Evaluated Demand Savings (kWh)	Realization Rate (kWh)	Completed Desk Reviews	Precision at 90% Confidence
Total Portfolio		**19,006,169**	**18,940,265**	**99.7%**	**78**	**3.21%**
Commercial Sector	43.3%	8,235,942	8,199,087	99.6%	30	0.00%
Residential Sector	47.8%	9,085,620	9,078,473	99.9%	27	6.68%
Load Management	0.5%	98,845	98,845	100.0%	10*	0.00%
Pilots	8.3%	1,585,761	1,563,860	98.6%	11	1.80%

*The review for the load management program included a review of equations and interval meter data to estimate the baseline usage and resulting level of load curtailment achieved for each event for all participants.

Program-level realization rates are discussed in the detailed findings sub-sections. **However, it is important to note that these results should only be viewed qualitatively due to the small sample sizes at the utility-program level. Program-level results should only be used to provide insight into how individual programs are affecting the overall portfolio realization rates.**

In program-level realization rates, we have also included a qualitative rating of low, medium, and high associated with the uncertainty of the verification effort based on program documentation received from the utility. The most favorable rating for uncertainty of "low" was given when thorough and detailed documentation was received to verify the savings. The "high" uncertainty rating was given when the EM&V team received primarily project-level savings calculations without supporting documentation to verify the inputs in the calculations. It is important to note that this uncertainty rating is specific to program documentation received to verify claimed savings and is not an indicator of the reasonableness or accuracy of savings estimates.

Across the whole portfolio, there is a reduced level of uncertainty associated with the PY2012 portfolio evaluated savings as sufficient documentation was received to complete an independent review of savings for most programs. Seven programs received a low uncertainty ranking. The Commercial SOP program, however, which accounts for approximately a quarter of all energy savings, has a higher degree of uncertainty as the EM&V team received limited sufficient documentation to complete an independent review of claimed savings for a majority of this program's sampled projects.

10.1.2 Cost-effectiveness results

SWEPCO's overall portfolio had a cost-effectiveness of 2.46 including low-income programs and 2.65 excluding low-income programs. All categories of programs passed the cost-

effectiveness analysis except for low income. Several individual programs also did not pass cost-effectiveness analysis, including SWEPCO CARE$ Energy Efficiency for Not-for-Profit Agencies SOP (SWEPCO CARE$), Home$avers, CoolSaver© A/C Tune-Up Pilot MTP, and SMART Source Solar PV Pilot MTP (residential). The SWEPCO CARE$ program has been discontinued for 2013.

The more cost-effective programs include Commercial SOP and Commercial Solutions MTP. The programs with lower cost-effectiveness results include those previously mentioned as not passing cost-effectiveness analysis. The Commercial SOP drives the portfolio's cost-effectiveness by providing 20 percent of portfolio benefits using only 9 percent of costs. The Residential SOP also delivered a large portion of program benefits (29 percent), and used 22 percent of portfolio costs to do so.

Table 10-3. SWEPCO Cost-effectiveness Results

Level of Analysis	Claimed Savings Results	Evaluated Savings Results
Total Portfolio	**2.47**	**2.46**
Total Portfolio excluding low-income programs	**2.66**	**2.65**
Commercial Sector	**3.92**	**3.91**
Commercial SOP	5.49	5.45
SWEPCO Care$ Energy Efficiency for Not-for-Profit Agencies SOP	0.33	0.33
Commercial Solutions MTP	4.93	4.93
SCORE MTP	2.60	2.60
Residential Sector	**2.71**	**2.71**
Residential SOP	3.21	3.21
Hard-to-Reach SOP	2.21	2.21
Low-Income	**0.80**	**0.78**
Home$avers	0.80	0.78
Load Management	**1.70**	**1.70**
Load Management SOP	1.70	1.70
Pilots	**1.11**	**1.09**
CoolSaver A/C Tune-Up Pilot MTP (Residential)	0.53	0.53
Small Business Direct Install Pilot MTP	1.76	1.72
SMART Source Solar PV Pilot MTP (Residential)	0.66	0.66
LED Lighting Pilot MTP (Nonresidential)	2.22	2.22

10.2 DETAILED FINDINGS—COMMERCIAL

10.2.1 Commercial standard offer

A. Commercial Standard Offer Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
6.1%	811	806	99.4%	23.9%	4,550,108	4,513,253	99.2%	High	16

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the SWEPCO CSOP program were only slightly lower than claimed savings, with realization rates for both kW and kWh exceeding 99 percent.

The lower realization rate for the SWEPCO CSOP was driven by a single site. At this site, the reported savings in the tracking system did not match the reported savings in the utility calculators. The EM&V team adjusted the savings for this site to make them consistent with the savings reported in the calculators, which resulted in a reduction in kWh and kW savings for this site (kWh realization rate = 95 percent and kW realization rate = 96 percent).

Desk reviews were completed for a census of projects, thus, there is no sample error associated with the evaluation of the SWEPCO CSOP. However, the EM&V team was not able to verify key inputs and assumptions (e.g., equipment quantity and specifications) for 11 of the 16 sites, because no documentation was provided for these sites. In particular, SWEPCO did not provide the EM&V team with the requested invoices or pre/post inspection reports. As a result, the uncertainty ranking for these estimates is considered HIGH because sufficient documentation was provided for fewer than 70 percent of the sites.

B. SWEPCO CARE$ Energy Efficiency for Not-for-Profit Agencies Standard Offer Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
0.1%	17	17	100.0%	0.3%	55,246	55,246	100.0%	Low	2

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the SWEPCO CARE$ program equaled claimed savings, with 100 percent realization rates for both kW and kWh.

Desk reviews were completed for a census of projects, thus, there is no sample error associated with the evaluation of the SWEPCO CSOP. The documentation provided by SWEPCO for this program was sufficient for both sites, thus, the uncertainty ranking for these estimates is considered LOW.

10.2.2 Commercial Solutions Market Transformation Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
2.9%	385	385	100.0%	10.6%	2,008,553	2,008,553	100.0%	Medium	5

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the SWEPCO Commercial Solutions Pilot MTP were equal to the claimed savings, with realization rates for both kW and kWh equaling 100 percent. There were no adjustments to any of the savings calculations.

Desk reviews were completed for a sample of projects. The EM&V team was not able to verify key inputs and assumptions (e.g., equipment quantity and specifications) for one of the five sites because insufficient documentation was provided for the site. In particular, SWEPCO did not provide the EM&V team with the requested invoice. Since sufficient documentation was provided for 80 percent of the sampled sites, the uncertainty ranking for these estimates is MEDIUM.

10.2.3 SCORE Market Transformation Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
4.4%	580	580	100.0%	8.5%	1,622,035	1,622,035	100.0%	Medium	7

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the SWEPCO Score MTP matched the claimed savings, resulting in realization rates for both kW and kWh of 100 percent.

The desk reviews were completed for a sample of projects. The EM&V team was not able to verify key inputs and assumptions (e.g., equipment quantity and specifications) for one of the seven sites because limited documentation was provided for the site. In particular, SWEPCO did not provide the EM&V team with the requested invoice. Since sufficient documentation

was provided for 86 percent of the sampled sites, the uncertainty ranking for these estimates is MEDIUM.

10.3 DETAILED FINDINGS—RESIDENTIAL

10.3.1 Residential Standard Offer Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
11.4%	1,520	1,519	99.9%	27.5%	5,217,853	5,216,288	99.9%	Low	17

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated kW savings for the SWEPCO RES SOP were slightly lower than claimed savings, with realization rates for both kW and kWh slightly less than 100 percent.

Realization rates for the SWEPCO RES SOP were mainly driven by savings adjustments to the following measure:

- **Air infiltration.** Variation in application of specific eligibility criteria introduced in early 2012 has led to an adjustment of air infiltration savings for several utility programs. For this program, we adjusted savings for 14 records that did not meet the Deemed Savings Manual eligibility criteria—14 where the initial leakage is above 4.0 CFM50 per square foot. Additionally, three other records do not match the EM&V team's evaluated savings. For these values, no consistent scaling factor was determined.
- **Ceiling insulation.** The EM&V team identified three records where savings did not match those calculated using the Deemed Savings Manual. For two records their kW savings match the EM&V team's evaluated savings, but their kWh savings are scaled by different factors. For the other record, the kWh savings are scaled up by a factor of 2.08 and the kW savings are scaled down by a factor of 0.94.
- **Duct efficiency.** The EM&V team identified 15 instances where savings did not exactly match those calculated using the Deemed Savings Manual Duct Efficiency calculator. This resulted in a minor impact to savings.

Desk reviews were completed for 17 projects for which sufficient measure information was provided through the supplemental data request. No discrepancies were identified by the EM&V team through this review. Since sufficient documentation was provided for more than 90 percent of the sampled sites, the uncertainty ranking for these estimates is LOW.

10.3.2 Hard-to-Reach Standard Offer Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)*	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews**
8.9%	1,188	1,188	100.0%	19.0%	3,612,382	3,610,937	99.9%	Low	5

*Claimed kWh savings vary slightly from the PY2012 EEPR due to rounding.

**Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the HTR SOP were nearly identical to claimed savings, with realization rates for kW and 100 percent and kWh slightly less than 100 percent.

Realization rates for the HTR SOP were mainly driven by savings adjustments to the following measure:

- **Air infiltration.** Variation in application of specific eligibility criteria introduced in early 2012 has led to an adjustment of air infiltration savings for several utility programs. For this program, we adjusted savings for two records that did not meet the Deemed Savings Manual eligibility criteria. In all cases, the final ventilation rates were lower than the minimum requirement. Additionally, two other records do not match the EM&V team's evaluated savings.
- **Water heater measures.** The EM&V team identified one record where savings could not be verified using the Deemed Savings Manual due to a lack of measure-specific inputs.
- **Lighting—CFLs.** The EM&V team identified four records where savings did not match those calculated using the Deemed Savings Manual. For three of these records, reported savings appear to deviate from the EM&V team calculations by factors scaling savings up by 1.17 and 1.38. The remaining record savings could not be verified due to lack of measure-specific inputs.
- **Duct efficiency.** The EM&V team identified one instance where savings did not exactly match those calculated using the Deemed Savings Manual Duct Efficiency calculator. This resulted in a minor impact to savings.

Desk reviews were completed for all five projects sampled for which sufficient measure information was provided through the supplemental data request. No discrepancies were identified by the EM&V team through this review. Since sufficient documentation was provided for more than 90 percent of the sampled sites, the uncertainty ranking for these estimates is LOW.

10.3.3 Home$avers

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
0.6%	84	88	104.9%	1.3%	255,385	251,248	98.4%	Low	5

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the SWEPCO Home$avers program were slightly different from claimed savings, with realization rates for kW slightly more than 100 percent and kWh slightly less than 100 percent.

Realization rates for the SWEPCO Home$avers program was mainly driven by savings adjustments to the following measures:

- **Refrigerator replacement.** For targeted low-income programs, claimed savings calculations were based on algorithms that differed from the Deemed Savings Manual in some cases. Using these alternative calculations, the EM&V team was able to achieve a near 100 percent match to the reported savings; however, a few discrepancies remained, due to a calculation error in the implementation contractor's database that produced lower aggregate savings than were calculated by the EM&V team.
- **Ceiling fan.** All ceiling fan energy savings appear to be scaled to a constant 99.9481 percent of DSM-calculated values across all utilities. No demand savings are included for ceiling fans within the tracking system, but the EM&V team calculated these based on the Deemed Savings Manual.
- **Heat pump.** For targeted low-income programs, claimed savings calculations were based on algorithms that differed from the Deemed Savings Manual. However, when using the alternative calculation, savings discrepancies remained.
- **Window AC.** For targeted low-income programs, claimed savings calculations were based on algorithms that differed from the Deemed Savings Manual. Using the alternative calculation, savings matched for all observations within the tracking system.

For low-income measures, it is noted above that the EM&V team compared calculations provided by the implementation contractor to the Deemed Savings Manual. Low-income programs have different implementation requirements than non-low-income energy efficiency programs. The Public Utility Regulatory Act (PURA) §39.905(f) addresses general provisions for low-income programs, with which SWEPCO as a bundled utility voluntarily complies. For low-income programs, we recommend improved documentation on savings calculation approaches that represent alternate calculations than those in the Deemed Savings Manual for refrigerators and HVAC measures.

Desk reviews were completed for five projects for which sufficient measure information was provided through the supplemental data request. The EM&V team identified only two

discrepancies through this process—differences in tonnage and SEER/HSPF for two heat pump installations were identified as a result of comparing these measures in the AHRI database. As sufficient documentation was provided for more than 90 percent of the sampled sites, the uncertainty ranking for these estimates is LOW.

10.4 DETAILED FINDINGS—LOAD MANAGEMENT

10.4.1 Load Management Standard Offer Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)*	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews**
61.8%	8,237	8,237	100.0%	0.5%	98,845	98,845	100.0%	Low	10

*Claimed kW savings match the PY2012 EEPR; however, there is a slight variance in claimed kWh savings from the EEPR.

**Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

The PY2012 evaluation activities found that the individual participant load impact calculations in the work papers supplied to the EM&V team were very similar to those validated by using the individual customer interval load data. The EM&V team needed to coordinate with SWEPCO and its contractor to verify reported savings as SWEPCO made adjustments to the baselines for three customers. Two of these customers had the adjustment made to the baseline for one curtailment event each. The third customer had an adjustment made to each of curtailment events. The adjustments resulted in slightly increased savings.

The EM&V team was able to verify the baseline adjustments, resulting in a 100 percent realization rate. However, the EM&V team's review of the adjustments did raise a process issue, which will be investigated in the PY2013 evaluation research. The EM&V team will investigate if a recommendation regarding standardizing the calculation of baselines for the load management programs in future program years could improve the transparency, accuracy and consistency of load management programs' impacts statewide.

10.5 DETAILED FINDINGS—PILOTS

10.5.1 CoolSaver A/C Tune-Up Market Transformation Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
1.5%	205	205	100.0%	2.2%	413,181	413,181	100.0%	Low	3

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for SWEPCO's CoolSaver A/C Tune-up Pilot MTP were the same as the claimed savings; thus, realization rates for both kW and kWh are 100 percent.

The first phase of impact evaluation the EM&V team completed was a tracking system review. No issues were found during this phase.

The second phase of the impact evaluation was to complete desk reviews for a select sample of projects. In order to complete a comprehensive desk review for this program, the EM&V team requested all project documentation associated with each sampled project, including the customer application and invoice, any calculators used, and reports of QA/QC or M&V activity if conducted. What the EM&V team received for each project was an invoice from the contractor, the Incentive Check Request, and the Tune-up Form. The implementer also provided program documentation including the Contractor Manual, Contractor FAQs, and the CoolSaver 2013 M&V Plan. This project documentation included enough information that critical inputs to calculating savings could be determined and compared to the CoolSaver 2013 M&V Plan. The challenges the EM&V team encountered were that the contractor invoices and Tune-Up Forms did not indicate that the condenser coil was cleaned or that the airflow was adjusted to proper CFM/ton per the CoolSaver A/C Tune-up Program Manual. Tasks might have been performed, but supporting documents do not clearly indicate all tasks were completed. Because key parameters for savings calculations were identified, this ambiguous documentation did not affect savings.

Because the EM&V team received sufficient documentation for all sampled sites, we were able to verify key inputs and assumptions. As a result, the uncertainty ranking for these estimates is LOW.

10.5.2 Small Business Direct Install Pilot Market Transformation Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
1.8%	242	236	97.4%	5.6%	1,063,147	1,041,246	97.9%	Low	5

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the SWEPCO Small Business Direct Install Pilot MTP were lower than the claimed savings, with realization rates for both kW and KWh approximately 97 and 98 percent, respectively.

The realization rate for the SWEPCO Small Business Direct Install Pilot MTP was mainly driven by savings adjustments to two sites. For the first site, multiple fixtures as identified on the pre- and post-inspection forms did not match the reported savings, resulting in understated project savings. The change resulted in increased savings (kWh and kW realization rate = 104 percent). For the second site, multiple fixtures as identified on the pre- and post-inspection forms did not match the reported savings resulting in overstated project savings. The change resulted in decreased savings (kWh realization rate = 86 percent and kW realization rate = 82 percent).

Desk reviews were completed for a sample of projects. The EM&V team was able to verify key inputs and assumptions (e.g., equipment quantity and specifications) for five of the five sites because sufficient documentation was provided for the sites. Since sufficient documentation was provided for 100 percent of the sampled sites, the uncertainty ranking for these estimates is LOW.

10.5.3 SMART Source Solar PV Market Transformation Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
0.4%	57	57	100.0%	0.6%	109,434	109,434	100.0%	High	3

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

The table above compares savings claimed by SWEPCO to the evaluated savings estimates for the SMART Source PV program. Evaluated savings matched claimed or reported savings from program administrators because the evaluation activities found no evidence of differences between installed and tracked system capacity. This finding was based on desk reviews of three installations. Evaluated savings estimates are based solely on installed capacity reported in the tracking system multiplied by the approved deemed savings calculations of 1,600 kWh and 0.83 kW per kW of capacity.

The EM&V team was only able to verify 62 percent of the installed system capacity ratings in the tracking system based on our review of a sample of either inspection reports or final invoices to confirm reported system capacity. One site did not have an inspection report and the final invoice did not list system capacity or module type to verify installed capacity. Installed capacity is the only input to the evaluated savings calculations for this program year, so the overall uncertainty ranking for inputs to this savings estimate is considered HIGH.

It should be noted that for PY2013, prospective evaluated savings from this program will be based on PvWatts simulations and metered data. These simulations will account for available sunlight and panel orientation in the local utility area. If these simulations were applied for PY2012 program installation data, demand savings realization would have been less than 100 percent:

- Prospective kWh Realization Rate if using simulation: 81 percent
- Prospective kW Realization Rate if using simulation: 82 percent

These prospective realization rates using simulation are shown to provide a preview of what should be expected in PY2013. The kWh realization rate is expected to be less than 100 percent because the available solar resource in SWEPCO's service territory is somewhat less than other parts of the state. The PvWatts simulation program is likely to produce lower estimates of demand savings from the PV installations due to the following factors, which are considered in the simulation program more conservatively than in the deemed savings calculation:

1. Wiring losses—driven largely by:
    a. PV module nameplate DC rating adjustments—for temperature and actual capacity.
    b. Module Mismatch Loss—panels are connected in series to build voltage and are limited by the current of the worst performing panel.
    c. AC & DC Wiring Losses—resistive losses in the wires on both the DC side (before the inverter) and AC side (after the inverter) decrease performance.
2. Inverter efficiency losses when converting AC to DC power.
3. Shading—from nearby panels, buildings, or trees.
4. Soiling—build-up of dirt or other particulates on the panels that block sunlight from reaching the PV cells.
5. System availability—how often the system is "up" and not offline due to maintenance, failures, etc.
6. Equipment degradation over time—PV cells lose efficiency over time at commonly accepted rates of 0.5–1 percent, primarily due to short circuit current (I_{sc}) losses caused by ultraviolet (UV) absorption at or near the top of the silicon surface.

11. IMPACT EVALUATION RESULTS—TEXAS NEW MEXICO POWER COMPANY

This section presents the evaluated savings and cost-effectiveness results for Texas new Mexico Power Company's (TNMP) energy efficiency portfolio. The key findings are summarized first, followed by details for each program in the portfolio.

11.1 KEY FINDINGS

11.1.1 Evaluated savings

PY2012 evaluated savings are slightly less than PY2012 claimed energy savings for TNMP's portfolio. The portfolio demand and energy realization rates are both less than 100 percent primarily due to savings adjustments to the SCORE/CitySmart program.

Table 11-1 shows the claimed and evaluated demand savings for TNMP's portfolio and broad customer sector/program categories for PY2012.

Table 11-1. TNMP Program Year 2012 Claimed and Evaluated Demand Savings

Level of Analysis	Percent Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Completed Desk Reviews	Precision at 90% Confidence
Total Portfolio		**7,093**	**7,028**	**99.1%**	**119**	**0.85%**
Commercial Sector	26.1%	1,848	1,785	96.6%	20	3.34%
Residential Sector	32.7%	2,320	2,319	100.0%	77	0.07%
Load Management	41.2%	2,925	2,924	100.0%	22*	0.00%

*The review for the load management program included a review of equations and interval meter data to estimate the baseline usage and resulting level of load curtailment achieved for each event for all participants.

Table 11-2 shows the claimed and evaluated energy savings for TNMP's portfolio and broad customer sector/program categories for PY2012.

Table 11-2. TNMP Program Year 2012 Claimed and Evaluated Energy Savings

Level of Analysis	Percent Portfolio Savings (kWh)	2012 Claimed Demand Savings (kWh)	2012 Evaluated Demand Savings (kWh)	Realization Rate (kWh)	Completed Desk Reviews	Precision at 90% Confidence
Total Portfolio		**12,737,358**	**12,405,961**	**97.4%**	**119**	**1.83%**
Commercial Sector	48.7%	6,202,479	5,878,569	94.8%	20	3.86%
Residential Sector	51.3%	6,534,879	6,527,393	99.9%	77	0.09%
Load Management	0.0%	0	0	n/a	22*	n/a

*The review for the load management program included a review of equations and interval meter data to estimate the baseline usage and resulting level of load curtailment achieved for each event for all participants.

Program-level realization rates are discussed in the detailed findings sub-sections. **However, it is important to note that these results should only be viewed qualitatively due to the small sample sizes at the utility-program level. Program-level results should only be used to provide insight into how individual programs are affecting the overall portfolio realization rates.**

In program-level realization rates, we have also included a qualitative rating of low, medium, and high associated with the uncertainty of the verification effort based on program documentation received from the utility. The most favorable rating for uncertainty of "low" was given when thorough and detailed documentation was received to verify the savings. The "high" uncertainty rating was given when the EM&V team received primarily project-level savings calculations without supporting documentation to verify the inputs in the calculations. It is important to note that this uncertainty rating is specific to program documentation received to verify claimed savings and is not an indicator of the reasonableness or accuracy of savings estimates.

There is a low level of uncertainty in the evaluated kW savings due to the high percent of kW savings from the Load Management program. There was sufficient documentation (work papers, interval meter data) provided to the EM&V team to verify claimed kW savings for a census of participants in the load management program.

There is a high level of uncertainty associated with the PY2012 evaluated kWh savings for residential programs due to insufficient documentation to complete an independent review of savings across several of the programs including all of the standard offer programs, the Low-Income Weatherization program, and ENERGY STAR® New Homes program. For the nonresidential market transformation programs in the portfolio, the level of uncertainty of evaluated savings is less as these programs had sufficient documentation for the majority of sampled projects.

11.1.2 Cost-effectiveness results

TNMP's overall portfolio had a cost-effectiveness of 2.45 including low-income programs and 2.64 excluding low-income programs. All categories of programs passed the cost-effectiveness analysis except for pilot programs. The Solar PV Pilot program has already been discontinued.

The more cost-effective programs include Large Commercial SOP, ENERGY STAR® New Homes MTP, and Commercial Solutions MTP. The programs with lower cost-effectiveness results include the Load Management SOP, Solar PV Pilot (which has been discontinued), and Low Income Weatherization program. The Large Residential SOP and SCORE/CitySmart MTP contribute a combined 45 percent of portfolio benefits, strongly influencing the portfolio cost-effectiveness results.

Table 11-3. TNMP Cost-effectiveness Results

Level of Analysis	Claimed Savings Results	Evaluated Savings Results
Total Portfolio	**2.50**	**2.45**
Total Portfolio excluding low-income programs	**2.70**	**2.64**
Commercial Sector	**3.16**	**3.01**
Large Commercial SOP	4.53	4.53
Commercial Solutions MTP	3.15	3.15
SCORE/CitySmart MTP	3.00	2.74
Residential Sector	**2.73**	**2.72**
Large Residential SOP	2.93	2.92
Small Residential SOP	2.91	2.90
Large Hard-to-Reach SOP	1.70	1.70
Small Hard-to-Reach SOP	1.60	1.60
ENERGY STAR® New Homes MTP	4.98	4.98
Low-Income	**1.54**	**1.56**
Low Income Weatherization	1.54	1.56
Load Management	**1.07**	**1.07**
Load Management	1.07	1.07
Pilots	**0.66**	**0.66**
Small DRG (Solar PV) Pilot	0.66	0.66

11.2 DETAILED FINDINGS—COMMERCIAL

11.2.1 Large Commercial Standard Offer Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
1.6%	113	113	100.0%	5.3%	678,136	678,136	100.0%	High	3

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the TNMP Large CSOP were equal to the claimed savings, with realization rates for both kW and kWh equaling 100 percent. There were no adjustments to any of the savings calculations for the three sites sampled.

The EM&V team was not able to verify key inputs and assumptions (e.g., equipment quantity and specifications) for two of the three sites sampled for desk reviews because no or insufficient documentation was provided. In particular, TNMP did not provide the EM&V team with the requested invoices or pre/post-inspection reports. Since sufficient documentation was provided for fewer than 70 percent of the sampled sites, the uncertainty ranking for these estimates is HIGH.

11.2.2 Commercial market transformation

A. Commercial Solutions Market Transformation Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
9.5%	676	676	100.0%	17.7%	2,249,210	2,249,210	100.0%	Low	5

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the TNMP Commercial Solutions MTP were equal to the claimed savings, with realization rates for both kW and kWh equaling 100 percent. There were no adjustments to any of the savings calculations.

The desk reviews were completed for a sample of projects. The EM&V team was able to verify key inputs and assumptions (e.g., equipment quantity and specifications) for five of the five sites because sufficient documentation was provided for the site. Since sufficient documentation was provided for 100 percent of the sampled sites, the uncertainty ranking for these estimates is LOW.

B. SCORE/CitySmart Market Transformation Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
14.9%	1,060	997	94.1%	25.7%	3,275,133	2,951,222	90.1%	Low	12

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the TNMP Score/CitySmart MTP were lower than the claimed savings, with realization rates for kW at 94 percent and with realization rates for kWh at 90 percent.

The realization rates for the TNMP Score/CitySmart MTP were mainly driven by savings adjustments to two sites. For these sites, the hot water aerators were initially estimated with savings using deemed values. However, the deemed values were not filed and approved by the PUCT. Therefore, the EM&V team calculated savings using M&V Option A as key parameters (flow rates and temperatures were taken during equipment installations by the implementation contractor). The change in methodology resulted in decreased savings (the first site's kWh and kW realization rate = 60 percent, and the second site's kWh and kW realization rate = 98 percent).

The desk reviews were completed for a sample of projects. The EM&V team was able to verify key inputs and assumptions (e.g., equipment quantity and specifications) for all 12 sites because sufficient documentation was provided for the site. Since sufficient documentation was provided for 100 percent of the sampled sites, the uncertainty ranking for these estimates is LOW.

11.3 DETAILED FINDINGS—RESIDENTIAL

11.3.1 Residential Standard Offer Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)*	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)*	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews**
18.7%	1,325	1,320	99.6%	29.8%	3,801,359	3,789,956	99.7%	High	30

*Claimed savings vary slightly from the PY2012 EEPR due to rounding.

**Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the TNMP RES SOP were slightly lower than claimed savings, with realization rates for both kW and kWh slightly below 100 percent.

Realization rates for the TNMP RES SOP were mainly driven by savings adjustments to the following measure:

- **Duct efficiency.** The EM&V team found slight differences in the savings calculated through the Duct Efficiency tool compared to those reported in the tracking system for 23 installations. This resulted in a minor impact on savings.

The EM&V team was able to verify savings through the desk review process for one of the 30 sampled projects for TNMP RES SOP. For this project, the data received matched the tracking system. The rest were not verified due to a lack of key measure attribute assumptions provided in the supplemental data received. Since sufficient documentation was provided for fewer than 70 percent of the sampled sites, the uncertainty ranking for these estimates is HIGH.

11.3.2 Hard-to-Reach Standard Offer Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
6.8%	480	480	100.0%	11.0%	1,401,266	1,400,846	99.9%	High	6

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the TNMP HTR SOP were slightly lower than claimed savings, with realization rates for kWh slightly below 100 percent. The kW savings agreed.

Realization rates for the TNMP HTR SOP were mainly driven by savings adjustments to the following measure:

- **Duct efficiency.** The EM&V team found slight differences in the savings calculated through the Duct Efficiency tool compared to those reported in the tracking system for seven installations. This resulted in a minor impact on savings.

The EM&V team was on able to verify savings through the desk review process for one of the sampled projects for TNMP HTR SOP. This project was for the large HTR SOP program and the data received matched the tracking system. The rest were not verified due to a lack of key measure attribute assumptions provided in the supplemental data received. Since sufficient documentation was provided for fewer than 70 percent of the sampled sites, the uncertainty ranking for these estimates is HIGH.

11.3.3 ENERGY STAR® New Homes Market Transformation

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
6.1%	436	436	100.0%	8.1%	1,035,079	1,035,079	100.0%	High	5

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for TNMP's ENERGY STAR® New Homes MTP were the same as the claimed savings for kW and kWh (100 percent). Evaluated savings for TNMP's ENERGY STAR® New Homes MTP were the same as the claimed savings for kW and kWh, with realization rates reflecting 100 percent for both kW and kWh.

The first phase of impact evaluation the EM&V team completed was a tracking system review. No issues were found during this phase.

The second phase of the impact evaluation was to complete desk reviews for a select sample of projects.

The desk reviews were completed for a sample of projects. In order to complete a comprehensive desk review for this program, the EM&V team requested all project documentation associated with each sampled project, including the application, reports of QA/QC or M&V activity if conducted, documentation for how the as-built home compares to the base home, and modeling and energy savings information. What the EM&V team received for each project was one Excel file with select baseline home data and one Excel file with the exact same as-built home data. These files were helpful in understanding some of the components going into the as-built home and in providing direct comparison to the baseline home. At the time this report was written, the EM&V team had not received information about how energy savings or incentives were calculated. This additional information contained critical inputs to calculating savings to allow for comparison and to verify energy savings and incentive payouts. During early discussions with the program implementer, they mentioned that a program manual would be available with this information for PY2013.

Ideally, the EM&V team would have reviewed TNMP's stated algorithms and compared the claimed savings against those algorithms in a documented program manual or, at the very least, against a home built to code. Because the EM&V team received the baseline and as-built home data, we were able to verify key inputs and assumptions. However, because we did not have the savings calculations, we did build our own model. Due to the emphasis on peak kW in Texas, the EM&V team specifically modeled cooling as part of the new homes component and pulled that measure out to review independently. Per the Deemed Savings Manual on new construction cooling, we estimated the cooling factor as part of the overall kW by taking the highest kW cooling factor, leveraging the kWh as part of the formula, and re-estimating the kW. This does decrease the kW per new home in every sampled instance.

Recognizing the new homes program takes a whole-building approach to energy savings, we did not make adjustments to savings based on the various component comparisons, including cooling. However, due to the limited amount of information provided related to kWh and kW savings calculations; this is an option for PY2013 that we propose discussing. Due to insufficient supporting documentation for all sampled homes, the uncertainty ranking for both the kW and kWh savings is HIGH. However, the EM&V team would like to point out that the sufficient level of program documentation for a new homes program was the documentation received for TNMP. Additionally, since the drafting of this report, the EM&V team has had discussions with the implementer to discuss savings calculations for this program. Based on these discussions, the EM&V team is confident that the implementer will provide documentation for the PY2013 evaluation efforts (and beyond) that will take the uncertainty ranking for this program from HIGH to LOW.

11.3.4 Low Income Weatherization

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
1.1%	80	84	104.7%	2.3%	297,173	301,512	101.5%	High	6

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated kW savings for the TNMP Low-Income Weatherization program were slightly higher than claimed savings, with realization rates for kW equal to 105 percent. For kWh savings, the evaluated savings were also higher than claimed, with a realization rate of 102 percent.

Realization rates for the TNMP Low-Income Weatherization program were mainly driven by savings adjustments to the following measures:

- **Refrigerator replacement.** For targeted low-income programs, claimed savings calculations were based on algorithms that differed from the Deemed Savings Manual in some cases. Using these alternative calculations, the EM&V team nevertheless found discrepancies between reported and calculated savings for all 51 of TNMP's refrigerator replacements due to a calculation error in the implementation contractor's database that produced lower aggregate savings than were calculated by the EM&V team.
- **Ceiling fan.** All ceiling fan energy savings appear to be scaled to a constant 99.9481 percent of DSM-calculated values across all utilities. No demand savings are reported for ceiling fans, despite their provision in the Deemed Savings Manual. The EM&V team included savings based on the deemed savings manual.
- **12W–16W CFLs.** Three 12W–16W CFL measures were found to have scaled energy savings down by 88.145 percent, while increasing demand savings by a factor of 125 percent.

- **Central heat pump.** TNMP was the sole utility to use the Deemed Savings Manual algorithm to calculate central heat pump savings. Nevertheless, a small rounding difference was apparent, and one record reported savings that diverged significantly from those calculated by the EM&V team. In addition, from the desk review, the efficiency and capacity did not agree with the value found in the AHRI database.
- **Central AC.** For targeted low-income programs, claimed savings calculations were based on algorithms that differed from the Deemed Savings Manual in some cases. Using the alternative calculation, the EM&V team found no discrepancies between the calculated and reported savings for TNMP.
- **Window AC.** For targeted low-income programs, claimed savings calculations were based on algorithms that differed from the Deemed Savings Manual in some cases. Using the alternative calculation, the EM&V team found no discrepancies between the calculated and reported savings for TNMP.

The EM&V team was not able to verify savings for at least one measure per sampled project for TNMP low-income weatherization due to a lack of key measure attribute assumptions provided in the supplemental data received. Since sufficient documentation was provided for fewer than 70 percent of the sampled sites, the uncertainty ranking for these estimates is HIGH.

11.4 DETAILED FINDINGS—LOAD MANAGEMENT

11.4.1 Load Management

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
41.2%	2,925	2,924	100.0%	0.0%	0	0	n/a	Low	22

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

The PY2012 evaluation activities found that the individual participant load impact calculations in the work papers supplied to the EM&V team were very similar to those validated by using the individual customer interval load data.

12. IMPACT EVALUATION RESULTS—SOUTHWESTERN PUBLIC SERVICE COMPANY

This section presents the evaluated savings and cost-effectiveness results for Southwestern Public Service Company's[16] (Xcel SPS) energy efficiency portfolio. The key findings are summarized first, followed by details for each program in the portfolio.

12.1 KEY FINDINGS

12.1.1 Evaluated savings

The PY2012 portfolio demand realization rate for Xcel SPS' portfolio is driven downward by the load management realization rate of 43 percent, which accounts for over a third of the portfolio's demand savings. The difference in the load management claimed and evaluated savings resulted from a new customer who did not participate in a curtailment test event, and therefore the EM&V team was unable to validate the available demand savings for this customer. Xcel SPS has put a process change in place for PY2014 to call a test event each program year for all load management participating customers. The demand realization rates across both residential and commercial sector programs were slightly over 100 percent.

The PY2012 evaluated energy savings are very similar to the PY2012 claimed energy savings for Xcel SPS' portfolio. The portfolio level realization rate is 100.3 percent for energy savings. Both residential and commercial sector realization rates are very close to 100 percent.

Table 12-1 shows the claimed and evaluated demand savings for Xcel SPS' portfolio and broad customer sector/program categories for PY2012.

Table 12-1. Xcel SPS Program Year 2012 Claimed and Evaluated Demand Savings

Level of Analysis	Percent Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Completed Desk Reviews	Precision at 90% Confidence
Total Portfolio		**5,325**	**4,257**	**79.9%**	**69**	**2.69%**
Commercial Sector	47.7%	2,542	2,545	100.1%	32	0.00%
Residential Sector	16.5%	881	890	101.0%	35	12.88%
Load Management	35.7%	1,902	822	43.2%	2*	0.00%

*The review for the load management program included a review of equations and interval meter data to estimate the baseline usage and resulting level of load curtailment achieved for each event for all participants.

[16] Southwestern Public Service Company is a subsidiary of Xcel Energy.

Table 12-2 shows the claimed and evaluated energy savings for Xcel SPS' portfolio and broad customer sector/program categories for PY2012.

Table 12-2. Xcel SPS Program Year 2012 Claimed and Evaluated Energy Savings

Level of Analysis	Percent Portfolio Savings (kWh)	2012 Claimed Demand Savings (kWh)	2012 Evaluated Demand Savings (kWh)	Realization Rate (kWh)	Completed Desk Reviews	Precision at 90% Confidence
Total Portfolio		**9,077,223**	**9,106,671**	**100.3%**	**69**	**2.28%**
Commercial Sector	72.1%	6,543,796	6,578,662	100.5%	32	0.00%
Residential Sector	27.9%	2,533,428	2,528,009	99.8%	35	8.21%
Load Management	0.0%	0	0	n/a	2*	n/a

*The review for the load management program included a review of equations and interval meter data to estimate the baseline usage and resulting level of load curtailment achieved for each event for all participants.

Program-level realization rates are discussed in the detailed findings sub-sections. **However, it is important to note that these results should only be viewed qualitatively due to the small sample sizes at the utility-program level. Program-level results should only be used to provide insight into how individual programs are affecting the overall portfolio realization rates.**

In program-level realization rates, we have also included a qualitative rating of low, medium, and high associated with the uncertainty of the verification effort based on program documentation received from the utility. The most favorable rating for uncertainty of "low" was given when thorough and detailed documentation was received to verify the savings. The "high" uncertainty rating was given when the EM&V team received primarily project-level savings calculations without supporting documentation to verify the inputs in the calculations. It is important to note that this uncertainty rating is specific to program documentation received to verify claimed savings and is not an indicator of the reasonableness or accuracy of savings estimates.

There is a lower level of uncertainty in the evaluated kW savings due to the high percent of kW savings from the Load Management program. There was sufficient documentation (work papers, interval meter data) provided to the EM&V team to verify claimed kW savings for a census of participants in the load management program.

There is a high level of uncertainty associated with the PY2012 evaluated kWh savings for the nonresidential sector due to insufficient documentation to complete an independent review of savings. For residential programs, the level of uncertainty of evaluated savings is less as these programs had sufficient documentation for the majority of sampled projects.

12.1.2 Cost-effectiveness results

Xcel SPS' overall portfolio had a cost-effectiveness of 2.88 including low-income programs and 3.21 excluding low-income programs. All programs passed the cost-effectiveness analysis except for Load Management.

The more cost-effective programs include the commercial sector programs and Residential SOP. The programs with lower cost-effectiveness results include the Load Management SOP and Low-Income Weatherization program. The Large Commercial SOP had the biggest influence on overall results, accounting for 62 percent of portfolio benefits and 46 percent of the total budget.

Table 12-3. Xcel SPS Cost-effectiveness Results

Level of Analysis	Claimed Savings Results	Evaluated Savings Results
Total Portfolio	**2.89**	**2.88**
Total Portfolio excluding low-income programs	**3.23**	**3.21**
Commercial Sector	**3.88**	**3.89**
Large Commercial & Industrial SOP	3.84	3.86
Small Commercial & Industrial SOP	4.44	4.44
Residential Sector	**2.64**	**2.69**
Residential SOP	2.98	3.09
Hard-to-Reach SOP	2.17	2.14
Low-Income	**1.53**	**1.54**
Low-Income Weatherization	1.53	1.54
Load Management	**0.92**	**0.40**
Load Management SOP	0.92	0.40

12.2 DETAILED FINDINGS—COMMERCIAL

12.2.1 Commercial standard offer

A. Large Commercial & Industrial Standard Offer Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
45.9%	2,446	2,449	100.1%	67.4%	6,116,850	6,151,716	100.6%	High	23

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the Xcel Large CSOP were slightly higher than the claimed savings, with realization rates for both kW and kWh slightly exceeding 100 percent.

The realization rate for the Xcel Large CSOP was mainly driven by savings adjustments to two sites:

- For the first site, the number of lamps per fixture was overstated. Based on the review of the invoices, the EM&V team changed the number of post-retrofit lamps per fixture from six lamps to three lamps, which resulted in increased savings (kWh and KW realization rate = 122 percent).
- For the second site, the reported EER was not consistent with the EER for the installed equipment. The change in the EER value resulted in lower savings (kWh realization rate = 98 percent and kW realization rate = 91 percent).

The desk reviews were completed for a census of projects; thus, there is no sample error associated with the evaluation of the Xcel Large CSOP. However, the EM&V team was not able to verify key inputs and assumptions (e.g., equipment quantity and specifications) for 21 of the 23 sites because no or insufficient documentation was provided for those sites. In particular, Xcel did not provide the EM&V team with invoices or pre/post inspection reports. The uncertainty ranking for these estimates is considered HIGH because sufficient documentation was provided for fewer than 70 percent of the sampled sites.

B. Small Commercial & Industrial Standard Offer Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
1.8%	96	96	100.0%	4.7%	426,946	426,946	100.0%	High	9

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the Xcel Small CSOP were equal to the claimed savings, with realization rates for both kW and kWh equaling 100 percent. There were no adjustments to any of the savings calculations for the nine sites reviewed.

Desk reviews were completed for a census of projects; thus, there is no sample error associated with the evaluation of the Small CSOP. However, the EM&V team was not able to verify key inputs and assumptions (e.g., equipment quantity and specifications) for any of the nine sites because no or insufficient documentation was provided for those sites. In particular, Xcel did not provide the EM&V team with the requested invoices or pre/post inspection reports. For six of the nine sites, we were not able to verify the type or number of lighting fixture quantities installed. For three of the sites, the EM&V team was unable to verify the fixture quantities. The uncertainty ranking for these estimates is considered HIGH because sufficient documentation was provided for fewer than 70 percent of the sampled sites.

12.3 DETAILED FINDINGS—RESIDENTIAL

12.3.1 Residential Standard Offer Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
8.8%	466	473	101.5%	15.6%	1,417,765	1,422,869	100.4%	Medium	25

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the Xcel SPS Res SOP were slightly higher than claimed savings, with realization rates of 101 percent and 100.4 percent for demand and energy savings, respectively.

Realization rates for the Xcel SPS Res SOP were driven in small part by savings adjustments to the following measures during the data review process:

- **Air infiltration.** There were five records that did not meet the Deemed Savings Manual eligibility criteria where the initial leakage is above 4.0 CFM50 per square foot. For the five with high initial leakage, the EM&V team calculated savings based on an initial leakage of 4.0 CFM50/sq. ft., which is lower than the reported savings.
- **Duct efficiency.** The EM&V team found slight differences in the savings calculated through the Duct Efficiency tool compared to those reported in the tracking system for 16 installations. This resulted in a minor impact on savings.

The EM&V team was able to verify savings through the desk review process for 21 out of 25 projects for which sufficient measure information was provided through the supplemental data request. The team identified small discrepancies between the database and the supplemental data provided for two duct efficiency measure assumptions for one project in this process. The re-calculated savings for these measures led to the slightly higher than 100 percent realization rate.

However, the team was unable to verify savings through the desk review process for the remaining four sampled projects for Xcel SPS due to a lack of key measure attribute assumptions provided in the supplemental data received. Since sufficient documentation was provided for 80 percent of the sampled sites, the uncertainty ranking for these estimates is MEDIUM.

12.3.2 Hard-to-Reach Standard Offer Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
5.8%	308	307	99.5%	8.1%	736,938	724,484	98.3%	Medium	5

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the Xcel SPS HTR SOP were slightly lower than claimed savings, with realization rates for both kW and kWh slightly less than 100 percent.

Realization rates for the Xcel SPS HTR SOP were mainly driven by savings adjustments to the following measures:

- **Ceiling insulation.** There was one record that did not match evaluated savings. For this record, the kWh savings were scaled up by a factor 15.18, but the kW savings match.
- **Air infiltration.** There are 28 records that did not meet the Deemed Savings Manual eligibility criteria as the initial leakage is above 4.0 CFM50 per square foot. For the 28 measures with high initial leakage, the EM&V team calculated savings based on an initial leakage of 4.0 CFM50/sq. ft., which is lower than the reported savings. There is also one record that did meet the Deemed Savings Manual eligibility criteria but did not match with the kWh evaluated savings calculated. This record's kWh was scaled up by a factor of 13.2; the kW savings match.
- **Duct efficiency.** The EM&V team found slight differences in the savings calculated through the Duct Efficiency tool compared to those reported in the tracking system for 12 installations. This resulted in a minor impact on savings.

The EM&V team was able to verify savings through the desk review process for four out of five targeted project completes for the Xcel SPS HTR SOP. There were no deviations reported from the savings in the database. Since sufficient documentation was provided for 80 percent of the sampled sites, the uncertainty ranking for these estimates is MEDIUM.

12.3.3 Low-Income Weatherization

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
2.0%	106	109	103.4%	4.2%	378,724	380,655	100.5%	Low	5

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the Xcel Low-Income Weatherization program were slightly higher than claimed savings with realization rates of 103 percent and 101 percent for both demand and energy savings, respectively.

Realization rates for the Xcel SPS Low-Income Weatherization program were driven by savings adjustments to the following measures from the data review process:

- **Refrigerator replacement.** For targeted low-income programs, claimed savings calculations were based on algorithms that differed from the Deemed Savings Manual. Using these alternative calculations, the EM&V team nevertheless found discrepancies between reported and calculated savings for all 75 of Xcel's refrigerator replacements due to a calculation error in the implementation contractor's database that produced lower aggregate savings than were calculated by the EM&V team.
- **Ceiling fan.** All ceiling fan energy savings appear to be scaled to a constant 99.9481 percent of DSM-calculated values, across all utilities. No demand savings are reported for ceiling fans despite their provision in the Deemed Savings Manual. The EM&V team included the kW savings as calculated the savings from the Deemed Savings Manual.
- **Window AC.** For targeted low-income programs, claimed savings calculations were based on algorithms that differed from the Deemed Savings Manual. Using the alternative calculation, the EM&V team found no discrepancies between the calculated and reported savings for Xcel.

For several measures, the EM&V team compared calculations provided by the implementation contractor to the Deemed Savings Manual. Low-income programs have different implementation requirements than non-low-income energy efficiency programs. The Public Utility Regulatory Act (PURA) §39.905(f) addresses general provisions for low-income programs, with which Xcel SPS, as a bundled utility voluntarily complies. For low-income programs, we recommend improved documentation on savings calculation approaches that represent alternate calculations than those in the Deemed Savings Manual for refrigerators and HVAC measures.

The EM&V team was able to verify savings through the desk review process for five out of five targeted projects for the Xcel SPS Low-Income Weatherization program. There were no deviations from the claimed savings in the database. Since sufficient documentation was provided for 100 percent of the sampled sites, the uncertainty ranking for these estimates is LOW.

12.4 DETAILED FINDINGS—LOAD MANAGEMENT

12.4.1 Load Management Standard Offer Program

Program Contribution To Portfolio Savings (kW)	2012 Claimed Demand Savings (kW)	2012 Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	2012 Claimed Energy Savings (kWh)	2012 Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Uncertainty Ranking	Completed Desk Reviews*
35.7%	1,902	822	43.2%	0.0%	0	0	n/a	Low	2

*Confidence intervals are not reported at the utility program level, as these results should only be viewed qualitatively due to the very small sample sizes.

Evaluated savings for the Xcel SPS Load Management SOP were lower than the claimed savings with a realization rate of 43 percent for kW.

The PY2012 evaluation activities found that the individual participant load impact calculations in the work papers supplied to the EM&V Team were very similar to those validated by using the individual customer interval load data. The EM&V team was able to match the 822 kW in the work papers exactly. The difference in the evaluated and claimed savings is due to the addition of a new participant that did not receive a curtailment test event in PY2012, and therefore the EM&V team was unable to verify the customer's contribution to the program's demand savings. The lower than 100 percent realization rate is used to prospectively inform program improvements. Xcel SPS has made a process change in PY2014 to call a curtailment test event for all load management participants in the program year.

13. RECOMMENDATIONS

This section discusses key findings and recommendations across all the utilities. Due to the reduced level of effort for PY2012, findings and recommendations at this time are limited to program tracking, documentation, and savings calculations.

The EM&V effort found that utilities generally have well-established program design and delivery processes, supported by developed program tracking systems, program documentation, and savings calculations. This finding is supported by the generally healthy realization rates across utility portfolios. At the same time, across several utility programs, the EM&V team had a high level of uncertainty in evaluated savings due to limited information available to complete the third-party verification of savings calculations. The EM&V team has identified improvements that can increase the transparency, accuracy, and evaluability of program impacts going forward.

The recommendations were discussed and prioritized for future program year implementation at the Energy Efficiency Implementation Project (EEIP) meeting held October 22, 2013, consistent with §25.181(q)(9). The EM&V team and PUCT staff are working with each utility to establish an action plan and timeline for the implementation of the recommendations based on the prioritization agreed upon at the EEIP meeting.

13.1 PROGRAM TRACKING

Across the Texas utilities' programs, data are tracked and stored by many different parties in many different formats with varying level of detail. Generally, data are tracked by an external contractor,[17] although there are exceptions. Oncor, for example, tracks and stores its own data. Our data reviews have shown that the program tracking data format and level of information can vary for the same program, even if the data are housed by the same contractor.

This variation is somewhat due to the utilities' different requests of their contractors. While most of the utilities use the same external contractors for their tracking systems and processes are coordinated through the Electric Utilities Marketing Managers of Texas (EUMMOT), utilities make their own individual decisions regarding information needs they have for their programs and tracking system enhancements they would or would not like to have. Another driver of the variation is the proficiency of different Energy Efficiency Service Providers (EESPs) in maintaining and submitting the requested tracking data.

First, we discuss the EM&V team's data program tracking request and reconciliation process. Then we summarize key findings and recommendations.

[17] SUBST. 25.181 does not contain a definition of *contractor*. We use this term to refer to external contractors who either implement programs for the utilities and/or maintain program tracking data for the utilities. We use this term to distinguish these entities from Energy Efficiency Service Providers (defined in §25.181(c)(17)), which are market actors that install energy efficiency measures or perform energy efficiency services through the programs (i.e., a HVAC contractor who installs an efficient unit for an electric customer).

13.1.1 Background—program tracking requests and reconciliation

The EM&V team developed an EM&V database to import program tracking data, creating a master file of key variables to make it possible to standardize reporting of program tracking and evaluation results across all utilities and programs. The process and protocols for extracting data from tracking systems, transporting it to the EM&V team, and loading it into the EM&V database have largely been established. Code for loading data into the EM&V database have been developed and can be utilized as new data is acquired each quarter (unless there are changes to the tracking system data provided that require some revisions to the code).

Early in the evaluation process, the EM&V team requested a preliminary data extract of the three organizations that represented a significant portion of the tracking data in Texas: Frontier Associates, CLEAResult, and Oncor. This preliminary data request allowed the evaluation team to review the data format and to begin developing the EM&V database and code to import the data provided into the database.

Next, the EM&V team requested all PY2012 data on April 1, 2013, in a single data request. All utilities (and hence their contractors) were asked to submit full program datasets within 20 calendar days. Utilities and implementation contractors were all responsive to the request, and provided the data as completely as possible.

For the most part, the data were complete and consistent with the utilities' reported savings in the Energy Efficiency Plan and Reports (EEPRs).[18] Where there were differences, the reasons behind differences in savings compared with EEPRs included:

- Transitions in tracking system format by the external contractor, resulting in inaccurate data being stored in tracking systems
- Partial savings within the PY2012 savings data, either for a prior year's savings accounted for in 2012 or partial 2012/2013 savings
- Adjustments made to summary savings values extracted from the tracking system by utilities prior to reporting the savings within the EEPRs. In these cases, the tracking system is correctly calculating savings in agreement with approved deemed savings values, but there was no documentation initially provided that explained the adjustments.

Although the data format varied, the information received primarily included: installations by measure category, related savings, contact information (name, telephone number, site address), and in about two-thirds of cases some sort of unique identifier. The unique identifier may be auto-generated (e.g., projectID), may be a unique account number associated with the customer, and/or may be a unique number associated with the facility or contractor providing services. Some organizations also provided more detailed measure-level information necessary to verify installations and savings; however, where not provided, the evaluation team requested the information in the supplemental data request, which was sent in early June 2013.

[18] As a result of the EM&V data review and reconciliation, in some cases, utilities filed updated EEPRs if an error was identified that required corrected PY2012 claimed savings.

13.1.2 Key findings and recommendations

Key process findings around program tracking are summarized next, along with the relevant recommendations.

Key Finding #1: Utilities did not consistently verify reported numbers with external contractors.

It was not apparent in the evaluation process that the utilities shared the reported savings and participant counts with external contractors prior to their being published in the EEPRs. Going forward, this should be an established process for both the utilities and external contractors that support the tracking data.

Comparing reported savings from both parties would have allowed the utilities to catch any reporting errors more quickly. Doing so also may provide contractors with input where their data extracts or analyses are incorrect. The EM&V team, through the reconciliation process, found both of these situations to be the case, and the process of reviewing the EEPRs against the contractors' reports identified areas for data improvement.

Recommendation #1: Share resulting impact and participation tables with external contractors and the EM&V team as part of a data QA/QC process before filing the EEPRs with the PUCT.

Key Finding #2: There are various opportunities to modify data format to improve data organization and transparency.

As mentioned previously, the format of each program's tracking data varied. Below are a number of generalized findings on data format that limited the data tracking review/and or the evaluation process, or created considerable additional effort to evaluate the programs. These findings are intentionally general in order to be applicable to multiple programs.

- **Unique site identifying data.** The tracking data does not include a unique customer identifier for all records (e.g., account number). In fact, this information is missing for about a third of participants. The two most common reasons for missing this information are (a) utilities do not provide unique customer identifiers to the contractors due to security concerns; (b) it is a contractor-driven program and the payment is made to the contractor; and/or (c) the customer is completely removed from the process from a data tracking perspective (e.g., buyers of new homes). Note that most tracking data do include field(s) that have unique numbers at the record- or measure-level, and/or capture site address information which some organizations are using as a basis for establishing customer counts, but this level of information differs from a unique site-level indicator. This issue complicates the evaluation process, making it difficult to develop samples for surveys and on-site visits, and match customer counts since there is not a standard rule or unique identifier for establishing customer counts.

  Recommendation #2a: If not already included in the tracking data supplied to the evaluation team, provide a unique identifier, such as ESIID, with all quarterly tracking submitted in response to data requests.

- **Individual measure versus measure category tracking.** For most commercial programs and some residential programs, measure-level savings are recorded at the measure category level (or savings calculator level) instead of the measure-specific level. For example, the tracking system will document the savings associated with a lighting project as captured within a lighting calculator, but the calculator itself may include many unique lighting installations, their costs, and related savings. Not having data tracked at the measure-specific level reduces the level of transparency as the types of measures and individual savings being claimed cannot readily be assessed.

  This structure required the evaluation team to request and manually review each savings calculator to determine the exact measures installed and the relative impact of the measure after sampling was completed. Additionally, this structure requires an additional level of effort and time investment on the utilities' and implementation contractors' parts to pull a considerable number of calculators and back-up documentation to fulfill supplemental data requests so that the evaluation team could review measure-specific details.

  Lastly, this structure creates complications for calculating cost-effectiveness. Cost-effectiveness models use measure-specific variables, such as effective useful life (EUL), to determine cost-effectiveness. This measure-level information is not available in tracking data that capture the aggregated calculator values; instead, calculator-level blended rates had to be applied in PY2012.

  Through discussions with contractors, the EM&V team learned that the lack of measure-specific information in the tracking systems partially resulted because the EUL had initially been set to a uniform value (ten years) across all measures. However, as these values have been improved to reflect different EULs across different measures, the tracking systems also need to evolve to support better analysis of the programs.

  Recommendation #2b: Track program data at the measure-specific level, rather than the measure-category level. Calculators can continue to be used to determine savings and project-level cost-effectiveness, but the information embedded in the calculators should be transferred to a tracking system and verified against the calculator values.

  This recommendation has already been discussed with two primary contractors as part of the PY2012 EM&V effort and it is the EM&V team's understanding that they are working on having measure-specific information readily available in tracking systems starting with PY2013. The EM&V team recognizes that this recommendation does require an investment to revise tracking system formats and/or data collection and reporting practices. However, there will be considerable improvements over time in terms of the transparency of the data, the ability to capture issues early, clean and transparent documentation of partial credit projects (for those cases not yet completed in a given time period where partial savings are claimed), and more accurate and efficient cost-effectiveness and impact evaluations.

- **EM&V Database extraction and importation processing time.** Each program's tracking data format varied, from a straightforward MS Excel-based measure-level

tracking system with all measure-level details captured on a single line, to a complicated SQL relational database structure that required a development of complex queries to accurately replicate the required outputs.

A majority of the program data was provided in the relational database structure (MS SQL). There are some advantages to this structure as it provides access to all available tracking data. It was also initially thought that it would result in reduced burden on the contractor. However, development of the queries to accurately replicate the required output was an added burden on the EM&V team. In addition, any future modifications to the source files and implementers' internal tracking systems will require additional effort with each data request as the two groups troubleshoot discrepancies, which could cause delays in the evaluation process.

Recommendation #2c: Communicate any modifications in tracking system format and information to the EM&V team as soon as it is finalized, and provide a dummy dataset with the change to allow the EM&V team to prepare revised importation code for the next data request.

- **Additional data necessary for third-party evaluation.** While the data required for evaluation was generally available in the tracking systems, the EM&V team did identify additional types of information, which, if routinely included in the tracking systems, would reduce follow-up requests and response effort. These were utility and program-specific issues, which are documented in Sections 4–12. The EM&V team identified a number of examples of additional types of information (below). These are general examples as identified throughout the evaluation process when reviewing data across all utilities.
  - Consistently collect and provide customer contact information (name, address, phone number), even for programs that are EESP driven
  - For load management programs, provide daily peak temperatures with load management program data
  - For those utilities that offer PV programs, capture specific PV-related fields such as tilt and azimuth and module and inverter quantities
  - Include in the tracking system all measure-related details used to calculate savings for partially deemed measures (e.g., AC SEER, AC tons, and AHRI number for residential air conditioning recipients).

Recommendation #2d: Coordinate with the EM&V team to determine additional required program tracking data fields. Including this additional information will facilitate the M&V process and improve the efficacy of the data response process for utilities and contractors.

Key Finding #3: Definition of participants varied by utility.

As part of the reconciliation process, the EM&V team attempted to calculate the number of participants for each utility program and match this to the numbers reported in the EEPRs. Through this process, it was identified that utilities defined participants differently; therefore, the numbers could not be compared or consistently referenced. For example, one utility may

reference a participant by account number, whereas another might identify a participant by a unique measure installed.

Furthermore, contractors also defined participants and at times provided their assessment of participant counts to utilities, but those reports were rarely referenced in the EEPRs. Establishing a consistent definition of a participant, and how to calculate the number of participants, will provide consistency across the state, allow for comparability, and provide another point of reference to validate program data for evaluation purposes.

The EM&V team has discussed this finding with PUCT staff and will be conducting research with the utilities to provide statewide recommendations for participant definitions in the PY2013 report.

Recommendation #3: For each program type, the EM&V team will work with the utilities to determine a consistent definition of participant by program type that should be used statewide. This definition should be communicated for consistency in calculations across all stakeholders including the EM&V team, utilities, and implementation contractors.

13.2 PROGRAM DOCUMENTATION

As discussed throughout this report, desk reviews were conducted across all utilities and most programs to provide an independent third-party review of PY2012 savings and to assess the accuracy of the tracking system data. As part of the desk reviews, the EM&V team examined the various program documentation materials to review key program inputs and assumptions, identify gaps, and document critical program processes. A primary process goal of the PY2012 desk reviews was to provide recommendations to enhance overall program documentation in order to improve the transparency of claimed savings. Similar to the findings discussed above regarding the variation in the ways data are being tracked across the Texas utilities' programs, program documentation is also tracked and stored by many different parties and in different formats. The variation is largely related to who implements the program. Most of the utilities run some programs internally and outsource others to implementation contractors. Utilities are more likely to run standard offer programs, low-income/hard-to-reach programs and load management programs internally. Smaller utilities are more likely to outsource the implementation of most or all of their programs.

Generally, project-level documentation is stored by a contractor if implemented externally, although there are exceptions. In addition, program documentation at the project level may vary for the same program, even if implemented by the same contractor.

First, we discuss the process of how program documentation was obtained and reviewed as part of the PY2012 EM&V effort. Then we discuss key findings and recommendations related to program documentation.

13.2.1 Background—program documentation requests

The EM&V team developed a Supplemental Data Request form (a MS Excel spreadsheet) to assist in organizing the project-level documentation requests for each utility's program to support the desk reviews. Information collected in this form included key fields such as the date the request was sent, the deadline for request completion, key project identifiers, the

organization that provided the original data, sector, participant name, site address, measure description, and type of project-level documentation requested.

The EM&V team requested all PY2012 supplemental data in June 2013 for each utility program. All utilities were asked to submit their documentation files within 20 calendar days. All of the utilities and implementation contractors were responsive to the request and tried to provide the data as completely as possible.

The utilities (or implementation contractors) provided the majority of the project-level documentation during the first supplemental data request. In the course of conducting desk reviews, the EM&V team identified cases where additional information was needed to complete a due-diligence review of the claimed savings. As a result, the EM&V team issued a follow-up supplemental data request in July 2013.

Although project-level documentation varied quite a bit by utility and program, the information primarily included: program manuals, algorithms for calculating energy savings, completed M&V activities, unlocked calculators, contractor invoices, photos, baseline conditions, and detailed reports (e.g., audit forms, inspections, certification forms) that provided participant and measure details (e.g., building size, pre/post measurements, quantity of bulbs) for all measures installed at the requested sites.

13.2.2 Key findings and recommendations

Key process issues related to the project documentation requests are summarized next, along with the relevant recommendations.

Key Finding #4: Availability of program manuals varied by utility program.

The EM&V team discovered that many of the utility programs throughout Texas do not have a comprehensive program manual, or in many cases, no program manual at all.

Recommendation #4: Prior to launch, every program should develop a manual, or other program design and delivery documentation, that at a minimum details the following critical elements: program goals and metrics, delivery methods (including any program marketing channels), participation requirements for both customers and EESPs, sample application form(s), required software or savings calculators, incentive delivery, payment processing, data tracking and reporting, and how energy savings are calculated.

Ideally, the program manual would also include the following: procedures for complaint resolution, quality control and quality assurance, and program governance. An addendum to the program manual should be an EESP participation agreement that outlines what is expected from EESPs, including customer service standards and project documentation. The program manual should be a living document, which should be reviewed for needed updates on a regular basis (at a minimum, annually).

Key Finding #5: Project-level documentation supporting savings calculations were often not well-documented, and in some cases, not documented at all.

The project-level documentation received as part of the PY2012 desk review process was often limited, resulting in high uncertainty rankings across many utility programs. Given the

Texas utilities have not yet undergone a comprehensive EM&V effort, nor had the breadth of information requested been previously required, this was generally expected as no statewide standards for level of program documentation had previously been established.

While the EM&V team found that data tracking of savings were generally correctly entered from hard copy forms into tracking databases, the EM&V team was not able to replicate savings calculations for some programs. Savings calculations should have supporting documentation that allows for measure-level verification, especially those key project inputs and parameters that drive a significant portion of calculated savings.

Robust and organized program documentation will help improve the accuracy and transparency of estimated savings in future program years. Project activities should be conducted and documented in a way that allows for effective independent review.

Recommendation #5: The EM&V team recommends making the following changes, grouped by nonresidential and residential sector programs:

Nonresidential sector

- **Lighting projects (Recommendation #5a):** The key inputs for deemed savings projects are type of fixtures and quantities for pre and post periods. Ideally, the EM&V team would have liked to have received pre- and post-inspection reports and customer procurement documents that include equipment invoices or purchase orders that describe the equipment quantities and specifications (i.e., make and model) that confirm the inputs used for savings calculations to help verify these key inputs. For projects where M&V plans have been implemented, the primary source of data used to verify savings should be specified (e.g., logged lighting data or facility reported operating schedule information) to confirm the operating hours used in the savings calculations.
- **HVAC projects (Recommendation #5b):** The key inputs are equipment specifications, age of existing equipment, and quantity. The EM&V team recommends providing equipment cut sheets, photos for pre and post equipment nameplates, and pre- and post-inspection reports. In addition, the pre- and post-inspection should confirm the working condition of the existing equipment to determine if the project is an early replacement or replace-on-burnout type.
- **Roofing projects (Recommendation #5c):** The key inputs needed are the pre and post roofing materials and thicknesses, roofing area, floors within building, HVAC equipment specification, age of existing equipment, and quantity. This documentation should be included in project files.
- **New construction projects (Recommendation #5d):** In addition to the end use type documentation requirements, drawings used for presenting equipment schedules (lighting, HVAC, etc.) need to be clearly titled. Equipment counts should be clearly marked and files titled as well. Baseline conditions must be clearly identified.
- **Load management (Recommendation #5e):** A standardized form of documentation and reporting should be developed in order to verify program impacts. The

documentation should include the calculation of baselines, and impacts and incentives on an individual program participant basis.

Residential Sector

- **General (Recommendation #5f):** Utilities should have the necessary documentation available for verifying project savings. The utilities should collect customer procurement documents that include equipment invoices or purchase orders that describe the equipment quantities and specifications (i.e., make and model) that confirm the inputs used for savings calculations, audit/installation forms, and equipment specifications sheets. The EM&V team understands this may require a change in program processes, primarily requiring EESPs as part of program participation to submit pertinent savings information (e.g., invoices, equipment specifications sheets) used in savings calculations.
- **Utility M&V adjustments (Recommendation #5g):** Utilities should clearly document all inspection findings and results based on their M&V activities and how they were used to adjust claimed savings. The EM&V team was not in many cases able to easily verify the adjustments made between deemed savings calculations and utility M&V adjusted savings.
- **Low-income programs (Recommendation #5h):** Improved documentation on savings calculation approaches that differ from Deemed Savings Manuals should be made available. For these programs, the EM&V team received alternate calculations than those in the Deemed Savings Manual for refrigerators and HVAC measures.

13.3 SAVINGS CALCULATIONS

This section differs from the above as it provides very specific, targeted recommendations related to savings calculations.

Key Finding #6: While the EM&V team generally found savings calculations reasonable, near-term updates in savings will improve the accuracy of PY2014 claimed savings.

Overall, there is a well-established infrastructure supporting reasonable savings estimates through Deemed Savings Manuals and savings calculators (in MS Excel spreadsheets). However, the PY2012 EM&V research did identify updates needed to improve consistency and accuracy of savings estimates. While the statewide Technical Reference Manual (TRM) will address many of the issues identified, the TRM will not be used as the basis of claimed savings until PY2015.[19] Therefore, the EM&V team has identified near-term updates in the current infrastructure to improve PY2014 claimed savings.

Recommendation #6: The EM&V team recommends making the following changes, grouped by nonresidential and residential sector programs for PY2014 claimed savings calculations:

[19] The reader is referred to the Approach to Texas Technical Reference Manual, June 12, 2013, the Public Utility Commission of Texas EM&V team.

Nonresidential sector

The EM&V team makes the following recommendations pertaining to the external HVAC calculators:

- Age or some other indicator of working condition for the equipment that was replaced should be provided. This is especially important if the equipment age exceeds the equipment's Estimated Useful Life (EUL) and Early Replacement (Retrofit) is claimed **(Recommendation #6a).**
- For New Construction (NC) and Replace on Burnout (ROB) projects, baseline efficiency should be consistent with the latest Texas building code, which currently is the IECC 2009 **(Recommendation #6b).**
- For Early Replacement (Retrofit) projects, the baseline efficiency for DX units and chillers is selected from 1989 ratings taken from ASHRAE 90.1 code. Instead, the baseline efficiency should be selected from the 1999 ASHRAE code for any DX units with a 15 years EUL **(Recommendation #6c).**
- For chillers with an EUL of 20 years, baseline efficiency should also be selected from 1999 codes since 1989 codes are not representative for retrofit chillers. The use of 1999 codes for chillers is considered conservative and will provide better estimates of savings for Early Replacement (retrofit) projects going forward **(Recommendation #6d).**
- For Early Replacement (Retrofit) projects, implementers can also consider modifying the calculator such that the existing unit efficiency can be used for savings when available and well documented to verify the existing unit efficiency. Partial load efficiencies should be used to estimate kWh energy savings and full load efficiencies should be used to estimate kW demand savings **(Recommendation #6e).**

Residential

- **New Construction.** For the ENERGY STAR® New Homes MTPs, the baseline efficiency should be consistent with the latest Texas residential building code, which currently is the IECC 2009 **(Recommendation #6f).**
- **Application of updates.** The utilities should consistently apply any changes to the deemed savings manual for the entire program year. This should include changes that impact the duct efficiency calculator **(Recommendation #6g).**

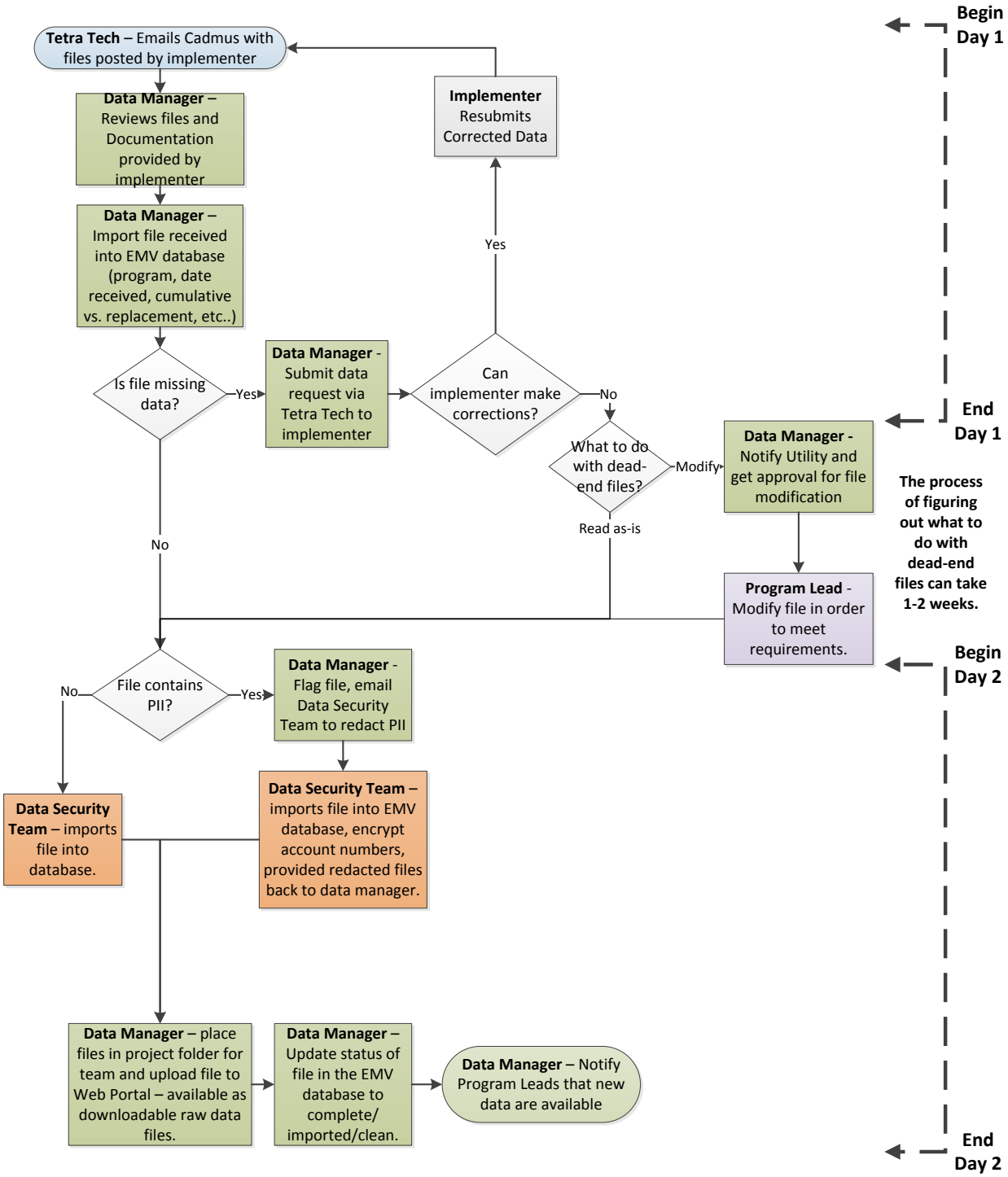
13.4 CONCLUSIONS

The objective of the recommendations above is to facilitate more accurate, transparent, and consistent savings calculations and program reporting across the Texas energy efficiency programs. The EM&V team recognizes there is a trade-off between these objectives and program administration cost and program participation barriers. The EM&V team discussed with the PUCT and utilities the feasibility of the above recommendations. The reasonable roll-out of recommendations was discussed given several of the recommendations require utility process changes as well as have administrative cost implications.

APPENDIX A: DATA MANAGEMENT PROCESS

The following figure details the data management process.

Figure A-1. Data Management Process



APPENDIX B: DESK REVIEW TEMPLATE

This appendix provides the desk review template utilized across the majority of programs. Completed desk review details for sampled projects are provided to the PUCT and utilities.

Texas [Program] - Desk Review Report

This form summarizes the evaluation review and any resulting adjustments to the project savings.
This evaluation is based on a review of the claimed savings (ex-ante) project documentation.

Project ID	
Utility	
Measure(s) Type	
Application Type (NC or ROB or ER)	
Building Type	
Evaluator	
Review Date	

Measured ID	Annual Savings	Energy Savings (kWh)	Demand Savings (kW)	Natural Gas (Therms)
Measure 1 ***[Add additional rows for multiple measures]***	**Reported**			N/A
	Evaluated			N/A
	RR			N/A

Project Description

[Provide detailed project description - includes equipment type, size, quantity]
The project involved the replacement of [baseline equipment] with [energy efficient equipment] in [facility type]. As part of the [application type], the following measure(s) were implemented:
1) Replacement of [quantity] [baseline] with [quantity] [energy efficient equipment]
2) Replacement of [quantity] [baseline] with [quantity] [energy efficient equipment]

Comparison of Tracking System Data to the Project Documentation

[Compare tracking system data (savings, projects, incentives, etc.) to the project documentation and report any discrepancies]

Tracking system data is in [agreement/disagreement] with the data in the project documentation. [Note discrepancies if found]

Are the reported calculation methods consistent with the Program Manual - Stipulated or Deemed Approach?

[Note the calculation method used e.g., CalcSmart Tool. Check program stipulated or deemed method is consistent with the reported calc method. Check if the project baseline clearly defined and appropriate]

The ex-ante [measure] savings were calculated using [tool]. [Note stipulated values utilized].

The savings estimates listed within the [form] are [consistent/not consistent] with the tracking database reported impacts. [Note any inconsistencies]

Are key parameters used for calculations identified with clear explanation of their source?

[Note if the key parameters are well supported and consistent - e.g., efficiency of the post install equipment is not supported with manufacturer sheet]

The [form]supplied within the ex ante documentation was [insufficiently/sufficiently] referenced and explained [all/some/no] assumptions clearly. [Specify insufficiencies and additional explanations needed.]

Evaluation Savings Calculations Summary

[Provide a summary of the ex post savings e.g., used Calcs Smart or Lighting tool to estimate savings or verified the ex ante calculation tool and savings are consistent. List any adjustments to the savings or project specific savings summary, if any]

The evaluation team calculated savings using [tool]. The key parameters such as [i.e., installed fixture quantity and fixture types] used for savings calculations were verified from the project documentation.

Reasons for Savings Gap

[List all the reasons for the difference in evaluated vs. reported savings estimates]

The primary reason for the [lower/higher] energy and demand realization rates is due to the difference between the reported and evaluated [driver, i.e., installed fixture quantity]. Example: The evaluators verified that a total of [quantity] fixtures were installed compared to the ex ante reported total of [quantity] fixture installations. The adjusted fixture quantity in the evaluation analysis resulted in a [x% reduction/increase] of both the energy and peak demand savings realization rate.

Additional Evaluation Findings

[Provide all additional project findings; e.g. project documentation quality, Project Cost, recommendations to improve the measure/ project implementation]

APPENDIX C: DETAILED SAMPLING AND METHODOLOGY

Details of the EM&V team's sampling and impact evaluation methodology are discussed below as follows:

- Commercial standard offer programs
- Commercial market transformation programs
- Residential standard offer programs
- Residential market transformation programs
- Low-income/hard-to-reach programs
- Load management programs
- PV/solar programs.

C.1 COMMERCIAL STANDARD OFFER PROGRAMS

The evaluation of the PY2012 Commercial Standard Offer programs (CSOPs) included desk reviews for 175 sites.[20] No primary data collection was conducted for PY2012.

Program tracking data was used to inform the sample design for the PY2012 program. For each utility, using the EM&V Database, CSOP sites were stratified into three strata using the reported kW savings. Sites were sorted from largest to smallest reported kW savings, and placed into one of three strata such that each stratum contains about one-third of the program total kW. The EM&V team then randomly selected the targeted sample points for each utility in PY2012. The utilities for which a census effort was performed (i.e., all sites claimed in PY2012 were evaluated) were not stratified since sampling was not required.

An objective of the sampling plan was to ensure that all end uses were represented in the sample. If there was an end use that had a small number of participants and was unlikely to be randomly pulled, then an additional stratum was created at the statewide level, which contained all the participants that installed that end use. A sample size was allocated to that stratum that was proportional to the kW savings, with a minimum sample size of two. This ensured that all end uses were sampled at the statewide level. For sites with multiple end uses, the EM&V team performed desk reviews for all the end uses for up to 10 percent of the sampled sites.

Table C-1. Commercial Standard Offer Program—Data Collection Plan for PY2012 by Utility

Utility	Program	Desk Reviews
AEP TCC	CSOP	20
AEP TCC	CSOP Non-Profit	3
AEP TNC	CSOP	20

[20] Each site is a facility with a unique site address as identified through the field cs_id.

Utility	Program	Desk Reviews
AEP TNC	CSOP Non-Profit	3
CenterPoint	CSOP	30
El Paso Electric	CSOP	6
Entergy	CSOP	-
Oncor	CSOP Custom	20
Oncor	CSOP Basic	20
Sharyland	CSOP	-
SWEPCO	CSOP	16
SWEPCO	CSOP Non-Profit	2
TNMP	Large CSOP	3
TNMP	Small CSOP	-
Xcel SPS	Large CSOP	20
Xcel SPS	Small CSOP	12
Total		**175**

C.2 COMMERCIAL MARKET TRANSFORMATION PROGRAMS

The evaluation included desk reviews for 161 sites.[21] No customer participant surveys or on-site data collection was conducted for PY2012.

Program tracking data was used to inform the sample design for the PY2012 Market Transformation programs. For each utility, sites were stratified into three strata using the reported kW savings in the tracking data extract from the statewide EM&V database. Sites were then sorted from largest to smallest reported kW savings and placed into one of three strata such that each stratum contained approximately one-third of the program total kW claim. The EM&V team then randomly selected the targeted sample points for each utility in PY2012.

Approximately one-third of the utility level sample was pulled randomly from each of the three kW strata. However, in specific cases the EM&V team sampled a larger portion of the projects in the largest savings strata to provide great representation of overall program savings. For utilities for which a census effort was performed (i.e., all sites claimed in PY2012 were evaluated), the evaluation did not stratify sites since no sampling was required.

An objective of the sampling plan was to ensure that all end uses were represented in the sample. If there was an end use that had a small number of participants and was unlikely to be randomly pulled, then an additional stratum was created at the statewide level, which

[21] Each site is a facility with a unique site address.

contained all the participants that installed that end use. A sample size was allocated to that stratum that was proportional to kW savings, with a minimum sample size of two. This ensured that all end uses were sampled at the statewide level. For sites with multiple end uses, the EM&V team performed desk reviews for all the end uses for up to 10 percent of the sampled sites.

Another objective of the sampling plan was to evaluate projects with potentially increased levels of uncertainty and to ensure representation of other key attributes (e.g., retrofit versus new construction, deemed versus custom savings methodologies) within the sample. After the initial random sample was drawn, a review was completed to ensure that these key attributes were represented as applicable per utility. Where variations were missing, substitutions may have occurred. Substitutions were tracked and reported accordingly.

Table C-2. Commercial Market Transformation Program—Data Collection Plan for PY2012 by Utility

Utility	Program	Desk Reviews
AEP TCC	Score/CitySmart MTP	8
	Commercial Solutions MTP	5
	CoolSaver© Tune-up MTP	4
	Open MTP	0
AEP TNC	Score/CitySmart MTP	4
	Commercial Solutions MTP	5
	Open MTP	0
CenterPoint	Score/CitySmart MTP	20
	RCx MTP	5
	Advanced Lighting Commercial MTP	6
	Multi-Family Water & Space Heating MTP	2
	Sustainable Schools Pilot MTP	0
El Paso Electric	Score MTP	3
	Large C&I Solutions MTP	15
	Small Commercial Solutions MTP	10
	Commercial Rebate Pilot MTP	0
Entergy	Score/CitySmart MTP	12
	Commercial Solutions MTP	12
Oncor	Educational Facilities MTP	6
	Government Facilities MTP	5
	Air Conditioning MTP	5

Utility	Program	Desk Reviews
Sharyland	Customized Commercial MTP	0
	Commercial Water Heating Pilot MTP	0
	Residential Water Heating Pilot MTP	0
SWEPCO	Score MTP	7
	Commercial Solutions MTP	5
	Small Business Direct Install Pilot MTP	5
	LED Lighting Pilot MTP	0
TNMP	Score/CitySmart MTP	12
	Commercial Solutions MTP	5
	Small Business Pilot MTP	0
Xcel SPS	RCx MTP	0
Total		**161**

C.3 RESIDENTIAL STANDARD OFFER PROGRAMS

The evaluation of the PY2012 Residential Standard Offer program included desk reviews for 147 participants. No customer participant surveys or on-site data collection was conducted for PY2012.

Several factors were considered in the desk review sampling and realization rate development for residential standard offer programs. First, as part of the tracking system review objective, the EM&V team checked that the savings calculated using the 2012 Deemed Savings Manual agreed with the claimed savings in the tracking system. To accomplish this, we needed the measure-specific inputs such as pre and post R value for insulation, county (for weather zone), and efficiency level. This calculation was automated, allowing for a comparison for the census of records that did not require a secondary calculator (i.e., duct efficiency).

In addition to performing the tracking system review, a key evaluation objective was to verify the savings. For those measures that had additional required data entry validation, we selected a sample to check the accuracy of the data input into the tracking system. For example, for HVAC equipment measures, the EM&V team confirmed the efficiency and capacity of the rebated unit from the AHRI database using the AHRI number. We calculated, for this sample, the savings based on the confirmed capacity/efficiency and compared it against the tracking system. This provided us with the ex-post savings. All HVAC measures required this secondary review. For shell, water heating, and lighting measures, no additional data entry validation needed to be performed and the adjusted ex-ante savings were equivalent to ex-post.

The EM&V team selected the sample for the desk review using a simple random approach stratified by utility program. That is, for a given utility, we randomly selected our sample from the population of participants that installed these measures. For the Oncor participants, as we did not have the necessary fields in the database needed to perform the census review of the

tracking system, we selected the sample across all measure categories and requested the needed data through the supplemental data request.

Table C-3. Residential Standard Offer Program—Data Collection Plan for PY2012 by Utility

Utility	Program	Desk Reviews (2012)
AEP TCC	RSOP	15
AEP TNC	RSOP	10
CenterPoint	RSOP	10
Entergy	RSOP	20
Oncor	RSOP	20
Sharyland	RSOP	0
SWEPCO	RSOP	17
TNMP	RSOP	30
Xcel SPS	RSOP	25
Total		**147**

C.4 RESIDENTIAL MARKET TRANSFORMATION PROGRAMS

The evaluation of the PY2012 Market Transformation programs included desk reviews for 119 participants and 6 retailers. No customer participant surveys or on-site data collection were conducted for PY2012.

For these programs, several factors were considered in the desk review sampling. First, as part of the tracking system review objective and where applicable, the EM&V team checked that the savings calculated using the 2012 Deemed Savings Manual agreed with the claimed savings in the tracking system. To accomplish this, the EM&V team needed measure-specific inputs such as SEER or EER ratings and county (for weather zone).

In addition to performing the tracking system review, a key evaluation objective was to verify the savings. To do this, the EM&V team selected a random sample of projects for desk reviews to check the accuracy of the inputted data. For example, for the A/C Distributor and CoolSaver A/C Tune-up programs, the EM&V team worked to confirm the efficiency and capacity of the rebated unit from the AHRI database using the AHRI number, and compared the savings against the tracking system to get ex-post savings. Where a sample was selected, the EM&V team randomly selected the sample from the population of participants that have installed these measures, ensuring where applicable that higher saving projects were captured.

CenterPoint's Advanced Lighting Residential MTP program, as an upstream program, used a different sampling approach. For this program, the EM&V team randomly selected the evaluation samples from a list of participating stores involved in the program for evaluation of all lamp types sold by that participating store.

The table below provides the PY2012 participant (unique sites) desk reviews by utility for PY2012.

Table C-4. Residential Market Transformation Program—Data Collection Plan for PY2012 by Utility

Utility	Program	Desk Reviews
AEP TCC	A/C Distributor Pilot MTP (Res)	2
	CoolSaver A/C Tune-up Pilot MTP (Res)	2
	ENERGY STAR® New Homes MTP	5
AEP TNC	A/C Distributor Pilot MTP (Res)	5
CenterPoint	A/C Distributor Pilot MTP (Res)	10
	Energy Wise Resource Action MTP	10
	ENERGY STAR® Homes MTP	25
	Advanced Lighting Residential MTP	6
	Home Performance with ENERGY STAR® MTP	0
El Paso Electric	Appliance Recycling	10
	LivingWise® MTP	10
	Residential Solutions MTP	9
Entergy	ENERGY STAR® Homes MTP	5
	Home Performance with ENERGY STAR® MTP	5
Oncor	Air Conditioning MTP (Res)	8
	ENERGY STAR® Homes MTP	5
SWEPCO	CoolSaver A/C Tune-Up Pilot MTP (Res)	3
TNMP	ENERGY STAR® Homes MTP	5
Total		**125**

C.5 LOW-INCOME/HARD-TO-REACH PROGRAMS

The evaluation of the PY2012 Low-Income/Hard-to-Reach programs included desk reviews for 244 participants. No customer participant surveys or on-site data collection were conducted for PY2012.

As part of the tracking system review objective, the EM&V team checked that the savings calculated using the 2012 Deemed Savings Manual agreed with the claimed savings in the tracking system. To accomplish this, we used the measure-specific inputs such as pre and post R-value for insulation, county (for weather zone), and efficiency level. This calculation was automated, allowing for a comparison for the census of records that did not require a secondary calculator (i.e., duct efficiency).

In addition to performing the tracking system review, a key evaluation objective was to verify the savings. For those measures that had additional required data entry validation, we

selected a sample to check the accuracy of the inputted data. For example, for HVAC equipment measures, the EM&V team confirmed the efficiency and capacity of the rebated unit from the AHRI database using the AHRI number. We calculated, for this sample, the savings based on the confirmed capacity/efficiency and compared against the tracking system. This provided us with the ex-post savings. All HVAC measures required this secondary review. For shell, water heating, and lighting measures, no additional data entry validation needed to be performed and the adjusted ex-ante savings was equivalent to ex-post.

For the new homes projects occurring under the Hard-to-Reach standard offer program, the EM&V team reviewed a sample of the electronic files used in calculating whole-house impacts and the corresponding paper documentation, if applicable.

The EM&V team selected the sample for the desk review using a simple random approach stratified by utility program. That is, for a given utility, we randomly selected our sample from the population of participants that have installed these measures. For participants in programs offered by Oncor, as we did not have the necessary fields in the database needed to perform the census review of the tracking system, we drew the sample across all measure categories and requested the needed data through the supplemental data request.

Table C-5. Low-Income/Hard-to-Reach Programs—Data Collection Plan for PY2012 by Utility

	Desk Reviews (2012)			
Utility	HTR SOP	LI	HTR MTP*	Total
AEP TCC	10	10	0	20
AEP TNC	5	5	0	10
CenterPoint	10	0	39	49
El Paso Electric	0	0	35	35
Entergy	10	0	0	10
Oncor	44	44	0	88
Sharyland	0	0	0	0
SWEPCO	5	5	0	10
TNMP	6	6	0	12
Xcel SPS	5	5	0	10
Total	**95**	**75**	**74**	**244**

*Of the 39 desk reviews listed for CenterPoint MTP, two reviews were associated with their Multifamily Water & Space Heating MTP, and the remainder associated with Agencies in Action MTP.

C.6 LOAD MANAGEMENT PROGRAMS

The evaluation of the Load Management programs did not involve any on-site data collection. Interval load data from participating customers was requested for the PY2012 evaluation.

Table C-6. Load Management Programs—Data Collection Plan for PY2012 by Utility

Utility	Program	Program Tracking Data Reviews (2012)	Premise Level Metered Data for Sample of Participant
AEP TCC	Load Management	56	30
	Irrigation Load Management	0	0
AEP TNC	Load Management	7	7
	Irrigation Load Management	0	0
CenterPoint	Load Management	339	30
	Retail Electric Provider Pilot[22]	1,026	0
El Paso Electric	Load Management	11	11
Entergy	Load Management	9	9
Oncor	Load Management	157	30
Sharyland	Load Management	N/A	0
SWEPCO	Load Management	9	9
TNMP	Load Management	22	22
Xcel SPS	Load Management	2	2
Total		**1,638**	**150**

C.7 PV/SOLAR PROGRAMS

For Solar PV PY2012, the EM&V team used simple random sampling within each utility and measure category to select a sample. Some programs like AEP TNC's are quite small so the EM&V team employed a census approach to maximize the sample. The EM&V team also requested available metered data for all desk review sites.

[22] This pilot program will not be evaluated until PY2013.

Table C-7. PV/Solar Programs—Data Collection Plan for PY2012 by Utility

Utility	Program	Desk Reviews
AEP TCC	SMART Source Solar PV Pilot MTP–Non-Residential	5
	SMART Source Solar PV Pilot MTP–Residential	5
AEP TNC	SMART Source Solar PV Pilot MTP–Non-Residential	4*
	SMART Source Solar PV Pilot MTP–Residential	6*
El Paso Electric	Solar PV Pilot Program–Residential & Non-Residential	2
Oncor	Non-Residential Solar Photovoltaic Standard Offer Program (SPVSOP)	5
	Residential Solar Photovoltaic Standard Offer Program (SPVSOP)	5
SWEPCO	SMART Source Solar PV Pilot MTP–Residential	2
Total		**34**

*One of the planned five AEP TNC Non-Residential desk reviews was shifted to Residential since there are only four Non-Residential participants in PY2012.

APPENDIX D: COST-EFFECTIVENESS CALCULATIONS

This appendix describes the calculations used for modeling cost-effectiveness. This approach provides the Public Utility Commission of Texas (PUCT) with a consistent methodology for evaluating cost-effectiveness across the utilities.

D.1 APPROACH

The approach to the EM&V team's benefit-cost testing is based on P.U.C. SUBST. R. 25.181, where costs and benefits are defined in section (d):

> "The cost of a program includes the cost of incentives, measurement and verification, any shareholder bonus awarded to the utility, and actual or allocated research and development and administrative costs. The benefits of the program consist of the value of the demand reductions and energy savings, measured in accordance with the avoided costs prescribed in this subsection. The present value of the program benefits shall be calculated over the projected life of the measures installed or implemented under the program."

This description is consistent with the Program Administrator Cost Test (PACT). Based on this definition, we collected the costs reported in the utilities' 2013 Energy Efficiency Plan and Reports (EEPRs), filed between March 29, 2013, and June 4, 2013.[23] The program benefits must be calculated at a measure level in order to apply individual effective useful lives (EULs). Therefore, the savings were derived from the EM&V Database, which is a comprehensive, centralized source of the utilities' program tracking data.

The EULs were primarily taken from program tracking data provided by Frontier Associates; in cases where a measure was not accounted for, the evaluation team has recommended a placeholder value. In addition, some programs were not tracked at a sufficient level of detail to allow the EM&V team to apply an EUL to a measure. In these situations, we calculated a weighted average EUL from the project files that were sampled for desk reviews. These additional EULs are documented below in Table D-1.

Table D-1. Average Effective Useful Lives for Non-specific Tracked Measures

Measure Description	EUL	Source	Notes
Lighting Retrofit	13.43	Oncor Tracking Data	This accounts for the blend of lighting technologies—Oncor tracked measure life along with each installation.
Lighting New Construction	15	Oncor Tracking Data	This accounts for the blend of lighting technologies—Oncor tracked measure life along with each installation.
Boiler	20	DEER (2008)	
Compressed Air	10	Efficiency VT TRM	

[23] PUCT filing number 41196.

Measure Description	EUL	Source	Notes
Air Infiltration	11	DEER (2008)	
Other/Custom	10	Default Value	
Water Heater Measures	7	Weighted average of detailed Res water heater measures	For the Res sector, this is a blended average of the water heater measures tracked at enough detail to identify a EUL.
Water Heater Measures	8.75	Weighted average of detailed HTR water heater measures	For the HTR sector, this is a blended average of the water heater measures tracked at enough detail to identify a EUL.
Roofing Worksheet	17	kWh weighted average of nonresidential cool roof and roof insulation	
CARE$ Placeholder	16.5	Average measure life from SWEPCO CARE$ program	AEP TCC and TNC did not have tracking data in time for interim results; applied SWEPCO average EUL to TCC and TNC total savings.
Energy Wise Kits	4	CenterPoint LivingWise® Report	
LivingWise Kits	8	El Paso LivingWise Performance Status Report	
Screw-in LED	15	GDS (2007)	

The present value of the benefits is calculated separately for energy and demand as follows:

$$PV = \frac{AC}{WACC - E}\left[1 - \left(\frac{1+E}{1+WACC}\right)^{n}\right]$$

Where:

AC is the avoided cost of the benefit (energy or demand)

The discount rate, *WACC*, is the utility's weighted average cost of capital

E is the escalation rate

n is the effective useful life of the measure.

This calculation was modified from the original evaluation plan in order to allow for including an escalation rate. The evaluation team has provided results for benefit-cost calculation using an escalation rate of 2 percent and without an escalation rate.

The benefit-cost ratio is calculated as:

$$BC = \frac{PV_e + PV_d}{C}$$

Where:

PV_e is the present value of the avoided energy costs

PV_d is the present value of the avoided demand costs

C is the total program cost, including incentives, administrative, evaluation, measurement, and verification, shareholder bonus, and research and development costs.

Some costs are reported by the utilities at the portfolio level, such as research and development and shareholder bonus costs. These costs are attributed to individual programs based on each program's incentive costs as a percentage of the portfolio. Evaluation, Measurement, and Verification (EM&V) costs were previously distributed among utility programs by the evaluation team based on programs' share of energy savings and evaluation priority.

D.1.1 Savings-to-Investment Ratio

Targeted low-income energy efficiency programs are run by all unbundled transmission and distribution utilities. These programs are evaluated using the Savings-to-Investment Ratio (SIR) rather than the PACT described above.

The SIR is significantly different in both the benefits and costs included. The benefits are comprised of the customer's avoided energy costs. This means that the retail electric rate is used rather than the utility's avoided cost, and there is no cost associated with avoided demand. Rather than the weighted average cost of capital, the SIR uses a societal discount rate of 3 percent. The only costs included are the incentives paid to the weatherization agencies.

The following table lists the average retail rates paid by customers. These rates are based on data collected by Frontier Associates through weatherization agencies.

Table D-2. Average Energy Cost by Utility

Utility	Average kWh Rate
AEP TCC	$0.1060
AEP TNC	$0.1060
CenterPoint	$0.1285
Oncor	$0.1206
SWEPCO	$0.1330
TNMP	$0.1200
Xcel SPS	$0.1100

APPENDIX E: QA/QC PROTOCOLS

This appendix documents the quality assurance (QA) protocols established for the PUCT EM&V team for reporting claimed and evaluated impacts. Although quality control is a function of all evaluation stages (e.g., populating the EM&V database, sampling, analysis), this appendix focuses on the QA processes within the reporting stage. A Quality Assurance team (QA team), which will be led by the Tetra Tech EM&V data lead, will be developed and accountable for ensuring all QA protocols are being followed.

Below we summarize the specific activities that will be subject to quality assurance and processes. Note that these QA processes focus on accuracy of data; this section does not address methodological issues.

Accuracy of ex-ante program data. The EM&V team is housing data, analysis, and reporting functions within the EM&V Database. Data will be provided by program implementers, read into the database in raw form, and organized for analysis. The database centrally stores the claimed (ex-ante) savings, which will be used for sampling and reporting of those claimed savings. Data will be provided to the EM&V team quarterly. The EM&V team will characterize the data received in terms of energy and demand savings and participants served and report the information within the detailed research plans. These detailed research plans will be delivered to the utilities for review and confirmation that the population data is accurate. Inaccurate population data may indicate missing data, errors in the data importation process, or misunderstanding of the data fields.

- Responsibility: Program leads
- Accountability: QA team
- Consulted: Utility staff and implementation contractors and EM&V Project Manager.

Application of verification rates and net-to-gross ratios. The impacts will be generated in the EM&V database. The database will categorize measure-level information in the format it was provided to the EM&V team per the data acquisition process. Although projects may be sampled and verified at the measure level, the EM&V team will conduct impact evaluations to obtain and report verification and net-to-gross estimates at the utility and program type level, which will then be aggregated and reported at the program group level.

These impact estimates will be provided by the program leads and stored in two locations. First, the program leads will enter the impact results within an Excel tracking sheet stored on the SharePoint site. The Excel tracking sheet will include the following fields: program year, utility, program group, program type, measure group, program lead, verification rate, net-to-gross ratio, report source of verification rate, report source of net-to-gross ratio, and modification date. *Only one sheet will maintain current impact information.* Should data be updated throughout the process, the outdated records will be moved to a separate worksheet within that file. Doing so will ensure one sheet will maintain the correct rates, and that any modifications are documented including reason for modification.

Second, the EM&V database will include an interface where program leads will directly enter their impact results. These results will then be stored and applied against the claimed savings to calculate the evaluated gross and evaluated net results for the annual reporting.

By creating a two-staged impact reporting process, the EM&V team builds into the process a point of verification of the data. The evaluated and net savings results will be directly calculated out of the EM&V database using the rates supplied within the web interface. The EM&V team will then verify that the results are as expected using the values documented within the Excel impact reporting file. Should the results differ, the Quality Assurance team will be able to go refer to the original source to verify the results.

- Responsibility: Program leads
- Accountability: QA team
- Consulted: Impact leads, EM&V database lead, and Project Manager.

Accuracy of reported savings. As documented within the report outline, program impacts will be aggregated and reported in various ways. At the most aggregate level, the data will be reported by program group overall and then by utility. At the most granular level, the data will be reported by program group for each utility. The annual report will therefore represent impacts within over 100 tables. It will be critical to spend considerable time providing QA against those reported values.

The EM&V database will calculate the full year claimed savings by utility, program type and program group. Although claimed savings will be documented in quarterly detailed research plans, adjustments made in claimed savings are likely to occur throughout the year. Therefore, it will be necessary to calculate the full program year claimed savings and verify our results against the utility claimed data, which will be reported to the commission. The EM&V team will request that the utilities provide their draft claimed savings to verify against the reported claimed savings within the EM&V database. Any differences in the evaluation and utility claimed savings will be clearly documented within the report.

All results tables will be cross-referenced to ensure the results true-up and are consistent with each other. For example, the sum of all Residential MTPs evaluated net savings documented within the utility-specific sections should equal the Residential MTP results captured in Volume I. The QA team will develop a checklist of tables to be cross-checked and against which sources, and will systematically go through this checklist throughout the report proofing process.

Although not a specific QA function, the team's development of these reporting functions with the overarching goal of ensuring transparency will inherently allow for ad hoc QA checks by the PUCT, utilities, implementation contractors, or other interested parties. For example, the EM&V database can export results and resulting calculations within easy-to-use Excel files. In addition, impact-related reports will tie back to results clearly for secondary review.

- Responsibility: Utilities (for providing claimed savings) and program leads (for verifying claimed impacts provided)
- Accountability: QA team (for final review and cross-checks of impact tables)
- Consulted: Impact leads, EM&V Database lead, utilities, and Project Manager.