

Public Utility Commission of Texas

Annual Statewide Portfolio Report for Program Year 2016—Volume II

Project Number 46302



September 1, 2017



TETRA TECH

6410 Enterprise Lane, Suite 300 | Madison, WI 53719
Tel 608.316.3700 | Fax 608.661.5181

tetratech.com

TABLE OF CONTENTS

1.0 IMPACT EVALUATION RESULTS—AMERICAN ELECTRIC POWER TEXAS CENTRAL COMPANY	11
1.1 Key Findings	11
1.1.1 Evaluated Savings.....	11
1.1.2 Cost-Effectiveness Results.....	12
1.2 Detailed Findings—Commercial (High/Medium Evaluation Priority)	14
1.2.1 Commercial Standard Offer Program	14
1.2.2 Commercial Market Transformation.....	16
1.3 Detailed Findings—Residential (High/Medium Priority Evaluation).....	19
1.3.1 CoolSaver A/C Tune-Up Market Transformation Program (Residential)	19
1.4 Detailed Findings—Load Management (High/Medium Priority Evaluation)	20
1.4.1 Load Management Standard Offer Program.....	20
1.4.2 Earth Networks Residential Demand Response Pilot Market Transformation Program ...	21
1.4.3 Reliant Residential Demand Response Pilot Market Transformation Program.....	22
1.5 Summary of Low Priority Evaluation Programs	22
2.0 IMPACT EVALUATION RESULTS—AMERICAN ELECTRIC POWER TEXAS NORTH COMPANY	24
2.1 Key Findings	24
2.1.1 Evaluated Savings.....	24
2.1.2 Cost-Effectiveness Results.....	25
2.2 Detailed Findings—Commercial (high/Medium Evaluation Priority)	27
2.2.1 Commercial Standard Offer Program	27
2.2.2 Commercial Market Transformation Program	28
2.3 Detailed Findings—Load Management (High/Medium Evaluation Priority)	29
2.3.1 Load Management Standard Offer Program.....	29
2.3.2 Earth Networks Residential Demand Response Program.....	30
2.4 Summary of Low Priority Evaluation Programs	31
3.0 IMPACT EVALUATION RESULTS—CENTERPOINT ENERGY HOUSTON ELECTRIC, LLC	33
3.1 Key Findings	33
3.1.1 Evaluated Savings.....	33
3.1.2 Cost-Effectiveness Results.....	34
3.2 Detailed Findings—Commercial (High/Medium Evaluation Priority)	36
3.2.1 Large Commercial Standard Offer Program	36

3.2.2 Commercial Market Transformation Program	36
3.2.3 Retail Electric Provider (Commercial)	38
3.3 Detailed Findings—Residential (Medium Evaluation Priority)	39
3.3.1 Retail Electric Provider	39
3.4 Detailed Findings—Load Management (High/Medium Evaluation Priority)	41
3.4.1 Large Commercial Load Management Standard Offer Program	41
3.4.2 Residential Demand Response Program.....	42
3.5 Detailed Findings—Pilots (High/Medium Evaluation Priority).....	43
3.5.1 Pool Pump Pilot Program (Commercial)	43
3.5.2 Pool Pump Pilot Program (Residential)	45
3.5.3 Data Centers Pilot	49
3.6 Summary of Low Priority Evaluation Programs	49
4.0 IMPACT EVALUATION RESULTS—EL PASO ELECTRIC COMPANY.....	52
4.1 Key Findings	52
4.1.1 Evaluated Savings.....	52
4.1.2 Cost-Effectiveness Results.....	53
4.2 Detailed Findings—Commercial (Medium Evaluation Priority).....	54
4.2.1 Commercial Standard Offer Program	54
4.2.2 Commercial Market Transformation Programs	55
4.3 Detailed Findings—Load Management (Medium Evaluation Priority)	59
4.3.1 Load Management Standard Offer Program.....	59
4.4 Summary of Low Priority Evaluation Programs	60
5.0 IMPACT EVALUATION RESULTS—ENTERGY TEXAS, INC.	62
5.1 Key Findings	62
5.1.1 Evaluated Savings.....	62
5.1.2 Cost-Effectiveness Results.....	63
5.2 Detailed Findings—Commercial (High/Medium Evaluation Priority)	64
5.2.1 Commercial Market Transformation Programs	64
5.3 Detailed Findings—Load Management (high/medium evaluation priority)	65
5.3.1 Load Management Standard Offer Program.....	65
5.4 Summary of Low Priority Evaluation Programs	66
6.0 IMPACT EVALUATION RESULTS—ONCOR.....	68
6.1 Key Findings	68
6.1.1 Evaluated Savings.....	68
6.1.2 Cost-Effectiveness Results.....	69

6.2 Detailed Findings—Commercial (High/Medium Evaluation Priority)	71
6.2.1 Commercial Standard Offer	71
6.3 Detailed Findings—Load Management (High/Medium Evaluation Priority)	72
6.3.1 Commercial Load Management Standard Offer Program	72
6.4 Detailed Findings—Pilot (High/Medium Evaluation Priority)	73
6.4.1 Residential Demand Response Pilot	73
6.5 Summary of Low Priority Evaluation Programs	74
7.0 IMPACT EVALUATION RESULTS—SHARYLAND	76
7.1 Key Findings	76
7.1.1 Evaluated Savings.....	76
7.1.2 Cost-Effectiveness Results.....	77
7.2 Detailed Findings—Commercial (High/Medium Evaluation Priority)	78
7.2.1 Open for Small/Medium Business Market Transformation Program.....	78
7.2.2 Customized Commercial Market Transformation Program	79
7.3 Summary of Low Priority Evaluation Programs	80
8.0 IMPACT EVALUATION RESULTS—SOUTHWESTERN ELECTRIC POWER COMPANY	82
8.1 Key Findings	82
8.1.1 Evaluated Savings.....	82
8.1.2 Cost-Effectiveness Results.....	83
8.2 Detailed Findings—Commercial (High/Medium Evaluation Priority)	84
8.2.1 Commercial Standard Offer Program	84
8.2.2 Commercial Market Transformation Programs	85
8.3 Detailed Findings—Load Management (High/Medium Evaluation Priority)	86
8.3.1 Load Management Standard Offer Program	86
8.4 Summary of Low Priority Evaluation Programs	87
9.0 IMPACT EVALUATION RESULTS—TEXAS NEW MEXICO POWER COMPANY	89
9.1 Key Findings	89
9.1.1 Evaluated Savings.....	89
9.1.2 Cost-Effectiveness Results.....	90
9.2 Detailed Findings—Commercial (High/Medium Evaluation Priority)	92
9.2.1 Commercial Solutions Market Transformation Program.....	92
9.2.2 SCORE/CitySmart Market Transformation Program	92
9.3 Detailed Findings—Load Management (High/Medium Evaluation Priority)	93
9.3.1 Load Management Standard Offer Program	93
9.4 Summary of Low Priority Evaluation Programs	94

10.0 IMPACT EVALUATION RESULTS—XCEL ENERGY SOUTHWESTERN PUBLIC SERVICE COMPANY 96

- 10.1 Key Findings 96
 - 10.1.1 Evaluated Savings..... 96
 - 10.1.2 Cost-Effectiveness Results..... 97
- 10.2 Detailed Findings—Commercial (High/Medium Evaluation Priority)..... 98
 - 10.2.1 Commercial Standard Offer Program 98
- 10.3 Detailed Findings—Load Management (High/Medium Evaluation Priority) 101
 - 10.3.1 Load Management Standard Offer Program..... 101
- 10.4 Summary of Low Priority Evaluation Programs 102

LIST OF TABLES

- Table 1-1. AEP TCC PY2016 Claimed and Evaluated Demand Savings 11
- Table 1-2. AEP TCC PY2016 Claimed and Evaluated Energy Savings 12
- Table 1-3. AEP TCC Cost-effectiveness Results 13
- Table 1-4. PY2016 Claimed Savings (Low Evaluation Priority Programs) 23
- Table 2-1. AEP TNC PY2016 Claimed and Evaluated Demand Savings 24
- Table 2-2. AEP TNC PY2016 Claimed and Evaluated Energy Savings 25
- Table 2-3. AEP TNC Cost-Effectiveness Results 26
- Table 2-4. PY2016 Claimed Savings (Low Evaluation Priority Programs) 32
- Table 4-1. CenterPoint PY2016 Claimed and Evaluated Demand Savings 33
- Table 4-2. CenterPoint PY2016 Claimed and Evaluated Energy Savings 34
- Table 4-3. CenterPoint Cost-Effectiveness Results..... 35
- Table 4-4. PY2016 Claimed Savings (Low Evaluation Priority Programs) 51
- Table 4-1. El Paso Electric PY2016 Claimed and Evaluated Demand Savings 52
- Table 4-2. El Paso Electric PY2016 Claimed and Evaluated Energy Savings 53
- Table 4-3. El Paso Electric Cost-Effectiveness Results..... 54
- Table 4-4. PY2016 Claimed Savings (Low Evaluation Priority Programs) 61
- Table 5-1. Entergy Program Year 2016 Claimed and Evaluated Demand Savings 62
- Table 5-2. Entergy Program Year 2016 Claimed and Evaluated Energy Savings 63
- Table 5-3. Entergy Cost-Effectiveness Results 63

Table 5-4. PY2016 Claimed Savings (Low Evaluation Priority Programs)	67
Table 6-1. Oncor PY2016 Claimed and Evaluated Demand Savings	68
Table 6-2. Oncor PY2016 Claimed and Evaluated Energy Savings	69
Table 6-3. Oncor Cost-Effectiveness Results.....	70
Table 6-4. PY2016 Claimed Savings (Low Evaluation Priority Programs)	75
Table 7-1. Sharyland PY2016 Claimed and Evaluated Demand Savings.....	76
Table 7-2. Sharyland PY2016 Claimed and Evaluated Energy Savings.....	77
Table 7-3. Sharyland Cost-Effectiveness Results	78
Table 7-4. PY2016 Claimed Savings (Low Evaluation Priority Programs)	81
Table 8-1. SWEPCO Program Year 2016 Claimed and Evaluated Demand Savings.....	82
Table 8-2. SWEPCO Program Year 2016 Claimed and Evaluated Energy Savings	83
Table 8-3. SWEPCO Cost-effectiveness Results	84
Table 8-4. PY2016 Claimed Savings (Low Evaluation Priority Programs)	88
Table 4-1. TNMP PY2016 Claimed and Evaluated Demand Savings.....	89
Table 4-2. TNMP PY2016 Claimed and Evaluated Energy Savings.....	90
Table 4-3. TNMP Cost-Effectiveness Results	91
Table 9-4. TNMP PY2016 Claimed Savings (Low Evaluation Priority Programs)	95
Table 10-1. Xcel SPS PY2016 Claimed and Evaluated Demand Savings.....	96
Table 10-2. Xcel SPS PY2016 Claimed and Evaluated Energy Savings	97
Table 10-3. Xcel SPS Cost-Effectiveness Results	98
Table 10-4. PY2016 Claimed Savings (Low Evaluation Priority Programs)	104

ACKNOWLEDGEMENTS

We would like to acknowledge the many individuals who contributed to the Evaluation, Measurement, and Verification (EM&V) of Program Year 2016. This evaluation effort would not have been possible without their assistance and support.

Public Utility Commission of Texas and electric utility staff provided input throughout the evaluation processes. The following individuals participated in ongoing evaluation deliverable reviews and discussions, attended multiple meetings, and responded to follow-up questions and program data and documentation requests:

- Public Utility Commission of Texas: Katie Rich and Therese Harris
- American Electric Power Texas: Pam Osterloh, Robert Cavazos and Russell Bego
- CenterPoint: Cheryl Bowman, John Durland and Stephen Bezecny
- El Paso Electric: Susanne Stone and Araceli Perea
- Entergy: Kelley Carson
- Oncor: Mike Baker, Prachi Gupta, Garry Jones, Joseph Nixon and Mike Stockard
- Sharyland: Bridget Headrick and Alicia Rigler
- SWEPCO: Debra Miller and Paul Pratt
- TNMP: Stefani Case and Ashley Mitchell
- Xcel SPS: Jeremy Lovelady, Derek Shockley and Bryan Whitson.

We also wish to thank staff at the following utility consulting firms who provided program data and documentation and insight into program implementation: CLEARResult, Ecova, Frontier Associates, ICF International, Nexant, Resource Action Programs, and Willdan Energy Solutions.

EM&V team primary report contributors include:

Firm	Contributor	Role
Tetra Tech	Lark Lee	Overall project manager and technical reviewer
	Dan Belknap	Cost-Effectiveness testing, Data and Reporting Lead
	Rich Hasselman	Load management programs and Solar projects
	Kim Baslock, Kendra Scott and Chris King	Nonresidential programs
	Eric Rambo and Josh Verbeten	Sampling and Analysis

Please send any questions or comments on the report to Katie Rich (katie.rich@puc.gov.tx) and Lark Lee (lark.lee@tetrattech.com).

ACRONYMS/ABBREVIATIONS/DEFINITIONS

Acronyms/Abbreviations	Definition
AC	Air conditioner
AEP TCC	American Electric Power Texas Central Company
AEP TNC	American Electric Power Texas North Company
CF	Coincidence factor
C&I	Commercial and industrial
CMTF	Commercial Market Transformation Program
CNP	CenterPoint Energy Houston Electric, LLC
CSOP	Commercial Standard Offer Program
DHP	Ductless heat pump
DI	Direct install
ECM	Energy conservation measure
EECRF	Energy Efficiency Cost Recovery Factor
EEIP	Energy Efficiency Implementation Project
EEPR	Energy Efficiency Plan and Report
EESP	Energy efficiency service provider
EISA	Energy Independence and Security Act of 2007
Entergy	Entergy Texas, Inc.
EPE	El Paso Electric Company
ER	Early replacement
ERCOT	Electric Reliability Council of Texas
ERS	Emergency Response Service
ESCO	Energy service company
ESIID	Electric Service Identifier ID
ESNH	ENERGY STAR® New Homes
EM&V	Evaluation, measurement, and verification
EUMMOT	Electric Utility Marketing Managers of Texas
GSHP	Ground-source heat pump
HCIF	Heating/cooling interactive factor
HOU	Hours of use
HPwES	Home Performance with ENERGY STAR®
HTR	Hard-to-reach
HVAC	Heating, ventilation, and air conditioning

Acronyms/Abbreviations	Definition
IECC	International Energy Conservation Code
IPMVP	International Performance Measurement and Verification Protocol
kW	Kilowatt
kWh	Kilowatt hour
LED	Light emitting diode
LI	Low-income
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
PV	Photovoltaics
PY	Program Year
QA/QC	Quality assurance/quality control
RCx	Retro-commissioning
RFP	Request For Proposals
RMTP	Residential Market Transformation Program
ROB	Replace-on-burnout
RSOP	Residential Standard Offer Program
Sharyland	Sharyland Utilities, L.P.
SIR	Savings-to-investment ratio
SOP	Standard offer program
SRA	Self-report approach
SWEPCO	Southwestern Electric Power Company
TMY	Typical meteorological year
TNMP	Texas New Mexico Power Company
TRM	Technical Reference Manual
WACC	Weighted average cost of capital
Xcel SPS	Southwestern Public Service Company (subsidiary of Xcel Energy)

1.0 IMPACT EVALUATION RESULTS—AMERICAN ELECTRIC POWER TEXAS CENTRAL COMPANY

This section presents the evaluated savings and cost-effectiveness results for AEP TCC’s energy efficiency portfolio. The key findings are summarized first, followed by details for each program in the portfolio that had a high or medium evaluation priority. Finally, a list of the low evaluation priority for which claimed savings were verified through the EM&V database are included.

1.1 KEY FINDINGS

1.1.1 Evaluated Savings

AEP TCC’s evaluated savings for PY2016 were 39,116 in demand (kW) and 66,304,850 in energy (kWh) savings. Both the overall kW and kWh portfolio realization rates were slightly below 100 percent primarily due to differences in evaluated and claimed savings for the residential and commercial CoolSaver programs. The EM&V team is working with AEP TCC and the program implementer to revise the M&V approach for CoolSaver in PY2017 to resolve these savings differences going forward. AEP TCC adjusted sampled Commercial Standard Offer program (SOP) project savings based on evaluation results in their June 1, 2017 filing, which improved realization rates making them closer to 100 percent.

Table 1-1 shows the claimed and evaluated demand savings for AEP TCC’s portfolio and broad customer sector/program categories for PY2016.

Table 1-1. AEP TCC PY2016 Claimed and Evaluated Demand Savings

Level of Analysis	Percent Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Precision at 90% Confidence
Total Portfolio	100.0%	39,321	39,116	99.5%	0.8%
Commercial	18.4%	7,240	6,677	92.2%	4.5%
Residential	20.0%	7,845	7,758	98.9%	0.4%
Low Income	2.0%	780	780	100.0%	0.0%
Load Management	51.5%	20,234	20,223	100.0%	0.0%
Pilot	8.2%	3,222	3,677	114.1%	0.0%

*The residential sector realization rate is based on a census review of deemed measures to verify they were calculated in accordance with the PY2016 TRM 3.1.

** The review for the load management program included a census 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 1-2 shows the claimed and evaluated energy savings for AEP TCC’s portfolio and broad customer sector/program categories for PY2016.

Table 1-2. AEP TCC PY2016 Claimed and Evaluated Energy Savings

Level of Analysis	Percent Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Precision at 90% Confidence
Total Portfolio	100.0%	67,789,605	66,304,850	97.8%	0.7%
Commercial	53.2%	36,075,902	34,844,390	96.6%	1.4%
Residential	44.3%	30,046,911	29,790,671	99.1%	0.3%
Low Income	2.0%	1,387,550	1,387,550	100.0%	0.0%
Load Management	0.1%	48,673	49,191	101.1%	0.0%
Pilot	0.3%	230,569	233,048	101.1%	0.0%

*The residential sector realization rate is based on a census review of deemed measures to verify they were calculated in accordance with the PY2016 TRM 3.1.

** The review for the load management program included a census 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.

In program-level realization rates, we have also included a program documentation score of good, fair, or limited as discussed in Section 3. For the overall utility program documentation score, the score of “good” was given if 90 percent or more of the evaluated savings estimates received a score of good or fair due to program documentation received as indicated in detailed program findings. A score of “fair” was given if 70 percent to 89 percent of the evaluated savings estimates received a score of good or fair. A score of “limited” was given if less than 70 percent of savings received score of good or fair. In general, a score of “good” indicates the utility has established processes to collect sufficient documentation to verify savings; a score of “fair” also indicates established processes with some areas of improvements identified; and a score of “limited” indicates program documentation improvements across more individual programs and/or high savings programs have been identified. AEP TCC received a good program documentation score for most programs and a fair documentation score for the Commercial SOP program for PY2016 indicating opportunity for improvement for this program.

1.1.2 Cost-Effectiveness Results

AEP TCC’s overall portfolio had a cost-effectiveness of 2.46, or 2.67 excluding low-income programs.

The most cost-effective program was SCORE/CitySmart. The less cost-effective non-pilot programs were the CoolSaver A/C Tune-Up programs in both the residential and commercial sectors. The Reliant Residential Demand Response (DR) Pilot Market Transformation program (MTP) is not required to pass cost-effectiveness testing as it is in its first year of operation.

Table 1-3. AEP TCC Cost-effectiveness Results

Level of Analysis	Claimed Savings Results	Evaluated Savings Results	Net Savings Results
Total Portfolio	2.48	2.45	2.09
Total Portfolio excluding low-income programs	2.69	2.65	2.25
Commercial	3.01	2.95	2.54
Commercial Solutions MTP	3.29	3.29	2.79
Commercial SOP	3.35	3.35	2.68
CoolSaver A/C Tune-Up MTP	1.45	0.92	0.74
Open MTP	1.71	1.71	1.54
SCORE/CitySmart MTP	4.22	4.22	3.92
SMART Source Solar PV MTP	2.83	2.83	2.85
Residential	2.54	2.53	2.09
CoolSaver A/C Tune-Up MTP	1.05	0.97	0.78
High Performance New Homes MTP	1.54	1.54	1.08
Residential SOP	3.32	3.32	2.59
SMART Source Solar PV MTP	1.48	1.48	1.42
Hard-to-Reach SOP	2.40	2.40	2.40
Low Income*	1.62	1.62	1.62
Targeted Low-Income Energy Efficiency Program*	1.62	1.62	1.62
Load Management	1.85	1.85	1.85
Load Management SOP	1.85	1.85	1.85
Pilot	1.19	1.30	1.25
Earth Networks Residential DR Pilot MTP	1.28	1.46	1.46
Efficiency Connection Pilot MTP	1.16	1.16	1.05
Reliant Residential DR Pilot MTP	0.46	0.47	0.47

* The Low-Income sector and Low Income Weatherization program are evaluated using the savings-to-investment ratio (SIR).

1.2 DETAILED FINDINGS—COMMERCIAL (HIGH/MEDIUM EVALUATION PRIORITY)

1.2.1 Commercial Standard Offer Program

Program Contribution To Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution to Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Program Documentation Score
5.5%	2,161	2,160	100.0%	21.6%	14,664,215	14,657,837	100.0%	Fair

Completed Desk Reviews*	On-Site M&V
10	5

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

The PY2016 Commercial SOP evaluation efforts focused on desk reviews and on-site M&V. The sample of completed desk reviews and on-site M&V projects for this program are listed above.

The EM&V team made an adjustment to the claimed savings for eight projects. One project had an adjustment of less than one percent and seven had an adjustment of greater than five percent and further details are provided below. AEP TCC made adjustments in claimed savings for the seven projects summarized below, thereby improving the realization rate to one hundred percent.

Details on the project specific savings adjustments are listed below by Project ID:

Project ID # 955016: The energy efficiency project involved a lighting retrofit of the exterior areas of a car dealership. During the desk review and on-site M&V visit, the EM&V team found two discrepancies between the pre-retrofit fixture wattages used in the ex-ante calculator and the photo documentation provided. The wall packs had claimed an existing wattage of 1000 watts, however, the photo documentation indicated these were only 100 watts. Similarly, the back lot pole lights had claimed an existing wattage of 1000 watts, however, the photo documentation indicated these were only 400 watts. Based on these results, the adjustments made by the EM&V team decreased energy and peak demand savings by 10 percent.

Project ID # 955019: The energy efficiency project involved an early retirement of two 450-ton centrifugal water-cooled chillers with two high efficiency 450-ton chillers at a hospital. During the desk review, the EM&V team found multiple errors in the ex-ante calculations. First, the photographs indicate the old chillers were manufactured in 1996 and not 1997, which slightly changed the early retirement baseline. Secondly, the provided manufacture's specification sheets for the new chiller indicated that the full load efficiency was 0.552 kW per ton instead of the 0.55 kW per ton used in the ex-ante calculator. Finally, the manufacture's specification sheets indicated the part load efficiency was 0.483 kW per ton and not the claimed 0.474 kW per ton used in the ex-ante calculator. These findings decreased the projects energy saving by 8 percent and decreased peak demand savings by 5 percent. This participant did not receive an on-site M&V visit.

Project ID # 955023: The energy efficiency project involved a new construction lighting and heating, ventilation and air conditioning (HVAC) project at a primary school. During the desk review and on-site M&V visit, the EM&V team corrected multiple assumption reported within the lighting

portion of the projects savings calculations. In particular, several metal halide and CFL fixtures were installed outdoors, yet they were included in the ex-ante calculator as the interior lighting. Interior versus exterior lighting have different lighting power density (LPD) baseline requirements for which the savings are determined. Therefore, the outdoor fixtures were removed from the main calculator and placed into a separate calculator applying an outdoor building code baseline LPD. This adjustment resulted in an increase in savings for the linear fluorescent lighting measures and a decrease in savings associated with the outdoor lighting measures. These updates to the lighting portion of the project savings resulted in an overall 9 percent increase in the evaluated energy savings and a 7 percent increase in the evaluated peak demand savings as compared to the total reported project savings. This participant did not receive an on-site M&V visit.

Project ID # 955051: The energy efficiency project involved a lighting retrofit of the exterior areas of a lodging facility. During the desk review, the EM&V team found a discrepancy between the project documentation and the savings claimed in the tracking data. One of the line items for exterior lighting within the ex-ante calculator that was described as a Light Emitting Diode (LED) measure, was found missing from the tracking data for this project. The error was confirmed with the utility. Including this line item in the ex-post results resulted in increased energy savings by 5 percent and increased peak demand savings by 6 percent. This participant did not receive an on-site M&V visit.

Project ID # 955096: The energy efficiency project involved an early retirement of three 200-ton air-cooled chillers with two high efficiency 300-ton water-cooled chillers at a large office facility. During the desk review and on-site M&V visit, the EM&V team found multiple errors in the ex-ante calculations. First, the serial number for the old chillers indicated they were manufactured in 1998 and not 2001, which slightly changed the early retirement baseline. Secondly, the provided manufacture's specification sheets for the new chillers indicated that the full load efficiency was 0.509 kW per ton instead of the 0.5 kW per ton used in the ex-ante calculator. Finally, the manufacture's specification sheets indicated the part load efficiency was 0.328 kW per ton and not the claimed 0.4 kW per ton used in the ex-ante calculator. These findings decreased the projects energy saving by 14 percent and decreased peak demand savings by 36 percent. This participant did not receive an on-site M&V visit.

Project ID # 955113: The energy efficiency project involved a new construction lighting installation within the interior and exterior areas of a car dealership. The project also included a small number of non-qualifying LEDs. During the desk review and on-site M&V visit, the EM&V team found several wattage errors and a few quantity differences as compared to reported. First, there were four line items in the ex-ante calculator's inventory whose fixture wattages did not match the DLC certification or specification sheets. Secondly, there were seven line items of new fixtures that were not DLC certified and the claimed savings did not correctly adjusted these non-qualifying LEDs so their demand energy reduction is not included as part of the LPD or energy savings calculations. The EM&V Team adjusted the non-qualified fixtures to include a five times multiplier per the EM&V Teams guidance in the "Non-qualifying LEDs guidance memo final 7 17 2015." In addition to the discrepancies noted by the desk review, the on-site inspection confirmed minor quantity differences for three line items that found overall seven less fixtures installed as compared to reported. Based on these results, the adjustments made by the EM&V team decreased the projects energy savings by 7 percent and decreased peak demand savings by 5 percent.

Project ID # 955117: The energy efficiency project involved a lighting retrofit within the interior and exterior areas of a manufacturing facility. During the desk review, the EM&V team found the lighting retrofits took place within multiple facilities. Also, for most of the buildings included in the

project, the project documentation indicated the retrofits took place in only office areas and not manufacturing spaces. Therefore, the predominant building type for the indoor lighting was adjusted to be in line with “offices” as compared to the “manufacturing” building type that was claimed. This adjusted the deemed hours of use and summer peak coincidence factors from 5,740/73 percent for manufacturing to 3,737/77 percent for office. These findings reduced the projects energy savings by 10 percent and increased demand savings by 1 percent. This participant did not receive an on-site M&V visit.

The EM&V team was able to verify key inputs and assumptions that went into the savings calculations for these projects, including equipment quantities and equipment specifications (e.g., wattages, efficiencies) for six of the ten projects that had desk reviews completed because sufficient documentation was provided for the sites. A documentation score of 87 percent was assessed for the program, as partial documentation was provided for four projects and was limited in specific areas. In particular, all four of the projects found with limited documentation were lighting based projects.

Most project documentation included a pre and post inspection calculator, material invoices, and equipment specification sheets which are significant efforts by the utility to verify equipment conditions and quantities. However, many of the material invoices provided did not include full make and model information and quantities were not always clearly marked. For example, one large lighting project included an invoice with counts of "cartons" rather than fixture quantities. In addition, one lighting project site included multiple facilities in one ex-ante calculator. A separate calculator should have been developed for each building that took into account the buildings specific space usage areas and project details especially as the EM&V team found the building types were different from one another. Also, the material invoice included all fixture quantities and were not separated for each building.

The EM&V team recommends that for projects with multiple facilities or site locations, invoices should be collected that describe the lighting details separately to best reflect and support the quantities and types installed for each. Complete documentation enhances the accuracy and transparency of project savings along with ease of evaluation. Since sufficient documentation was provided for greater than 70 percent, but less than 90 percent of the sampled projects, the EM&V team assigned a program documentation score of Fair.

1.2.2 Commercial Market Transformation

1.2.2.1 Commercial Solutions Market Transformation Program

Program Contribution To Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution to Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Program Documentation Score
1.8%	712	712	100.0%	5.8%	3,930,677	3,930,677	100.0%	Good

Completed Desk Reviews*	On-Site M&V
2	1

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

The PY2016 Commercial Solutions MTP evaluation efforts focused on desk reviews and on-site M&V. The sample of completed desk reviews and on-site M&V projects for this program are listed above.

The EM&V team made no adjustments to any of the savings calculations for the projects reviewed. Therefore, evaluated savings were equal to the claimed savings, with realization rates for both kW and kWh equaling 100 percent.

The EM&V team was able to verify key inputs and assumptions that went into the savings calculations for these projects, including equipment quantities and equipment specifications (e.g., wattages, efficiencies) for two of the two projects that had desk reviews completed because sufficient documentation was provided. Since sufficient documentation was provided for 100 percent of the sampled projects, the program documentation score for these estimates is Good.

1.2.2.2 SCORE/CitySmart Market Transformation Program

Program Contribution To Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution to Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Program Documentation Score
4.6%	1,820	1,816	99.8%	15.2%	10,287,798	10,267,861	99.8%	Good

Completed Desk Reviews*	On-Site M&V
2	1

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

The PY2016 SCORE/CitySmart MTP evaluation efforts focused on desk reviews and on-site M&V. The sample of completed desk reviews and on-site M&V projects for this program are listed above.

The EM&V team made an adjustment to the claimed savings for one project. This project had an adjustment of less than two percent. Therefore, evaluated savings overall were not significantly impacted and nearly equal to the claimed savings, with realization rates for both kW and kWh equaling 100 percent.

The EM&V team was able to verify key inputs and assumptions that went into the savings calculations for these projects, including equipment quantities and equipment specifications (e.g., wattages, efficiencies) for two of the two projects that had desk reviews completed because sufficient documentation was provided. Since sufficient documentation was provided for 100 percent of the sampled projects, the program documentation score for these estimates is Good.

1.2.2.3 CoolSaver A/C Tune-Up Market Transformation Program (Commercial)

Program Contribution To Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution to Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Program Documentation Score
3.8%	1,487	929	62.5%	4.9%	3,325,045	2,119,848	63.8%	Good

Completed Desk Reviews*	On-Site M&V
Census Tracking Review	0

The PY2016 CoolSaver program evaluation efforts focused on an engineering review for a census of tune-up measures reported by the program as listed above.

The EM&V team made an adjustment to the claimed savings for all 1,811 tune-up measures. The tune-ups had adjustments of greater than five percent and further details for the tune-up adjustments are provided below by that measure type.

All tune-up measures: A total of 1,811 tune-up measures were reported by the program with reported savings of 1,487 kW and 3,325,045 kWh. During the engineering review of the tune-up measures, the EM&V team confirmed that the program is currently calculating reported savings for tune-up measures using stipulated energy loss factors based on the average Texas and New Mexico statewide M&V results for tune-up measurements collected from PY2011 through PY2015. A review of the PY2015 and PY2016 statewide M&V datasets indicated the efficiency loss factors being calculated for recent years is diverging from the aggregated average since PY2011. This could be due to potential changes in the marketplace (e.g., more efficient units in current year measures, improved accuracy of results from more experienced contractors, new testing tools in use, automation of testing procedures). After initial discussions with the utility and implementer, the EM&V team relied on the pre and post tune-up measurements that were collected as part of the M&V tune-up protocol during PY2015 across the state in Texas to evaluate the efficiency loss factors. The evaluated savings were determined by applying the statewide average efficiency loss factors using the formulas from the CoolSaver Option A EM&V Plan. The EM&V team also found that in PY2015, a large number of commercial tune-ups were completed with unique results as compared to the residential unit tune-ups. Therefore, separate efficiency loss factors were determined for each of the sectors and applied separately to their respective participants. Overall, the evaluated savings, at 929 kW and 2,119,848 kWh, were less than the reported savings. These adjustments resulted in a 36 percent decrease in the evaluated energy savings and a 38 percent decrease in the evaluated peak demand savings as compared to the reported savings for these measures.

The EM&V team reviewed the project level documentation obtained from a sample of four random projects to report qualitative findings across the program on documentation sufficiency. The EM&V team was able to verify key inputs and assumptions (e.g., equipment quantity and specifications, field measurements) and confirmed the data reported in the tracking system matched the information in the project files for four of the four projects that had documentation reviews completed because sufficient documentation was provided for the sites. Since sufficient documentation was provided for 100 percent of the sampled projects, the program documentation for these estimates is Good.

1.3 DETAILED FINDINGS—RESIDENTIAL (HIGH/MEDIUM PRIORITY EVALUATION)

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

Program Contribution To Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution to Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Program Documentation Score
2.6%	1,009	922	91.4%	4.9%	3,317,003	3,060,763	92.3%	Good

Completed Desk Reviews*	On-Site M&V
Census Tracking Review	0

The PY2016 CoolSaver program evaluation efforts focused on an engineering review for a census of tune-up measures reported by the program as listed above.

The EM&V team made an adjustment to the claimed savings for all 1,980 tune-up measures. The tune-ups had adjustments of greater than five percent and further details for the tune-up adjustments are provided below by that measure type.

All tune-up measures: A total of 1,980 tune-up measures were reported by the program with reported savings of 1,009 kW and 3,317,003 kWh. During the engineering review of the tune-up measures, the EM&V team confirmed that the program is currently calculating reported savings for tune-up measures using stipulated energy loss factors based on the average Texas and New Mexico statewide M&V results for tune-up measurements collected from PY2011 through PY2015. A review of the PY2015 and PY2016 statewide M&V datasets indicated the efficiency loss factors being calculated for recent years is diverging from the aggregated average since PY2011. This could be due to potential changes in the marketplace (e.g., more efficient units in current year measures, improved accuracy of results from more experienced contractors, new testing tools in use, automation of testing procedures). After initial discussions with the utility and implementer, the EM&V team relied on the pre and post tune-up measurements that were collected as part of the M&V tune-up protocol during PY2015 across the state in Texas to evaluate the efficiency loss factors. The evaluated savings were determined by applying the statewide average efficiency loss factors using the formulas from the CoolSaver Option A EM&V Plan. The EM&V team also found that in PY2015, a large number of commercial tune-ups were completed with unique results as compared to the residential unit tune-ups. Therefore, separate efficiency loss factors were determined for each of the sectors and applied separately to their respective participants. Overall, the evaluated savings, at 922 kW and 3,060,763 kWh, were less than the reported savings. These adjustments resulted in an 8 percent decrease in the evaluated energy savings and a 9 percent decrease in the evaluated peak demand savings as compared to the reported savings for these measures.

The EM&V team reviewed the project level documentation obtained from a sample of four random projects to report qualitative findings across the program on documentation sufficiency. The EM&V team was able to verify key inputs and assumptions (e.g., equipment quantity and specifications, field measurements) and confirmed the data reported in the tracking system matched the information in the project files for four of the four projects that had documentation reviews completed because sufficient

documentation was provided for the sites. Since sufficient documentation was provided for 100 percent of the sampled projects, the program documentation for these estimates is Good.

1.4 DETAILED FINDINGS—LOAD MANAGEMENT (HIGH/MEDIUM PRIORITY EVALUATION)

1.4.1 Load Management Standard Offer Program

Program Contribution To Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution to Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Program Documentation Score
51.5%	20,234	20,223	100.0%	0.1%	48,673	49,191	101.1%	Good

Completed Desk Reviews*	On-Site M&V

*The review for the load management program included a census 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.

The EM&V team evaluated the PY2016 AEP TCC Load Management Standard Offer Program by applying the TRM calculation methodology to interval meter data. The meter data was supplied in 15 minute increments at the Electric Service Identifier (ESI ID) level. Five load management events occurred during PY2016:

- May 26, 2016 from 3 p.m. to 4p.m.
- June 9, 2016 from 3 p.m. to 4 p.m. for two participating meters
- August 8, 2016 from 1 p.m. to 2 p.m., 3 p.m. to 5 p.m. or 3 p.m. to 6 p.m., with participation times varying depending on the participant option
- August 10, 2016 from 3 p.m. to 6 p.m. or 4 p.m. to 6 p.m., depending on participant option
- September 9, 2016 from 4:30 p.m. to 6 p.m. or 4:30 p.m. to 5 p.m., only used for two meters and the times specific to a single meter.

A total of 62 meters participated in the program, across the events. Using the meter data provided for all participants, the EM&V team applied the TRM methodology to calculate participant level savings and total program savings. The EM&V team found that the participant savings nearly matched the savings reported by TCC in kW, with a minor difference of 10 kW in total, likely driven by aggregate rounding differences. The EM&V team additionally calculated kWh savings which also very closely matched savings reported by TCC, though were slightly higher due to TCC not including the kWh savings of the ½ hour event on September 19th.

Evaluated savings for the AEP TCC Load Management SOP are 20,224 kW and 49,191 kWh. The realization rate for kW is 100 percent and the realization rate for kWh is 101.1percent.

1.4.2 Earth Networks Residential Demand Response Pilot Market Transformation Program

Program Contribution To Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution to Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Program Documentation Score
7.8%	3,084	3,537	114.7%	0.0%	15,419	17,683	114.7%	Good

Completed Desk Reviews*	On-Site M&V

*The review for the load management program included a census 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.

In PY2016, AEP TCC operated a residential demand response pilot program, implemented by Earth Networks. The EM&V team evaluated the pilot program by applying the PY2016 TRM 3.1 calculation (High 3 of 5 baseline) to participant interval meter data. The meter data was supplied in 15 minute increments at the ESI ID level. Two demand response events occurred during PY2016:

- August 8, 2016 from 4 p.m. to 6 p.m., with 2,473 meters
- August 10, 2016 from 3 p.m. to 6 p.m. with 2,471 meters.

Using the meter data provided for all participants, the EM&V team applied the TRM methodology to calculate participant level savings and total program savings. The EM&V team's results showed higher savings than those calculated by Earth Networks. The Earth Networks data and information was comprehensive in terms of explaining results, but the specific methodology for their calculation was unclear, though appears to have been a modification of the TRM High 3 of 5 method. It appears that the Earth Networks calculation applies the High 3 of 5 method to kWh consumption information, then derives the kW impact. The EM&V Team was not able to confirm the details of the Earth Networks calculations, though with a realization rate substantially above 100.0 percent, the Earth Networks method appears to be conservative.

Evaluated savings for the AEP TCC Earth Networks Residential DR Pilot MTP are 3,537 kW and 17,683 kWh. The realization rate for kW is 114.7 percent with the realization rate for kWh also 114.7 percent.

1.4.3 Reliant Residential Demand Response Pilot Market Transformation Program

Program Contribution To Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution to Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Program Documentation Score
0.2%	85	87	102.3%	0.0%	204	418	205.4%	Good

Completed Desk Reviews*	On-Site M&V

*The review for the load management program included a census 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.

In PY2016, AEP TCC operated a residential demand response pilot program, implemented by Reliant. The EM&V team evaluated the pilot program by applying the TRM calculation (High 3 of 5 baseline) to participant interval meter data. The meter data was supplied in 15 minute increments at the ESI ID level. Two demand response events occurred during PY2016:

- August 8, 2016 from 4 p.m. to 6 p.m., with 106 meters
- August 10, 2016 from 3 p.m. to 6 p.m. with 105 meters.

Using the meter data provided for all participants, the EM&V team applied the TRM methodology to calculate participant level savings and total program savings. The EM&V team’s results showed slightly higher savings for kW and substantially higher savings for kWh than those calculated by Reliant. The variance in kW is not significant and Reliant appeared to be following the TRM approach, with rounding differences at the meter level accumulating to drive the difference. The Reliant kWh calculation appears to be have been based on the average kW savings between the two events, rather than the sum of kWh savings across the events. The EM&V team did not further investigate the source of calculation differences due to the close agreement with the kW savings.

Evaluated savings for the AEP TCC Reliant Residential DR Pilot MTP are 87 kW and 418 kWh. The realization rate for kW is 102.5 percent with the realization rate for kWh at 205.4 percent.

1.5 SUMMARY OF LOW PRIORITY EVALUATION PROGRAMS

Table 1-4 provides a summary of claimed savings for AEP TCC’s low evaluation priority programs in PY2016, including programs’ overall contribution to portfolio savings. Low priority programs’ claimed savings were verified against the final PY2016 tracking data provided to the EM&V team for the EM&V database.

Table 1-4. PY2016 Claimed Savings (Low Evaluation Priority Programs)

Program	Contribution to Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Contribution to Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)
Open MTP	1.8%	711	711	100.0%	4.7%	3,194,943	3,194,943	100.0%
SMART Source Solar PV MTP	0.9%	349	349	100.0%	1.0%	673,224	673,224	100.0%
Residential SOP	11.7%	4,590	4,590	100.0%	27.6%	18,680,742	18,680,742	100.0%
Hard-to-Reach SOP	4.0%	1,581	1,581	100.0%	8.6%	5,809,217	5,809,217	100.0%
High Performance New Homes MTP	1.2%	459	459	100.0%	2.7%	1,843,501	1,843,501	100.0%
SMART Source Solar PV MTP	0.5%	206	206	100.0%	0.6%	396,448	396,448	100.0%
Targeted Low-Income Energy Efficiency Program	2.0%	780	780	100.0%	2.0%	1,387,550	1,387,550	100.0%
Efficiency Connection Pilot MTP	0.1%	53	53	100.0%	0.3%	214,947	214,947	100.0%

2.0 IMPACT EVALUATION RESULTS—AMERICAN ELECTRIC POWER TEXAS NORTH COMPANY

This section presents the evaluated savings and cost-effectiveness results for AEP TNC's energy efficiency portfolio. The key findings are summarized first, followed by details for each program in the portfolio that had a high or medium evaluation priority. Finally, a list of the low evaluation priority for which claimed savings were verified through the EM&V database are included.

2.1 KEY FINDINGS

2.1.1 Evaluated Savings

AEP TNC's evaluated savings for PY2016 were slightly more than claimed savings at 6,427 in demand (kW) and 10,814,035 in energy (kWh) savings. The overall kW portfolio realization rate is 101 percent, while the overall kWh portfolio realization rate is 100 percent.

Table 2-1 shows the claimed and evaluated demand savings for AEP TNC's portfolio and broad customer sector/program categories for PY2016.

Table 2-1. AEP TNC PY2016 Claimed and Evaluated Demand Savings

Level of Analysis	Percent Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Precision at 90% Confidence
Total Portfolio	100.0%	6,381	6,417	100.6%	0.3%
Commercial	22.4%	1,427	1,426	100.0%	1.4%
Residential	16.6%	1,061	1,061	100.0%	0.0%
Low Income	1.5%	95	95	100.0%	0.0%
Load Management	52.9%	3,378	3,378	100.0%	0.0%
Pilot	6.6%	421	457	108.6%	0.0%

*The residential sector realization rate is based on a census review of deemed measures to verify they were calculated in accordance with the PY2016 TRM 3.1.

** The review for the load management program included a census 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 2-2 shows the claimed and evaluated energy savings for AEP TNC's portfolio and broad customer sector/program categories for PY2016.

Table 2-2. AEP TNC PY2016 Claimed and Evaluated Energy Savings

Level of Analysis	Percent Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Precision at 90% Confidence
Total Portfolio	100.0%	10,818,500	10,814,035	100.0%	0.3%
Commercial	64.0%	6,925,907	6,921,338	99.9%	0.4%
Residential	32.5%	3,519,481	3,519,481	100.0%	0.0%
Low Income	2.1%	227,901	227,901	100.0%	0.0%
Load Management	0.1%	5,767	5,767	100.0%	0.0%
Pilot	1.3%	139,443	139,548	100.1%	0.0%

*The residential sector realization rate is based on a census review of deemed measures to verify they were calculated in accordance with the PY2016 TRM 3.1.

** The review for the load management program included a census 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.

In program-level realization rates, we have also included a program documentation score of good, fair, or limited as discussed in Section 3. For the overall utility program documentation score, the score of “good” was given if 90 percent or more of the evaluated savings estimates received a score of good or fair due to program documentation received as indicated in detailed program findings. A score of “fair” was given if 70 percent–89 percent of the evaluated savings estimates received a score of good or fair. A score of “limited” was given if less than 70 percent of savings received score of good or fair. In general, a score of “good” indicates the utility has established processes to collect sufficient documentation to verify savings; a score of “fair” also indicates established processes with some areas of improvements identified; and a score of “limited” indicates program documentation improvements across more individual programs and/or high savings programs have been identified. AEP TNC received a good program documentation score for most programs and a fair documentation score for the Commercial Standard Offer program (SOP) program for PY2016.

2.1.2 Cost-Effectiveness Results

AEP TNC’s overall portfolio had a cost-effectiveness of 2.21, or 2.43 excluding low-income programs.

The more cost-effective programs were SCORE/CitySmart Market Transformation program (MTP) and Residential SOP. The less cost-effective programs were Smart SourceSM Residential Solar MTP and Load Management SOP. All of AEP TNC’s programs passed cost effectiveness except for the Efficiency Connection Pilot MTP, which was not required to pass since it is in its first year of operation.

The lifetime cost of PY2016 evaluated savings was \$0.013 per kWh and \$20.93 per kW.

Table 2-3. AEP TNC Cost-Effectiveness Results

Level of Analysis	Claimed Savings Results	Evaluated Savings Results	Net Savings Results
Total Portfolio	2.21	2.21	1.92
Total Portfolio excluding low-income programs	2.43	2.43	2.10
Commercial	2.42	2.42	2.11
Commercial Solutions MTP	2.58	2.57	2.19
Commercial SOP	3.05	3.05	2.45
Open MTP	1.75	1.75	1.57
SCORE/CitySmart MTP	3.31	3.31	3.08
SMART Source Solar PV MTP	1.82	1.82	1.83
Residential	2.68	2.69	2.26
Residential SOP	3.08	3.08	2.40
SMART Source Solar PV MTP	1.33	1.41	1.35
Hard-to-Reach SOP	2.37	2.37	2.37
Low Income*	1.49	1.49	1.49
Targeted Low-Income Energy Efficiency Program*	1.49	1.49	1.49
Load Management	2.17	2.17	2.17
Load Management SOP	2.17	2.17	2.17
Pilot	0.93	0.95	0.88
Earth Networks Residential DR Pilot Program	1.23	1.34	1.34
Efficiency Connection Pilot MTP	0.87	0.87	0.78

* The Low-Income sector and Low Income Weatherization program are evaluated using the savings-to-investment ratio (SIR).

2.2 DETAILED FINDINGS—COMMERCIAL (HIGH/MEDIUM EVALUATION PRIORITY)

2.2.1 Commercial Standard Offer Program

Program Contribution To Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution to Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Program Documentation Score
4.7%	303	303	100.0%	16.1%	1,743,971	1,743,971	100.0%	Fair

Completed Desk Reviews*	On-site M&V
4	2

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

Desk reviews were performed for all sites where on-site M&V was performed to ensure consistency between on-site results and desk review results.

The PY2016 CSOP evaluation efforts focused on desk reviews and on-site M&V. The sample of completed desk reviews and on-site M&V projects for this program are listed above.

The EM&V team made no adjustments to any of the savings calculations for the projects reviewed. Therefore, evaluated savings were equal to the claimed savings, with realization rates for both kW and kWh equaling 100 percent.

The EM&V team was able to verify key inputs and assumptions (e.g., equipment quantity and specifications) for two of the four projects that had desk reviews completed because sufficient documentation was provided for the sites. A documentation score of 88 percent was assessed for the program, as only partial documentation was provided for two multi-measure projects and was limited in only one area. In particular the refrigeration portion of two new construction projects which included Solid and Glass Door Reach-In measures were found lacking clear documentation of the refrigerated case sizes and quantities.

The project files included some key documents such manufacturers equipment specifications, bid drawings, invoices and photos, however these were greatly limited in accuracy and detail. For example, the bid drawings included a list of refrigeration equipment that did not ultimately get installed as manufacture changes were apparent. So while these are key details to gather, they were not representative of the final equipment installed. As another example, one project included an invoice, but the invoice did not detail quantities or make and model information, so this could not be verified to the manufacturers specification sheets provided. Photos for one site were taken, however, they only generally confirmed the equipment size and quantity and nameplate details were not captured. For these types of refrigeration measures, full documentation to support the quantity and volume of the cases is needed. Drawings are a great document to gather, but they should include as-built drawings. If bid drawings are used, then they should be site verified as accurate during a post installation verification walk. Invoices should encompass all equipment purchases and should clearly describe the make, model and quantity information.

Complete documentation enhances the accuracy and transparency of project savings along with ease of evaluation. Since sufficient documentation was provided for greater than 70 percent, but less than 90 percent of the sampled projects, the EM&V team assigned a program documentation score of Fair.

2.2.2 Commercial Market Transformation Program

2.2.2.1 Commercial Solutions Market Transformation Program

Program Contribution To Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution to Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Program Documentation Score
4.6%	294	294	99.8%	20.5%	2,220,044	2,215,475	99.8%	Good

Completed Desk Reviews*	On-site M&V
2	1

*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.

Desk reviews were performed for all sites where on-site M&V was performed to ensure consistency between on-site results and desk review results.

The PY2016 Commercial Solutions MTP evaluation efforts focused on desk reviews and on-site M&V. The sample of completed desk reviews and on-site M&V projects for this program are listed above.

The EM&V team made adjustments to the claimed savings for one project. The project had an adjustment of less than one percent, therefore, it was not recommended that AEP TNC change their claimed savings since the difference was less than five percent. In addition, evaluated savings overall were not significantly impacted and nearly equal to the claimed savings, with realization rates for both kW and kWh equaling 100 percent.

The EM&V team was able to verify key inputs and assumptions that went into the savings calculations for these projects, including equipment quantities and equipment specifications (e.g., wattages, efficiencies) for two of the two projects that had desk reviews completed because sufficient documentation was provided. Since sufficient documentation was provided for 100 percent of the sampled projects, the program documentation score for these estimates is Good.

2.2.2.2 SCORE/CitySmart Market Transformation Program

Program Contribution To Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution to Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Program Documentation Score
6.1%	387	387	100.0%	9.3%	1,001,809	1,001,809	100.0%	Good

Completed Desk Reviews*	On-Site M&V
2	1

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

Desk reviews were performed for all sites where on-site M&V was performed to ensure consistency between on-site results and desk review results.

The PY2016 SCORE/CitySmart MTP evaluation efforts focused on desk reviews and on-site M&V. The sample of completed desk reviews and on-site M&V projects for this program are listed above.

The EM&V team made no adjustments to any of the savings calculations for the projects reviewed. Therefore, evaluated savings were equal to the claimed savings, with realization rates for both kW and kWh equaling 100 percent.

The EM&V team was able to verify key inputs and assumptions that went into the savings calculations for these projects, including equipment quantities and equipment specifications (e.g., wattages, efficiencies) for two of the two projects that had desk reviews completed because sufficient documentation was provided. Since sufficient documentation was provided for 100 percent of the sampled projects, the program documentation score for these estimates is Good.

2.3 DETAILED FINDINGS—LOAD MANAGEMENT (HIGH/MEDIUM EVALUATION PRIORITY)

2.3.1 Load Management Standard Offer Program

Program Contribution To Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution to Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Program Documentation Score
52.9%	3,378	3,378	100.0%	0.1%	5,767	5,767	100.0%	Good

Completed Desk Reviews*	On-Site M&V

*The review for the load management program included a census 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.

The EM&V team evaluated the AEP TNC Load Management Standard Offer Program by applying the TRM calculation method to interval meter data. The meter data was supplied in 15 minute increments at the ESIID level. Three load management events occurred during PY2016. The dates and times were:

- May 26, 2016 from 3 p.m. to 4 p.m. (scheduled)
- August 10, 2016 from 3 p.m. to 6 p.m. or 4 p.m. to 6 p.m. depending on the participant option (unscheduled)
- August 12, 2016 from 3 p.m. to 5 p.m. (unscheduled).

TNC provided the EM&V team interval meter data, site level savings, and total savings for the 18 meters participating in 2016. For calculating kW savings, only unscheduled events are used, while kWh calculations include all the events. The EM&V team found that for the August 10th event, the AEP TNC calculations included the August 8th event as an optional baseline day. The earlier event should have been excluded from the analysis and one eligible day earlier should have been added. The EM&V team’s calculation reflects the exclusion of August 8th and use of one additional baseline day earlier for selecting the highest 5 of 10 eligible days, resulting in slightly higher kW savings for the August 10th event. This was communicated to AEP and savings were adjusted prior to their April 1 EEPR. In all other aspects, the AEP TNC calculations appeared accurate.

2.3.2 Earth Networks Residential Demand Response Program

Program Contribution To Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution to Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Program Documentation Score
6.1%	388	424	109.3%	0.0%	1,166	1,271	109.0%	Good

Completed Desk Reviews*	On-site M&V

*The review for the load management program included a census 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.

In PY2016, AEP TNC operated a residential demand response pilot program, implemented by Earth Networks. The EM&V team evaluated the pilot program by applying the TRM calculation (High 3 of 5 baseline) to participant interval meter data. The meter data was supplied in 15 minute increments at the ESIID level. One demand response events occurred during PY2016:

- August 10, 2016 from 3:00 p.m. to 6:00 p.m. with 324 meters.

Using the meter data provided for all participants, the EM&V team applied the TRM methodology to calculate participant level savings and total program savings. The EM&V team’s results showed higher savings than those calculated by Earth Networks. The Earth Networks data and information was comprehensive in terms of explaining results, but the specific methodology for their calculation was unclear, though appears to have been a modification of the TRM High 3 of 5 method. It appears that the Earth Networks calculation applies the High 3 of 5 method to kWh consumption information, then derives the kW impact. The EM&V Team was not able to confirm the details of the Earth Networks calculations, though with a realization rate substantially above 100.0 percent, the Earth Networks method appears to be conservative.

Evaluated savings for the AEP TNC Earth Networks Residential Demand Response (DR) Pilot MTP are 424 kW and 1,271 kWh. The realization rate for kW is 109.3 percent with the realization rate for kWh at 109.2 percent.

2.4 SUMMARY OF LOW PRIORITY EVALUATION PROGRAMS

Table 1-4 provides a summary of claimed savings for AEP TNC's low evaluation priority programs in PY2016, including programs' overall contribution to portfolio savings. Low priority programs' claimed savings were verified against the final PY2016 tracking data provided to the EM&V team for the EM&V database.

Table 2-4. PY2016 Claimed Savings (Low Evaluation Priority Programs)

Program	Contribution to Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Contribution to Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)
Open MTP	6.0%	382	382	100.0%	17.0%	1,843,603	1,843,603	100.0%
SMART Source Solar PV MTP	0.9%	60	60	100.0%	1.1%	116,480	116,480	100.0%
Residential SOP	11.8%	753	753	100.0%	24.3%	2,632,186	2,632,186	100.0%
Hard-to-Reach SOP	3.6%	230	230	100.0%	6.8%	736,447	736,447	100.0%
SMART Source Solar PV MTP	1.2%	78	88	112.8%	1.4%	150,848	150,848	100.0%
Targeted Low-Income Energy Efficiency Program	1.5%	95	95	100.0%	2.1%	227,901	227,901	100.0%
Efficiency Connection Pilot MTP	0.5%	33	33	100.0%	1.3%	138,277	138,277	100.0%

3.0 IMPACT EVALUATION RESULTS—CENTERPOINT ENERGY HOUSTON ELECTRIC, LLC

This section presents the evaluated savings and cost-effectiveness results for CenterPoint’s energy efficiency portfolio. The key findings are summarized first, followed by details for each program in the portfolio that had a high or medium evaluation priority. Finally, a list of the low evaluation priority for which claimed savings were verified through the EM&V database are included.

3.1 KEY FINDINGS

3.1.1 Evaluated Savings

CenterPoint’s evaluated savings for PY2016 were 168,345 in demand (kW) and 188,389,366 in energy (kWh) savings. Both commercial and residential evaluated savings were lower than claimed savings for the CoolSaver HVAC tune-up measure. The EM&V team is working with CenterPoint and the program implementer to revise the M&V approach for CoolSaver in PY2017 to resolve these savings differences going forward. The overall kW portfolio realization rate is 100 percent as the decreases in demand savings were offset by slightly higher evaluated savings for load management programs, which are almost three quarters of kW savings. The overall portfolio realization rate for kWh is 99 percent. CenterPoint was responsive to all EM&V recommendations to adjust claimed savings based on EM&V results, which also supported healthy realization rates.

Table 4-1 shows the claimed and evaluated demand savings for CenterPoint’s portfolio and broad customer sector/program categories for PY2016.

Table 4-1. CenterPoint PY2016 Claimed and Evaluated Demand Savings

Level of Analysis	Percent Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Precision at 90% Confidence
Total Portfolio	100.0%	167,671	168,750	100.6%	0.4%
Commercial	9.5%	15,891	15,680	98.7%	4.1%
Residential	16.0%	26,909	26,287	97.7%	0.0%
Low Income	1.9%	3,114	3,114	100.0%	0.0%
Load Management	71.7%	120,219	122,131	101.6%	0.0%
Pilot	0.9%	1,538	1,538	100.0%	1.6%

*The residential sector realization rate is based on a census review of deemed measures to verify they were calculated in accordance with the PY2016 TRM 3.1.

** The review for the load management program included a census 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 CenterPoint’s portfolio and broad customer sector/program categories for PY2016.

Table 4-2. CenterPoint PY2016 Claimed and Evaluated Energy Savings

Level of Analysis	Percent Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Precision at 90% Confidence
Total Portfolio	100.0%	190,856,858	188,387,963	98.7%	0.2%
Commercial	48.8%	93,063,990	92,154,979	99.0%	0.4%
Residential	43.1%	82,191,230	80,619,973	98.1%	0.0%
Low Income	2.2%	4,251,437	4,251,437	100.0%	0.0%
Load Management	0.4%	721,411	732,784	101.6%	0.0%
Pilot	5.6%	10,628,790	10,628,790	100.0%	0.2%

*The residential sector realization rate is based on a census review of deemed measures to verify they were calculated in accordance with the PY2016 TRM 3.1.

** The review for the load management program included a census 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.

In program-level realization rates, we have also included a program documentation score of good, fair, or limited as discussed in Section 3. For the overall utility program documentation score, the score of “good” was given if 90 percent or more of the evaluated savings estimates received a score of good or fair due to program documentation received as indicated in detailed program findings. A score of “fair” was given if 70 percent–89 percent of the evaluated savings estimates received a score of good or fair. A score of “limited” was given if less than 70 percent of savings received score of good or fair. In general, a score of “good” indicates the utility has established processes to collect sufficient documentation to verify savings; a score of “fair” also indicates established processes with some areas of improvements identified; and a score of “limited” indicates program documentation improvements across more individual programs and/or high savings programs have been identified. CenterPoint received a good program documentation score for most programs, but a fair documentation score for the Commercial Market Transformation and Data Center Pilot programs for PY2016 indicating an opportunity for improvement for these two programs.

3.1.2 Cost-Effectiveness Results

CenterPoint’s overall portfolio had a cost-effectiveness of 2.65, or 2.92 excluding low-income programs.

The more cost-effective programs were New Homes MTP and Advanced Lighting Residential. The less cost-effective programs were Energy Wise Resource Action Program and residential Retail Electric Provider, both of which did not pass cost-effectiveness.

The lifetime cost of PY2016 evaluated savings was \$0.010 per kWh and \$17.24 per kW.

Table 4-3. CenterPoint Cost-Effectiveness Results

Level of Analysis	Claimed Savings Results	Evaluated Savings Results	Net Savings Results
Total Portfolio	2.63	2.61	2.13
Total Portfolio excluding low-income programs	2.88	2.87	2.32
Commercial	2.62	2.61	2.14
Large Commercial SOP	3.08	3.08	2.46
Commercial MTP	2.41	2.40	2.04
Retro-Commissioning MTP	0.89	0.89	0.80
Sustainable Schools	2.12	2.12	1.97
Retail Electric Provider (Commercial)	1.51	1.13	0.91
Residential	3.90	3.86	2.96
New Homes MTP	8.24	8.24	5.77
Residential & SC SOP	1.59	1.59	1.24
Advanced Lighting Residential	5.60	5.60	5.04
A/C Distributor MTP	1.59	1.59	1.27
Retail Electric Provider (Residential)	1.09	0.92	0.74
Multifamily MTP (Residential)	4.65	4.65	3.72
Energy Wise Resource Action MTP	0.68	0.68	0.54
Hard-to-Reach SOP	1.35	1.35	1.35
Multifamily MTP (HTR)	3.53	3.53	3.53
Retail Electric Provider (Income Qualified)	0.79	0.63	0.63
Low Income*	2.00	2.00	2.00
Targeted Low Income (Agencies in Action) MTP*	2.00	2.00	2.00
Load Management	1.58	1.61	1.61
Large Commercial Load Management SOP	1.68	1.71	1.71
Residential DR	1.00	1.03	1.03
Pilot	1.79	1.79	1.51
Pool Pump Pilot (Commercial)	0.53	0.53	0.45
Data Centers Pilot	2.50	2.50	2.12
Pool Pump Pilot (Residential)	1.07	1.07	0.85

3.2 DETAILED FINDINGS—COMMERCIAL (HIGH/MEDIUM EVALUATION PRIORITY)

3.2.1 Large Commercial Standard Offer Program

Program Contribution To Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution to Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Program Documentation Score
5.6%	9,451	9,467	100.2%	32.6%	62,265,944	62,287,499	100.0%	Good

Completed Desk Reviews*	On-Site M&V
10	5

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

The PY2016 Large Commercial Standard Offer program (SOP) evaluation efforts focused on desk reviews and on-site M&V. The sample of completed desk reviews and on-site M&V projects for this program are listed above.

The EM&V team made several adjustments to the claimed savings for five projects. All five projects had an adjustment of less than five percent and therefore it was not recommended that CenterPoint change their claimed savings. In addition, evaluated savings overall were not significantly impacted and nearly equal to the claimed savings, with realization rates for both kW and kWh equaling 100 percent.

The EM&V team was able to verify key inputs and assumptions that went into the savings calculations for these projects, including equipment quantities and equipment specifications (e.g., wattages, efficiencies) for ten of the ten projects that had desk reviews completed because sufficient documentation was provided. Since sufficient documentation was provided for 100 percent of the sampled projects, the program documentation score for these estimates is Good.

3.2.2 Commercial Market Transformation Program

Program Contribution To Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution to Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Program Documentation Score
2.4%	3,972	3,967	99.9%	12.0%	22,947,438	22,909,471	99.8%	Fair

Completed Desk Reviews*	On-Site M&V
4	2

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

The PY2016 Commercial MTP evaluation efforts focused on desk reviews and on-site M&V. The sample of completed desk reviews and on-site M&V projects for this program are listed above.

The EM&V team made an adjustment to the claimed savings for four projects. Two projects had an adjustment of less than five percent and two had an adjustment of greater than five percent and for whom further details are provided below by Project ID:

Project ID #953540: The energy efficiency project involved a custom heating, ventilation, and air conditioning (HVAC) installation of 79 water source heat pumps (206 tons total) as well as the conversion of large areas (e.g., gym, kitchens) to direct expansion air conditioning (DX) units from the previous chilled water system at a school facility. During the desk review the EM&V team's independent calculations produced similar results to the claimed ex-ante energy savings, however, the peak demand savings analysis yielded much lower results. Since the full calculation methodology for claimed peak demand was not evident in the Internal Performance Measurement and Verification Protocol Option C report or the supporting documentation, the exact reason for the savings gap cannot be explained. The evaluation used the appropriate probability analysis from the TRM Volume 1 to complete the evaluated savings determinations. Therefore, the difference is likely that the claimed savings used a different approach to calculate peak savings, which was not validated from the TRM procedure used by the EM&V team. The on-site M&V visit confirmed the HVAC operations and supports the demand savings approach used by the desk review. Based on these results, the EM&V team updated the project savings, which resulted in less than a 1 percent decrease in the evaluated energy savings and an 87 percent decrease in the evaluated demand savings as compared to the reported project savings.

Project ID #954258: During the desk review of this HVAC retrofit project at a school, the EM&V team found the ex-ante HVAC calculator had an entry for the date of install for the original three units had been entered as unknown. However, it was clear from photos and project notes that two of the existing units were manufactured/installed around 1996 and the third manufactured/installed around 2002. The date of install for two of the units were changed to 1996, which increased the project savings. Also, the original building type selected was secondary school even though the facility is an elementary school. Since the TRM does not have a deemed value for chillers in climate zone 3 for primary schools, the most appropriate building type is the Other building type. This lowered demand savings slightly as it changed the demand factor from 0.78 to 0.76. These adjustments resulted in an 8 percent increase in the evaluated energy savings and a 3 percent decrease in the evaluated demand savings as compared to the reported project savings. This project did not receive an on-site visit.

The EM&V team was able to verify key inputs and assumptions (e.g., equipment quantity and specifications) for two of the four projects that had desk reviews completed because sufficient documentation was provided for the sites. A documentation score of 88 percent was assessed for the program, as partial documentation was provided for two custom HVAC projects and was limited in only one area. In particular for one custom HVAC project, the details of the regression analysis were provided in detail in a clear M&V report and described well for the energy use savings analysis, but was missing details on the method used for deriving the energy demand savings. For a second custom HVAC project that was part of the Healthcare subprogram, the M&V plan was provided along with the post installation data collected, but an M&V report summarizing the final assumptions, findings and savings were not provided. Complete documentation enhances the accuracy and transparency of project savings along with ease of evaluation. Since sufficient documentation was provided for greater than 70 percent, but less than 90 percent of the sampled projects, the EM&V team assigned a program documentation score of Fair.

3.2.3 Retail Electric Provider (Commercial)

Program Contribution To Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution to Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Program Documentation Score
0.8%	1,341	1,120	83.5%	1.5%	2,875,003	1,982,404	69.0%	Good

Completed Desk Reviews*	On-Site M&V
Census Tracking Review	0

*The review for the load management program included a census 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.

The PY2016 Retail Electric Provider (Commercial) program evaluation efforts focused on an engineering review for a census of tune-up measures reported by the program as listed above.

The EM&V team made an adjustment to the claimed savings for all 1,302 tune-up measures. The tune-ups had adjustments of greater than five percent and further details for the tune-up adjustments are provided below by that measure type.

All tune-up measures: A total of 1,302 tune-up measures were reported by the Retail Electric Provider (Commercial) program with reported savings of 1,341 kW and 2,875,003 kWh. During the engineering review of the tune-up measures, the EM&V team confirmed that the program is currently calculating reported savings for tune-up measures using stipulated energy loss factors based on the average Texas and New Mexico statewide M&V results for tune-up measurements collected from PY2011 through PY2015. A review of the PY2015 and PY2016 statewide M&V datasets indicated the efficiency loss factors being calculated for recent years is diverging from the aggregated average since PY2011. This could be due to potential changes in the marketplace (e.g., more efficient units in current year measures, improved accuracy of results from more experienced contractors, new testing tools in use, automation of testing procedures). After initial discussions with the utility and implementer, the EM&V team relied on the pre- and post-tune-up measurements that were collected as part of the M&V tune-up protocol during PY2015 across the state in Texas to evaluate the efficiency loss factors. The evaluated savings were determined by applying the statewide average efficiency loss factors using the formulas from the CoolSaver Option A EM&V Plan. The EM&V team also found that in PY2015, a large number of commercial tune-ups were completed with unique results as compared to the residential unit tune-ups. Therefore, separate efficiency loss factors were determined for each of the sectors and applied separately to their respective participants. Overall, the evaluated savings, at 1,120 kW and 1,982,404 kWh, were less than the reported savings. These adjustments resulted in a 31 percent decrease in the evaluated energy savings and a 17 percent decrease in the evaluated demand savings as compared to the reported savings for these measures.

The EM&V team reviewed the project level documentation obtained from a sample of four random projects to report qualitative findings across the program on documentation sufficiency. The EM&V team was able to verify key inputs and assumptions (e.g., equipment quantity and specifications, field measurements) and confirmed the data reported in the tracking system matched the information in the project files for four of the four projects that had documentation reviews completed because sufficient documentation was provided for the sites. Since sufficient documentation was provided for 100 percent of the sampled projects, the program documentation for these estimates is Good.

3.3 DETAILED FINDINGS—RESIDENTIAL (MEDIUM EVALUATION PRIORITY)

3.3.1 Retail Electric Provider

3.3.1.1 Retail Electric Provider (Residential)

Program Contribution To Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution to Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Program Documentation Score
2.3%	3,820	3,211	84.1%	5.3%	10,151,772	8,613,197	84.8%	Good

Completed Desk Reviews*	On-Site M&V
Census Tracking Review	0

*The review for the load management program included a census 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.

The PY2016 Retail Electric Provider (Residential) program evaluation efforts focused on an engineering review for a census of tune-up measures reported by the program as listed above.

The EM&V team made an adjustment to the claimed savings for all 7,298 tune-up measures. The tune-ups had adjustments of greater than five percent and further details for the tune-up adjustments are provided below by that measure type.

All tune-up measures: A total of 7,298 tune-up measures were reported by the Retail Electric Provider (Commercial) program with reported savings of 3,649 kW and 9,282,109 kWh. During the engineering review of the tune-up measures, the EM&V team confirmed that the program is currently calculating reported savings for tune-up measures using stipulated energy loss factors based on the average Texas and New Mexico statewide M&V results for tune-up measurements collected from PY2011 through PY2015. A review of the PY2015 and PY2016 statewide M&V datasets indicated the efficiency loss factors being calculated for recent years is diverging from the aggregated average since PY2011. This could be due to potential changes in the marketplace (e.g., more efficient units in current year measures, improved accuracy of results from more experienced contractors, new testing tools in use, automation of testing procedures). After initial discussions with the utility and implementer, the EM&V team relied on the pre- and post-tune-up measurements that were collected as part of the M&V tune-up protocol during PY2015 across the state in Texas to evaluate the efficiency loss factors. The evaluated savings were determined by applying the statewide average efficiency loss factors using the formulas from the CoolSaver Option A EM&V Plan. The EM&V team also found that in PY2015, a large number of commercial tune-ups were completed with unique results as compared to the residential unit tune-ups. Therefore, separate efficiency loss factors were determined for each of the sectors and applied separately to their respective participants. Overall, the evaluated savings, at 3,040 kW and 7,743,534 kWh, were less than the reported savings. These adjustments resulted in a 17 percent decrease in the evaluated energy and demand savings as compared to the reported savings for these measures.

The EM&V team reviewed the project level documentation obtained from a sample of four random projects to report qualitative findings across the program on documentation sufficiency. The EM&V team was able to verify key inputs and assumptions (e.g., equipment quantity and specifications, field

measurements) and confirmed the data reported in the tracking system matched the information in the project files for four of the four projects that had documentation reviews completed because sufficient documentation was provided for the sites. Since sufficient documentation was provided for 100 percent of the sampled projects, the program documentation for these estimates is Good.

3.3.1.2 Retail Electric Provider (Income Qualified)

Program Contribution To Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution to Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Program Documentation Score
0.0%	64	51	79.9%	0.1%	162,024	129,341	79.8%	Good

Completed Desk Reviews*	On-Site M&V
Census Tracking Review	0

*The review for the load management program included a census 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.

The PY2016 Retail Electric Provider (Income Qualified) program evaluation efforts focused on an engineering review for a census of tune-up measures reported by the program as listed above.

The EM&V team made an adjustment to the claimed savings for all 116 tune-up measures. The tune-ups had adjustments of greater than five percent and further details for the tune-up adjustments are provided below by that measure type.

All tune-up measures: A total of 116 tune-up measures were reported by the Retail Electric Provider (Commercial) program with reported savings of 64 kW and 162,024 kWh. During the engineering review of the tune-up measures, the EM&V team confirmed that the program is currently calculating reported savings for tune-up measures using stipulated energy loss factors based on the average Texas and New Mexico statewide M&V results for tune-up measurements collected from PY2011 through PY2015. A review of the PY2015 and PY2016 statewide M&V datasets indicated the efficiency loss factors being calculated for recent years is diverging from the aggregated average since PY2011. This could be due to potential changes in the marketplace (e.g., more efficient units in current year measures, improved accuracy of results from more experienced contractors, new testing tools in use, automation of testing procedures). After initial discussions with the utility and implementer, the EM&V team relied on the pre- and post-tune-up measurements that were collected as part of the M&V tune-up protocol during PY2015 across the state in Texas to evaluate the efficiency loss factors. The evaluated savings were determined by applying the statewide average efficiency loss factors using the formulas from the CoolSaver Option A EM&V Plan. The EM&V team also found that in PY2015, a large number of commercial tune-ups were completed with unique results as compared to the residential unit tune-ups. Therefore, separate efficiency loss factors were determined for each of the sectors and applied separately to their respective participants. Overall, the evaluated savings, at 51 kW and 129,341 kWh, were less than the reported savings. These adjustments resulted in a 20 percent decrease in the evaluated energy and demand savings as compared to the reported savings for these measures.

The EM&V team reviewed the project level documentation obtained from a sample of four random projects to report qualitative findings across the program on documentation sufficiency. The EM&V team was able to verify key inputs and assumptions (e.g., equipment quantity and specifications, field measurements) and confirmed the data reported in the tracking system matched the information in the

project files for four of the four projects that had documentation reviews completed because sufficient documentation was provided for the sites. Since sufficient documentation was provided for 100 percent of the sampled projects, the program documentation for these estimates is Good.

3.4 DETAILED FINDINGS—LOAD MANAGEMENT (HIGH/MEDIUM EVALUATION PRIORITY)

3.4.1 Large Commercial Load Management Standard Offer Program

Program Contribution To Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution to Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Program Documentation Score
65.1%	109,119	110,720	101.5%	0.3%	654,711	664,321	101.5%	Good

Completed Desk Reviews*	On-Site M&V
Census Tracking Review	0

* The review for the load management program included a census 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.

The EM&V team evaluated the PY2016 CenterPoint Large Commercial Load Management Standard Offer Program by applying the TRM calculation methodology to interval meter data. The meter data was supplied in 15 minute increments at the Electric Service Identifier (ESI ID) level. Two load management events occurred during PY2016 on the following dates and times:

- July 11, 2016 from 2 p.m. to 5 p.m.
- July 22, 2016 from 2 p.m. to 5 p.m.

The EM&V team received the interval meter data as well as spreadsheets detailing the CenterPoint calculated baseline load, event load, and savings results for each event and ESI ID. In the documentation, CenterPoint noted that for the second event (July 22), the July 11 test date had been erroneously included as a potential baseline day, though no changes to the claimed savings were made. The EM&V team was able to complete its analysis with the data that had been provided, though removing July 11 and including July 7 as a potential baseline day, a difference from CenterPoint’s analysis.

The EM&V team applied CenterPoint’s TRM calculation methodology to the meter data and found that savings were 101.5 percent of the claimed aggregate kW savings calculated by CenterPoint. The EM&V team calculated kWh savings by multiplying the average kW savings times the number of event hours (6) in 2016.

Evaluated savings for the CenterPoint Large Commercial Load Management SOP are 110,720 kW and 664,321 kWh. The realization rate for both kW and kWh is 101.5 percent.

3.4.2 Residential Demand Response Program

Program Contribution To Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution to Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Program Documentation Score
6.6%	11,100	11,411	102.8%	0.0%	66,700	68,464	102.6%	Good

Completed Desk Reviews*	On-Site M&V
Census Tracking Review	0

*The review for the load management program included a census 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.

The EM&V team evaluated the PY2016 CenterPoint Residential Demand Response Program by applying the TRM calculation methodology to interval meter data. The meter data was supplied in 15 minute increments at the ESI ID level. Two load management events occurred during PY2016 on the following dates and times:

- July 11, 2016 from 2 p.m. to 5 p.m.
- July 22, 2016 from 2 p.m. to 5 p.m.

The EM&V team received the interval meter data as well as spreadsheets detailing the CenterPoint calculated baseline load, event load, and savings results for each event and ESI ID. Calculation results were initially presented as aggregate results and without individual meter calculation results. The EM&V team was unable to replicate the CenterPoint savings results. In discussion with CenterPoint, the EM&V team received a file with individual meter calculations. The EM&V team found that meters with increased consumption during events (using the TRM calculation method) had been excluded in the CenterPoint calculations, with only those participants showing decreases in consumption being considered for savings summation. Follow-up with CenterPoint confirmed the exclusion of meters demonstrating increased consumption. CenterPoint filed their EEPR to reflect the inclusion of meters with both increases and decreases of consumption. The difference in calculations between CenterPoint and the EM&V team is attributable to the aggregate effect of rounding differences at the meter level.

For thermostat-driven demand response programs, the practice is to include both decreases and increases in consumption unless a meter can be specifically documented to have opted out of an event. This has been the practice since the 2015 evaluation and implementation of the High 3 of 5 baseline method. However, in the PY2015 evaluation, the issue was not fully vetted with CenterPoint due to utility personnel changes. The EM&V team is reviewing TRM 4.0 language and will clarify as necessary to avoid confusion for the PY2017 calculations and evaluation.

Evaluated savings for the CenterPoint Residential Demand Response Program are 11,411 kW and 68,465 kWh. The realization rate for kW is 102.8 percent and for kWh is 102.6 percent.

3.5 DETAILED FINDINGS—PILOTS (HIGH/MEDIUM EVALUATION PRIORITY)

3.5.1 Pool Pump Pilot Program (Commercial)

Program Contribution To Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution to Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Program Documentation Score
0.0%	59	59	100.0%	0.3%	530,088	530,088	100.0%	Good

Completed Desk Reviews*	On-Site M&V
Census Tracking Review	0

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

The PY2016 Commercial Pool Pump Pilot program evaluation efforts focused on an engineering review for a census of pool pump measures reported by the program as listed above.

The EM&V team made an adjustment to the claimed savings for all 42 pool pump measures. The pools pumps had adjustments of greater than five percent and further details of these adjustments are provided below by that measure type. In addition, some participants had site specific findings that led to savings adjustments and further details are provided below by Project ID.

All pool pump measures: A total of 42 pool pump measures were reported by the Commercial Pool Pump Pilot program with reported savings of 46 kW and 570,449 kWh. During the engineering review of the pool pump measures, the EM&V team confirmed that the program is currently calculating reported savings using a custom methodology that relies mostly on site specific data collected at the time of the new pump installation. An installation form is provided for each site which included detailed information such as: customer information, site location, pool size, new pump manufacturer and size, the new pumps operating schedule at each speed level, and the contractor who performed the work. The form also included an area to gather the old pumps data including manufacturer, size, and existing operating schedule. These details are tracked by the program within the utilities tracking system and were the basis for the EM&V teams review and evaluated savings calculations. The EM&V team found that the energy savings methodology being used was reasonable and the evaluated energy savings were determined using the same formulas as those claimed. However, during this process, the EM&V team found that the peak demand savings methodology was calculated based on an average of the new pumps high and low-speed settings and a coincidence factor of 0.75 that was applied to both the old and new pump wattages. As the actual operating schedules were captured by the program, the evaluation used this information to apply the appropriate probability analysis from the TRM Volume 1 to complete the evaluated peak demand savings determinations. This was in alignment with the new peak demand methodology which was to be implemented in PY2016. This resulted in 26 percent higher peak demand savings for the program as most commercial pools were found to operate during all of the peak demand hours and for which the net difference between the old and new pump loads were verified. In essence this also supported that a coincidence factor of nearly 1.0 is occurring as compared to the coincidence factor of 0.75 assumed. Based on these results, the EM&V team updated the measures savings, which resulted in an overall evaluated savings of 59 kW and 530,088 kWh. This resulted in a 26 percent increase in the evaluated peak demand savings and a 7 percent decrease in the evaluated energy savings as compared to the reported project savings. The decrease in energy savings was due mostly to errors in how the pumps

operating schedules were used for savings calculations across five projects as further explained next by Project ID.

Project IDs 914971, 914976, and 914978: Documentation from Participant ID 914976 was included as part of the programs documentation review which revealed that the daily operating schedule as noted in the Installation Form verified that the new pump was installed to operate 24 hours per day. However, in the tracking system the new pumps schedule was documented as operating from 12:00 a.m. to 11:59 a.m. which is only a 11.98 hours. A tracking system error was believed to have occurred and should have been tracked as an operation from 11:59 p.m. instead of 11:59 a.m. to indicate all day operation. This was determined to be a systematic error across two other projects: Participant IDs 914971 and 914978. All three of these projects were calculated as part of the in ex-post calculations as running for 24 hours per day. This correction in addition to the adjustments in the demand factor resulted in an overall kW realization rate of 133 percent and a kWh realization rate of 44, 21 and 43 percent for Project IDs 914971, 914976, and 914978 respectively.

Project ID 914977: The claimed ex-ante savings were found to be in error. The verified energy and demand savings were 1.53 kW and 18,636 kWh while the ex-ante claimed savings were 3.72 kW and 19,732 kWh. The claimed demand savings of 3.72 kW is higher than the total kW input of the old pump which was 3 kW. The EM&V team was not able to find the source of the error with the given information. This correction in addition to the adjustments in the demand factor resulted in an overall kW realization rate of 62 percent and a kWh realization rate of 94 percent.

Project ID 914981: The project was found to contain an error in how the pumps operating schedule was documented in the tracking system and then used for calculating the claimed ex-ante savings. The existing pumps schedule in the tracking system was claimed to have operated for a total of 24 hours per day. However, the installation form that was provided as part of the project files documented that the actual operating schedule of the existing pump was found to operate from 8:00 AM to 8:00 PM or only 12 hours per day. The EM&V team calculated the pumps savings based on the in-situ pump run time of 12 hours per day. This correction in addition to the adjustments in the demand factor resulted in an overall kW realization rate 62 percent and a kWh realization rate 27 percent.

Key findings and applicable recommendations for the program include:

Key Finding #1: The peak demand savings did not follow the new procedures of TRM Version 3.1 Volume 1 peak demand probabilities that were to be implemented in PY2016.

As the pre and post pump operating schedules were captured by the program for commercial measures, the new peak demand methodology should be considered as higher peak demand savings for the program are likely. This is supported by the data that found most commercial pools operate during the peak demand hours. The data also supports a higher coincidence factor at this time of nearly 1.0 as compared to the coincidence factor of 0.75 currently assumed. Although, long term persistence of the post retrofit operating schedule should be studied in the future as well.

Recommendation: The peak demand savings should follow the new procedures described in TRM volume 1.

Key Finding #2: Projects should capture commercial pool usage hours within project documentation.

The EM&V team found many of the commercial pool pumps had significant reductions in post operating hours compared to existing. This is allowed for commercial pools under the provisions set by the Texas Department of State Health Services. However, the EM&V team found that many pumps had different

post operating hours as compared to the business hours of operation captured within the programs tracking system. Some post retrofit operating hours were found higher and some found lower as compared to the business hours of operation. This may indicate inconsistency for how hours are captured of either the business or the pumps.

Recommendation: The pools usage schedule (i.e., days and hours the pool is open to patrons) should be captured to support the reduced post retrofit operating schedules.

Key Finding #3: The make and model number for the old and new pumps should be reviewed for accuracy and be clearly captured within project documentation and the tracking data.

The EM&V team found that the program collected and tracked pump make and model numbers, however the information was not always detailed enough to clearly identify the specific equipment installed. This information is needed to collect manufacturers’ pump curve data to confirm equipment performance such as flow rates and energy factors. This metric changes depending on the size and type of the pumps and such information collected in the field could inform Texas specific performance averages based on the most common pumps installed in the state. Also, material invoices were found collected by the programs, however, these lacked clear detail of the make and model number of the pumps as well. As the energy factor is a key driver of savings assumptions, project documentation (e.g. commissioning reports, invoices) and the tracking data should clearly capture the existing and new pumps make and model numbers. Also, while the programs currently require an Energy Star® certified pool pump to be installed, this information would allow the EM&V team to assess the effectiveness of pump selection in Texas specifically and provide program feedback on technician pump selection procedures.

Recommendation: Project documentation (e.g., commissioning reports, invoices) and the tracking data should clearly capture the existing and new pumps make and model numbers.

The EM&V team reviewed the project level documentation obtained from a sample of four random projects to report qualitative findings across the program on documentation sufficiency. The EM&V team was able to verify key inputs and assumptions (e.g., pump size, pump settings) and confirmed the data reported in the tracking system matched the information in the project files for four of the four projects that had documentation reviews completed because sufficient documentation was provided for the sites. Since sufficient documentation was provided for 100 percent of the sampled projects, the program documentation for these estimates is Good.

3.5.2 Pool Pump Pilot Program (Residential)

Program Contribution To Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution to Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Program Documentation Score
0.3%	508	508	100.0%	1.0%	1,824,017	1,824,017	100.0%	Good

Completed Desk Reviews*	On-Site M&V
Census Tracking Review	0

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

The PY2016 Pool Pump Pilot program (Residential) evaluation efforts focused on an engineering review for a census of pool pump measures reported by the program as listed above.

The EM&V team made an adjustment to the claimed savings for two pool pump measures. The pool pumps had adjustments of greater than five percent and further details of these participants are provided below by Project ID.

All pool pump measures: A total of 573 pool pump measures were reported by the Residential Pool Pump Pilot program with reported savings of 508 kW and 1,823,729 kWh. During the engineering review of the pool pump measures, the EM&V team confirmed that the program is currently calculating reported savings using a custom methodology that is slightly different than the commercial program as it relies on a combination of site specific data collected at the time of the new pump installation and assumptions based on historical program data. An installation form is provided for each site which included detailed information such as customer information, site location, pool size, new pump manufacturer and size, the new pumps operating schedule at each speed level, and the contractor who performed the work. The form also included an area to gather the old pumps data including manufacturer, size, and existing operating schedule. From a review of site level documentation for a sample of projects, the EM&V team found the old pump data was not collected consistently and was omitted from the tracking system. The details that are tracked by the program within the utilities tracking system and were the basis for the EM&V teams review and evaluated savings calculations included the old/new pump sizes and the new operating hours. Assumptions that were based on historical data and were stipulated the same across all participants were the old pumps operating hours which were assumed to be 10.66 hours across 226 summer days and 6.6 hours across 139 winter days for an average of 9.1 daily operating hours. The EM&V team found that the energy and demand savings methodology used were reasonable and the evaluated energy savings were determined using the same formulas as those claimed, which resulted in nearly identical energy and demand savings results. However, during this process, the EM&V team found that the peak demand savings methodology was calculated based on an average of the new pumps high- and low-speed settings and a coincidence factor of 0.75 that was applied to both the old and new pump calculated wattages. However, as the old pumps actual operating schedules were not captured by the program, the evaluation was not able to apply the appropriate probability analysis from the TRM Volume 1 to update the evaluated peak demand savings determinations. Based on the new pump operating schedules, there is a high likelihood that many of the residential pool pumps may have significantly higher peak demand savings for the program as many residential pools were found to operate during most of the peak demand hours. However, the EM&V team could not verify this, as the old pump operating schedules were not always collected and none were reported within the tracking system. This may be an opportunity for the program if this data were collected and tracked in the future. The EM&V team recommends that the baseline or existing pumps operating schedule is collected and tracked by the program to further inform the measure coincidence factor. Based on these results, the EM&V team's calculations resulted in an overall evaluated savings of 508 kW and 1,824,017 kWh and were nearly identical to the reported savings. This resulted in a 100 percent realization rates and no significant change in the evaluated energy or demand savings as compared to the reported project savings.

The slight change in program level energy savings was due mostly to errors in how the pumps operating schedules were used for savings calculations across two projects as further explained next by Project ID.

Project ID 923103: The project was found to contain an error in how the pumps operating schedule was documented in the tracking system and then used for calculating the claimed ex-ante savings. The pump schedule in the tracking system was claimed to have operated for a total of 39 hours per day: 24 hours at the low-speed from 12 a.m. to 12 a.m. and 15 hours at the high-speed from 3:30 p.m. to 6:30 a.m. the following morning. As operation would be limited to no more than 24 hours in the day, the EM&V team calculated the pumps savings based on an operating

schedule at the low-speed from 3:30 p.m. to 6:30 a.m. for a total of nine hours each day and at the high-speed from 3:30 p.m. to 6:30 a.m. for a total of 15 hours each day. This correction resulted in a kW realization rate of 99 percent and a kWh realization rate of 116 percent.

Project ID 940934: The project was found to contain an error in how the pumps operating schedule was used for calculating the claimed ex-ante savings. The pump schedule in the tracking system was claimed to have operated for a total of nine hours per day—three hours at the low-speed from 9 a.m. to 12 p.m. and six hours at the high-speed from 12 p.m. to 6 p.m. However, the claimed ex-ante savings were based only on the high-speed operation and omitted the low-speed pump operating hours and energy use. The EM&V team included the low-speed operation in the calculations which reduced energy savings and increased demand savings. This correction resulted in a kW realization rate of 135 percent and a kWh realization rate of 95 percent.

Key findings and applicable recommendations for the program include:

Key Finding #1: The peak demand savings did not follow the new procedures of TRM Version 3.1 Volume 1 peak demand probabilities that were to be implemented in PY2016.

The peak demand savings should follow the new procedures described in TRM volume 1. For residential installations, many times the old pump is no longer in proper operating condition or has burned out. Therefore information on the existing system energy use or even operation can be difficult to gather. Due to these issues, the residential program began to stipulate the baseline pumps operating hours. These stipulated assumptions are based on a PY2014 survey that was conducted by the program which collected data for 52 installations to inform the baseline operating conditions including hours of operation across both summer and winter seasons. From the research that was completed, the old residential pumps operating hours were found to average 10.66 hours across 226 summer days and 6.58 hours across 139 winter days for an average of 9.1 daily operating hours. However, as the stipulations were limited to providing total hours of operation and the specific pre retrofit operating hours were not captured by the program, the evaluation was not able to apply the appropriate probability analysis from the TRM Volume 1 to update the evaluated peak demand savings determinations. Based on the new pump operating schedules, there is a high likelihood that many of the residential pool pumps may have higher peak demand coincidence factors for the program as many residential pools were found to operate during most of the peak demand hours in the post installation case. However, the EM&V team could not verify this from the tracking system and documentation review, as the old pump operating schedules were not always collected within the documents and none were reported within the tracking system. Also, the tracking system notes whether the old pump was still in operation for which 86 existing units were identified as operational. This may be an opportunity for the program to track the pre retrofit operating hour information in the future.

Recommendation: The peak demand savings should follow the new procedures described in TRM volume 1. Also, the baseline or existing pumps operating schedule should be collected and tracked by the program for a sample of residential pumps where such information is available. This would inform the residential peak demand probabilities and coincidence factors. The long term persistence of the post retrofit operating schedules should be studied in the future as well.

Key Finding #2: Key savings parameters were not always found appropriate for pumps used for non-primary pool operations (e.g. spas, water features) that have different turn over requirements.

The EM&V team found that the custom methodology for residential pool pumps used the same stipulated baseline operations for all pumps (retrofit and new construction) even if the pumps were installed for non-primary pool operations such as spas and water features which have different turn over requirements and significantly lower post installation operating schedules as compared to pool use only pumps. Also, the data showed that these were the only pump replaced at the site and not part of

the pool pump replacement. This may suggest that baseline operating schedules are different for non-primary pool pumps that were not originally included in the PY2014 survey research that established the stipulated baseline hours. Clearly capturing the baseline pumps operating schedule would confirm whether the programs stipulated values should apply to non-primary pool pumps and inform a separate baseline operating hour assumption if needed.

Recommendation: The baseline or existing pumps operating schedule should be collected and tracked by the program for all non-primary pool pumps.

Key Finding #3: The make and model number for the old and new pumps should be reviewed for accuracy and be clearly captured within project documentation and the tracking data.

The EM&V team found that the program collected and tracked pump make and model numbers, however the information was not always detailed enough to clearly identify the specific equipment installed. This information is needed to collect manufacturers' pump curve data to confirm equipment performance such as flow rates and energy factors. This metric changes depending on the size and type of the pumps and such information collected in the field could inform Texas specific performance averages based on the most common pumps installed in the state. Also, material invoices were found collected by the programs, however, these lacked clear detail of the make and model number of the pumps as well. As the energy factor is a key driver of savings assumptions, project documentation (e.g. commissioning reports, invoices) and the tracking data should clearly capture the existing and new pumps make and model numbers. Also, while the programs currently require an Energy Star® certified pool pump to be installed, this information would allow the EM&V team to assess the effectiveness of pump selection in Texas specifically and provide program feedback on technician pump selection procedures.

Recommendation: Project documentation (e.g. commissioning reports, invoices) and the tracking data should clearly capture the existing and new pumps make and model numbers.

The EM&V team reviewed the project level documentation obtained from a sample of four random projects to report qualitative findings across the program on documentation sufficiency. The EM&V team was able to verify most all key inputs and assumptions (e.g., pump size, pump settings) and confirmed the data reported in the tracking system matched the information in the project files for four of the four projects that had documentation reviews completed because sufficient documentation was provided for the sites. Only one parameter was not captured by the program in PY2016 and that is the existing pumps actual operating schedule. The program used an estimated daily operating schedule of 10.7 hours in summer and 6.6 hours in winter and an estimated coincidence factor of 0.75. Based on the new pumps operating schedules, the EM&V team believes that the actual coincidence of the residential pool pumps may be higher than 0.75, however, the EM&V team was limited in assessing this assumption as the actual hours were not captured. Since sufficient documentation was provided for greater than 90 percent of the sampled projects, the program documentation for these estimates is Good.

3.5.3 Data Centers Pilot

Program Contribution To Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution to Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Program Documentation Score
0.6%	971	971	100.0%	4.3%	8,274,684	8,274,684	100.0%	Fair

Completed Desk Reviews*	On-Site M&V
2	1

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

Desk reviews were performed for all sites where on-site M&V was performed to ensure consistency between on-site results and desk review results.

The PY2016 Data Centers Pilot program evaluation efforts focused on desk reviews and on-site M&V. The sample of completed desk reviews and on-site M&V projects for this program are listed above.

The EM&V team made no adjustments to any of the savings calculations for the projects reviewed. Therefore, evaluated savings were equal to the claimed savings, with realization rates for both kW and kWh equaling 100 percent.

As part of previous evaluation reports (PY2012–PY2015), the EM&V team recommended that the utility provide all pertinent documentation to aid in the independent evaluation of any project. Of the PY2016 projects reviewed, both had fair project information and/or project documentation. The EM&V team found that the project documentation has improved this year, as the EM&V team found the project files included many of the recommendations from PY2015. For example, invoices and photographic documents were documented, which are key to confirm equipment quantities and make/model information for the new equipment installed and to calculate savings. The documentation also included Building Automation System (BAS) screen shots to confirm the computer room air handler (CRAH) operations and the savings calculation spreadsheets as well. Also, the final claimed savings for each measure was provided, as recommended by the EM&V team, in one clear final calculation document. The one key document that was recommended by the EM&V team, but was not found was a final M&V report. As many of these projects were custom in nature and inherently are more complex, a final M&V report would provide a summary of whether the M&V plan was completed as planned or if any changed occurred. It would also provide an opportunity to summarize the savings calculations methods and key assumptions made that are not always apparent from the calculation spreadsheets. Also, as metered results are obtained and used as part of the savings, a summary of the findings would clearly indicate what data was used/not used and how missing or erroneous data was handled. Most importantly, it would confirm over which time period the data was collected, which is key to verifying it's appropriateness in use for the savings calculations. The M&V report with these details would greatly enhance the evaluability of the projects and enhances clarity of the project information. Since sufficient documentation was provided for 70 percent of the sampled projects, the program documentation score for these estimates is Fair.

3.6 SUMMARY OF LOW PRIORITY EVALUATION PROGRAMS

Table 4-4 provides a summary of claimed savings for CenterPoint's low evaluation priority programs in PY2016, including programs' overall contribution to portfolio savings. Low priority programs' claimed

savings were verified against the final PY2016 tracking data provided to the EM&V team for the EM&V database.

Table 4-4. PY2016 Claimed Savings (Low Evaluation Priority Programs)

Program	Contribution to Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Contribution to Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)
Sustainable Schools	0.4%	637	637	100.0%	1.4%	2,669,417	2,669,417	100.0%
Retro-Commissioning MTP	0.3%	489	489	100.0%	1.2%	2,306,188	2,306,188	100.0%
New Homes MTP	8.2%	13,671	13,671	100.0%	22.4%	42,736,617	42,736,617	100.0%
Advanced Lighting Residential	1.6%	2,645	2,645	100.0%	7.4%	14,095,756	14,095,756	100.0%
Multifamily MTP (HTR)	1.4%	2,331	2,331	100.0%	1.4%	2,669,946	2,669,946	100.0%
A/C Distributor MTP	1.4%	2,322	2,322	100.0%	3.3%	6,308,863	6,308,863	100.0%
Multifamily MTP (Residential)	0.8%	1,309	1,309	100.0%	2.2%	4,140,420	4,140,420	100.0%
Hard-to-Reach SOP	0.2%	338	338	100.0%	0.3%	628,995	628,995	100.0%
Energy Wise Resource Action MTP	0.2%	283	283	100.0%	0.5%	1,000,971	1,000,971	100.0%
Residential & SC SOP	0.1%	125	125	100.0%	0.2%	295,868	295,868	100.0%
Targeted Low Income (Agencies in Action) MTP	1.9%	3,114	3,114	100.0%	2.2%	4,251,437	4,251,437	100.0%

4.0 IMPACT EVALUATION RESULTS—EL PASO ELECTRIC COMPANY

This section presents the evaluated savings and cost-effectiveness results for El Paso Electric’s energy efficiency portfolio. The key findings are summarized first, followed by details for each program in the portfolio that had a high or medium evaluation priority. Finally, a list of the low evaluation priority programs for which claimed savings were verified through the EM&V database are included.

4.1 KEY FINDINGS

4.1.1 Evaluated Savings

El Paso Electric’s evaluated savings for PY2016 were 12,786 in demand (kW) and 22,905,591 in energy (kWh) savings. The overall kW and kWh portfolio realization rates are 100 percent. El Paso Electric was responsive to all EM&V recommendations to adjust claimed savings based on EM&V results.

Table 4-1 shows the claimed and evaluated demand savings for El Paso Electric’s portfolio and broad customer sector/program categories for PY2016.

Table 4-1. El Paso Electric PY2016 Claimed and Evaluated Demand Savings

Level of Analysis	Percent Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Precision at 90% Confidence
Total Portfolio	100.0%	12,790	12,786	100.0%	0.4%
Commercial Sector ¹	28.1%	3,595	3,591	99.9%	1.5%
Residential Sector*	12.5%	1,596	1,596	100.0%	0.0%
Load Management**	59.4%	7,599	7,599	100.0%	0.0%

* The residential sector realization rate is based on a census review of deemed measures to verify they were calculated in accordance with the PY2016 TRM 3.1 and recommended evaluation savings adjustments resulting from a census review of tune-up measures reported by the program.

** The review for the load management program included a census 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.

¹ A total of 27 tune-ups were reported by the Small Commercial Solutions MTP with reported savings of 14 kW and 24,169 kWh. Evaluated savings were found to be less than reported at 10 kW and 17,744 kWh resulting in realization rates of 70 percent kW and 73 percent kWh across the tune-up measures.

Table 4-2 shows the claimed and evaluated energy savings for El Paso Electric’s portfolio and broad customer sector/program categories for PY2016.

Table 4-2. El Paso Electric PY2016 Claimed and Evaluated Energy Savings

Level of Analysis	Percent Portfolio Savings (kWh)	Claimed Demand Savings (kWh)	Evaluated Demand Savings (kWh)	Realization Rate (kWh)	Precision at 90% Confidence
Total Portfolio	100.0%	22,912,025	22,905,591	100.0%	3.4%
Commercial Sector	86.8%	19,886,504	19,880,069	100.0%	3.9%
Residential Sector*	13.1%	3,002,726	3,002,726	100.0%	0.0%
Load Management**	0.1%	22,796	22,796	100.0%	0.0%

* The residential sector realization rate is based on a census review of deemed measures to verify they were calculated in accordance with the PY2016 TRM 3.1.

** 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 for high and medium evaluation priority programs 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.

In program-level realization rates, we have also included a program documentation score of good, fair, or limited as discussed in Section 3. In general, a score of “good” indicates the utility has established processes to collect sufficient documentation to verify savings; a score of “fair” also indicates established processes with some areas of improvements identified; and a score of “limited” indicates program documentation improvements across more individual programs and/or high savings programs have been identified. El Paso Electric received a good program documentation score for Large C&I Solutions MTP and Texas SCORE MTP and a fair program documentation score for Commercial SOP for PY2016.²

4.1.2 Cost-Effectiveness Results

El Paso Electric’s overall portfolio had an evaluated cost-effectiveness of 3.39.

The more cost-effective programs were Large C&I Solutions MTP and Commercial SOP. The less cost-effective programs were LivingWise MTP and Load Management SOP. This is not surprising given demand response programs primarily have capacity objectives and LivingWise is an education program geared toward school children. All programs passed cost-effectiveness based on evaluated savings results.

The lifetime cost of evaluated PY2016 savings was \$0.009 per kWh and \$14.56 per kW.

² In PY2016, only high and medium priority programs received documentation scores. Therefore, overall documentation scores are based only on high and medium priority programs.

Table 4-3. El Paso Electric Cost-Effectiveness Results

Level of Analysis	Claimed Savings Results	Evaluated Savings Results	Net Savings Results
Total Portfolio	3.39	3.39	3.00
Commercial	4.67	4.67	4.07
Commercial SOP	4.70	4.70	3.77
Small Commercial Solutions MTP	3.38	3.37	3.03
Large C&I Solutions MTP	5.81	5.81	4.94
Texas SCORE MTP	3.48	3.48	3.24
Residential	1.81	1.81	1.65
Residential Solutions MTP	2.52	2.52	2.02
LivingWise MTP	1.04	1.04	0.83
Hard-to-Reach Solutions MTP	1.94	1.94	1.94
Load Management	1.42	1.42	1.42
Load Management SOP	1.42	1.42	1.42

4.2 DETAILED FINDINGS—COMMERCIAL (MEDIUM EVALUATION PRIORITY)

4.2.1 Commercial Standard Offer Program

Program Contribution To Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Program Documentation Score
0.2%	30	30	100.0%	0.8%	177,439	177,439	100.0%	Fair

Completed Desk Reviews*	On-Site M&V
2	1

*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.

Desk reviews were performed for all sites where on-site M&V was performed to ensure consistency between on-site results and desk review results.

The PY2016 Commercial SOP evaluation efforts focused on desk reviews and on-site M&V. The sample of completed desk reviews and on-site M&V projects for this program are listed above.

The EM&V team made no adjustments to any of the savings calculations for the projects reviewed. Therefore, evaluated savings were equal to the claimed savings, with realization rates for both kW and kWh equaling 100 percent.

As part of prior evaluation reports, the EM&V team recommended that the utility provide all pertinent documentation to aid in the independent evaluation of any project. There is still improvement needed

for Commercial SOP in this area as only one out of the two projects reviewed had sufficient documentation. A documentation score of 83 percent was assessed for the program, as partial documentation was provided for the second project and was limited in only one area. In particular for lighting projects, pre and post inspections included field notes and photo documentation which are significant efforts by the utility to verify equipment installations and in general quantities. However, these documents did not provide confirmation that key equipment parameters such wattages, efficiencies, and ballast factors were assessed. Also, these documents did not provide the lighting equipment make or model information for which the EM&V team was not able to verify these key inputs and assumptions that went into the savings calculations without a site visit. The EM&V team recommends that at a minimum make and model information is provided for lighting projects. Typically this is done best by provide an equipment cut sheet, DLC certification screen print, and/or invoice with such information described. Complete documentation enhances the accuracy and transparency of project savings along with ease of evaluation. Since sufficient documentation was provided for greater than 70 percent, but less than 90 percent of the sampled projects, the EM&V team assigned a program documentation score of Fair.

4.2.2 Commercial Market Transformation Programs

4.2.2.1 Large C&I Solutions Market Transformation Program

Program Contribution To Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Program Documentation Score
16.9%	2,162	2,162	100.0%	55.6%	12,734,633	12,734,633	100.0%	Good

Completed Desk Reviews*	On-Site M&V
6	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.

Desk reviews were performed for all sites where on-site M&V was performed to ensure consistency between on-site results and desk review results.

The PY2016 Large C&I Solutions MTP evaluation efforts focused on desk reviews and on-site M&V. The sample of completed desk reviews and on-site M&V projects for this program are listed above. In addition, the engineering review for the program included a census review of tune-up measures reported by the program.

The EM&V team made adjustments to the claimed savings for three projects. All three projects had an adjustment of greater than five percent from originally claimed savings. Further details are provided below by Project ID. El Paso Electric adjusted savings for all of these projects and therefore the final program level realization rate is 100 percent.

Project ID #953058: The energy efficiency project involved both lighting and air compressor retrofits at a manufacturing facility. During the on-site M&V visit, the EM&V team identified an error in the baseline fixture and new fixture control types for the lighting replacement project. The reported savings had identified that all of the baseline and new fixtures were controlled by switch and none included control devices. During the on-site visit, the EM&V team found that significant portions of the lighting in the production and warehouse areas had occupancy sensors that were control devices that had been in place prior to the retrofit on the existing lighting and were transferred to

the new lighting during the retrofit installations. While the production areas were not found with any sensors that had activated the shutdown of lights, the warehouse was confirmed to have periods of lower occupancy and a high likelihood of the controls to reduce lighting needs as those periods occurred. The site visit also found that the facility does not operate as extensively as the custom hours that had been claimed for the production and warehouse areas. The custom operating hours for the lighting portion of the project were revised and the occupancy sensor control devices for both the baseline and new fixture quantities for the warehouse were updated to reflect the on-site findings. These updates to the lighting portion of the project savings resulted in a 16 percent decrease in the evaluated energy savings and a 32 percent decrease in the evaluated demand savings as compared to the reported lighting project savings. This project also received a desk review; however, the project documentation did not describe the existing or new condition of the occupancy sensors found during the site visit and therefore a full check of these particular equipment conditions could not be completed during the desk review.

Project ID #954314: The energy efficiency project involved lighting retrofits to a large road side billboard sign. During the on-site M&V visit, the EM&V team identified an error in the new fixture quantities installed and used as the basis for the savings calculations. The reported savings had identified that all of the pre-existing metal halide fixtures were replaced one-for-one. During the on-site visit, the EM&V team found that all eight (8) pre-existing metal halide fixtures were removed and replaced with a reduced number of only four (4) new LED fixtures. Post-retrofit quantities were updated to reflect the on-site findings which resulted in a 23 percent increase in the evaluated energy savings and a 22 percent increase in the evaluated demand savings as compared to the reported project savings. This project also received a desk review; however, the project documentation lacked clear information on the post lighting quantities. A physical post inspection was not completed by the utility so a post photo was not included. Also, a material invoice and an installation invoice were provided, however, the material invoice included LEDs for multiple other locations and did not break down the quantities by site. The installation invoice also did not describe the quantity of lighting removed or the quantity of new lighting installed. Therefore a full check of this particular assumption could not be completed during the desk review.

Project ID #954285, 954287, 954290, 954293-954301, 954304-954308, 954310-954313, 954315, 954318, 954319, 954321, 954326, 954327, 954330-954332: Similar to project ID #954314 described above, there were 30 additional road side billboard signs that were found reported as a one-for-one retrofit of pre-existing lighting fixtures to new LED fixtures. After further discussions with the utility, these 30 additional signs were identified as having a reduced number of post retrofit fixture quantities installed. The utility provided additional documentation that included a final invoice from the contractor confirming the post-retrofit quantities installed for these sites and for which the EM&V team was able to verify the adjusted savings implications. Although, some signs may have been retrofit with lower wattage LED fixtures (44 LED type versus 66 LED type and further reduced savings may have resulted, this level of detail was not tracked by the contractor. These savings are not able to be verified by the EM&V team due to lack of information to do so. The adjustment assuming all fixtures were retrofit with four 66 LED type fixtures resulted in a 23 percent increase in the evaluated energy and demand savings as compared to the reported project savings.

Project ID #953595: One tune-up measure was reported by the Large C&I MTP with reported savings of 0.6 kW and 832 kWh. One tune-up measure was reported by the Large C&I MTP with reported savings of 0.6 kW and 832 kWh. During the engineering review of the tune-up measures, the EM&V team confirmed that the program is currently calculating reported savings for tune-up measures using stipulated energy loss factors based on the average statewide M&V results for tune-up measurements collected from PY2011 through PY2015. A review of the PY2015 and PY2016 statewide M&V datasets indicated the efficiency loss factors being calculated for recent

years is diverging from the aggregated average since PY2011. This could be due to potential changes in the marketplace (e.g., more efficient units in current year measures, improved accuracy of results from more experienced contractors, new testing tools in use, automation of testing procedures). After a discussion with the utility and implementer, the EM&V team relied on the pre and post tune-up measurements that were collected as part of the M&V tune-up protocol during PY2016 for El Paso Electric to evaluate the efficiency loss factors. The evaluated savings were determined by applying the EPE specific efficiency loss factors using the formulas from the CoolSaver Option A EM&V Plan. Overall, the evaluated savings, at 0.4 kW and 601 kWh, were less than the reported savings. These adjustments resulted in a 27 percent decrease in the evaluated energy savings and a 31 percent decrease in the evaluated demand savings.

The EM&V team was able to verify key inputs and assumptions (e.g., equipment quantity and specifications) for five of the six projects that had desk reviews completed because sufficient documentation was provided for the sites. A documentation score of 94 percent was assessed for the program, as partial documentation was provided for one project and was limited in only one area. In particular for lighting projects, a pre inspections included clear existing light quantities and photo documentation which are significant efforts by the utility to verify equipment existing conditions and quantities. However, a post inspection was not completed and the initial material invoice provided did not confirm reduced post retrofit quantities without a site visit. After further discussion with the utility, further documentation was able to be gathered from the contractor, however, while it confirmed the post retrofit quantities, it did not confirm the make and model information which would have potentially confirmed further project savings. The EM&V team recommends that for projects with multiple site locations, invoices should be collected that describe the details for each location separately so that quantity and make/model information is detailed enough to estimate savings separately for each site. Complete documentation enhances the accuracy and transparency of project savings along with ease of evaluation. Since sufficient documentation was provided for 90 percent or greater of the sampled projects, the EM&V team assigned a program documentation score of Good.

4.2.2.2 Texas SCORE Market Transformation Program

Program Contribution To Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Program Documentation Score
4.3%	551	551	100.0%	13.6%	3,117,684	3,117,684	100.0%	Good

Completed Desk Reviews*	On-Site M&V
4	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.

Desk reviews were performed for all sites where on-site M&V was performed to ensure consistency between on-site results and desk review results.

The PY2016 Texas SCORE MTP evaluation efforts focused on desk reviews and on-site M&V. The sample of completed desk reviews and on-site M&V projects for this program are listed above. In addition, the engineering review for the program included a census review of tune-up measures reported by the program.

The EM&V team made adjustments to the claimed savings for three projects. All three projects had an adjustment of greater than five percent than originally claimed savings. El Paso adjusted claimed

savings for all the projects and therefore the final program realization rate is 100 percent. Further details are provided below.

Project ID #953667: The energy efficiency project involved lighting retrofits within the administrative area of a building that is located on the campus of a college. The reported savings assumed a building type of Education: College/University, which calculated the savings based on the deemed values for annual operating hours and coincidence factor (3,577/0.69) for this building type. The desk review found that while the building was clearly part of a university/college campus, its primary function where the lighting retrofits took place, were an administrative office setting with most rooms identified and labeled as office space. The EM&V team found the project qualified more appropriately as an Office building type, which was more representative of the actual function of the space. This adjustment increased the deemed values for annual operating hours and coincidence factor (3,737/0.77), which resulted in a 4 percent increase in the evaluated energy savings and a 12 percent increase in the evaluated demand savings as compared to the reported lighting project savings. This project did not receive an on-site visit.

Project ID #955011 and #955012: Four tune-up measures were reported by the Texas SCORE MTP with reported savings of 3 kW and 3,518 kWh. During the engineering review of the tune-up measures, the EM&V team confirmed that the program is currently calculating reported savings for tune-up measures using stipulated energy loss factors based on the average statewide M&V results for tune-up measurements collected from PY2011 through PY2015. A review of the PY2015 and PY2016 statewide M&V datasets indicated the efficiency loss factors being calculated for recent years is diverging from the aggregated average since PY2011. This could be due to potential changes in the marketplace (e.g., more efficient units in current year measures, improved accuracy of results from more experienced contractors, new testing tools in use, automation of testing procedures). After a discussion with the utility and implementer, the EM&V team relied on the pre and post tune-up measurements that were collected as part of the M&V tune-up protocol during PY2016 for El Paso Electric to evaluate the efficiency loss factors. The evaluated savings were determined by applying the EPE specific efficiency loss factors using the formulas from the CoolSaver Option A EM&V Plan. Overall, the evaluated savings, at 2 kW and 3,100 kWh, were less than the reported savings. These adjustments resulted in a 12 percent decrease in the evaluated energy savings and a 16 percent decrease in the evaluated demand savings.

The EM&V team was able to verify key inputs and assumptions (e.g., equipment quantity and specifications) for four of the four projects that had desk reviews completed because sufficient documentation was provided for the sites. Since sufficient documentation was provided for 100 percent of the sampled projects, the program documentation for these estimates is Good.

4.3 DETAILED FINDINGS—LOAD MANAGEMENT (MEDIUM EVALUATION PRIORITY)

4.3.1 Load Management Standard Offer Program

Program Contribution To Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Program Documentation Score
59.4%	7,599	7,599	100.0%	0.1%	22,796	22,796	100.0%	Good

Completed Desk Reviews*	On-Site M&V
0	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 review for the load management program included a census 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.

The EM&V team evaluated the PY2016 El Paso Electric Load Management Standard Offer Program by applying the TRM calculation methodology to interval (30 minute increment) meter data. Two load management events occurred during PY2016. The dates and times were:

- June 10, 2016 from 1:00 p.m. to 2:30 p.m. (scheduled)
- July 5, 2016 from 4:00 p.m. to 5:30 p.m. (unscheduled).

El Paso Electric supplied the EM&V team with 30 minute interval meter data, individual participant savings, and participant event level savings results. There were 16 participants with two events (32 participant event level savings results). Additionally, the EM&V team received spreadsheets showing El Paso Electric's construction of participant level savings from meter data. Finally, the EM&V team received a workbook that contained summary results for each participant, event, and calculated program savings.

The EM&V team applied the TRM methodology (High 5 of 10) to the meter data and compared the participant event level savings to the El Paso Electric results. The EM&V team found two issues—one general issue and one specific to a participant. El Paso Electric's initial calculations allowed for Memorial Day to be included as a potential baseline day for the June 10th event. Memorial Day was included baseline day for a subset of the participants. El Paso Electric provided the EM&V team with updated meter files and a recalculation of savings that excluded Memorial Day. With that update, the savings calculations were in agreement. The second issue related to a participant on an interruptible tariff that had an interruption overlapping the load management event on July 5th. The practice is for the tariff to first show reduced load down to the firm load delivery, with additional load management savings calculated as net of the firm load delivery. The initial calculations had shown the savings as the firm load delivery. In working with El Paso Electric, the EM&V team resolved the interruptible tariff issue, with El Paso Electric updating the participants' savings in agreement with the EM&V team. The total kW adjustment from the initial kW savings came to -187 kW..

Evaluated Savings for the El Paso Electric Load Management SOP are 7,599 kW and 22,796 kWh. The realization rate for kW is 100 percent and the realization rate for kWh is also 100 percent.

4.4 SUMMARY OF LOW PRIORITY EVALUATION PROGRAMS

Table 4-4 provides a summary of claimed savings for El Paso Electric's low evaluation priority programs in PY2016, including programs' overall contribution to portfolio savings. Low priority programs' claimed savings were verified against the final PY2016 tracking data provided to the EM&V team for the EM&V database.

Table 4-4. PY2016 Claimed Savings (Low Evaluation Priority Programs)

Program	Program Contribution To Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)
Small Commercial Solutions MTP	6.7%	852	847	99.5%	16.8%	3,856,747	3,850,323	99.8%
Hard-to-Reach Solutions MTP	7.2%	924	924	100.0%	6.4%	1,460,375	1,460,375	100.0%
Residential Solutions MTP	3.5%	452	452	100.0%	3.6%	814,716	814,716	100.0%
LivingWise MTP	1.7%	220	220	100.0%	3.2%	727,635	727,635	100.0%

5.0 IMPACT EVALUATION RESULTS—ENERGY TEXAS, INC.

This section presents the evaluated savings and cost-effectiveness results for Entergy’s energy efficiency portfolio. The key findings are summarized first, followed by details for each program in the portfolio that had a high or medium evaluation priority. Finally, a list of the low evaluation priority for which claimed savings were only verified through the EM&V Database are included.

5.1 KEY FINDINGS

5.1.1 Evaluated Savings

Entergy’s evaluated savings for PY2016 were 19,578 in demand (kW) and 44,616,971 in energy (kWh) savings with realization rates slightly below 100 percent for both kW and kWh due to adjustments in AC tune-ups’ claimed savings. Table 5-1 shows the claimed and evaluated demand savings for Entergy’s portfolio and broad customer sector/program categories for PY2016.

Table 5-1. Entergy Program Year 2016 Claimed and Evaluated Demand Savings

Level of Analysis	Percent Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Precision at 90% Confidence
Total Portfolio	100.0%	19,739	19,578	99.2%	0.0%
Commercial Sector	25.9%	5,105	4,945	96.9%	0.1%
Residential Sector	29.8%	5,885	5,885	100.0%	0.0%
Load Management	44.3%	8,749	8,749	100.0%	0.0%

* The residential sector realization rate is based on a census review of deemed measures to verify they were calculated in accordance with the PY2016 TRM 3.1.

** 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 Entergy’s portfolio and broad customer sector/program categories for PY2016.

Table 5-2. Entergy Program Year 2016 Claimed and Evaluated Energy Savings

Level of Analysis	Percent Portfolio Savings (kWh)	Claimed Demand Savings (kWh)	Evaluated Demand Savings (kWh)	Realization Rate (kWh)	Precision at 90% Confidence
Total Portfolio	100.0%	45,044,145	44,616,971	99.1%	3.2%
Commercial Sector	54.3%	24,472,842	24,045,667	98.3%	6.0%
Residential Sector	45.6%	20,553,975	20,553,975	100.0%	0.0%
Load Management	0.0%	17,329	17,329	100.0%	0.0%

* The residential sector realization rate is based on a census review of deemed measures to verify they were calculated in accordance with the PY2016 TRM 3.1.

** 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 for medium-evaluation priority programs 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.

In program-level realization rates, we have also included a program documentation score of good, fair, or limited as discussed in Section 3. For the overall utility program documentation score, the score of “good” was given if 90 percent or more of the evaluated savings estimates received a score of good or fair due to program documentation received as indicated in detailed program findings. A score of “fair” was given if 70 percent–89 percent of the evaluated savings estimates received a score of good or fair. A score of “limited” was given if less than 70 percent of savings received score of good or fair. In general, a score of “good” indicates the utility has established processes to collect sufficient documentation to verify savings; a score of “fair” also indicates established processes with some areas of improvements identified; and a score of “limited” indicates program documentation improvements across more individual programs and/or high savings programs have been identified. Entergy’s medium priority programs received documentation scores of “good”.

5.1.2 Cost-Effectiveness Results

Entergy’s overall portfolio had a cost-effectiveness of 3.01.

The more cost-effective programs were Commercial Solutions MTP and Entergy Solutions Premium Homes MTP. The less cost-effective programs were Load Management SOP and A/C Distributor MTP. The A/C Distributor MTP did not pass cost-effectiveness; however, PY2016 is its first year of implementation.

The lifetime cost of PY2016 evaluated savings was \$0.009 per kWh and \$14.61 per kW.

Table 5-3. Entergy Cost-Effectiveness Results

Level of Analysis	Claimed Savings Results	Evaluated Savings Results	Net Savings Results
Total Portfolio	3.01	2.98	2.50
Commercial	3.56	3.48	2.96

Level of Analysis	Claimed Savings Results	Evaluated Savings Results	Net Savings Results
Commercial Solutions MTP	3.56	3.48	2.96
Residential	2.79	2.79	2.28
Residential SOP	3.51	3.51	2.74
Entergy Solutions Premium Homes MTP	3.68	3.68	2.58
A/C Distributor MTP	0.74	0.74	0.59
Hard-to-Reach SOP	1.95	1.95	1.95
Load Management	1.61	1.61	1.61
Load Management SOP	1.61	1.61	1.61

5.2 DETAILED FINDINGS—COMMERCIAL (HIGH/MEDIUM EVALUATION PRIORITY)

5.2.1 Commercial Market Transformation Programs

5.2.1.1 Commercial Solutions Market Transformation Program

Program Contribution To Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Program Documentation Score
25.9%	5,105	4,945	96.9%	54.3%	24,472,842	24,045,667	98.3%	Good

Completed Desk Reviews*	On-site M&V
8	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.

Desk reviews were performed for all sites where on-site M&V was performed to ensure consistency between on-site results and desk review results.

The PY2016 Commercial Solutions MTP evaluation efforts focused on desk reviews and on-site M&V. The sample of completed desk reviews and on-site M&V projects for this program are listed above. In addition, the engineering review for the program included a census review of tune-up measures reported by the program.

The EM&V team made an adjustment to the claimed savings for one lighting project and 78 tune-up participants. The lighting project had an adjustment of less than five percent, however, the tune-ups had adjustments of greater than five percent and further details for the tune-up adjustments are provided below by that measure type.

All tune-up measures: Seventy-eight participants with a total of 544 tune-up measures were reported by the Commercial Solutions MTP with reported savings of 726 kW and 2,020,706 kWh. During the engineering review of the tune-up measures, the EM&V team confirmed that the program is currently calculating reported savings for tune-up measures using stipulated energy loss factors based on the average statewide M&V results for tune-up measurements collected from PY2011 through PY2016. A review of the PY2015 and PY2016 statewide M&V datasets indicated the efficiency loss factors being calculated for recent years is diverging from the aggregated average since PY2011. This could be due to potential changes in the marketplace (e.g., more efficient units in current year measures, improved accuracy of results from more experienced contractors, new testing tools in use, automation of testing procedures). After initial discussions with the utility and implementer, the EM&V team relied on the pre and post tune-up measurements that were collected as part of the M&V tune-up protocol during PY2016 across the state in Texas to evaluate the efficiency loss factors. The evaluated savings were determined by applying the statewide average efficiency loss factors using the formulas from the CoolSaver Option A EM&V Plan. The EM&V team also found that in PY2016, a large number of commercial tune-ups were completed with unique results as compared to the residential unit tune-ups. Therefore, separate efficiency loss factors were determined for each of the sectors and applied separately to their respective participants. Overall, the initial evaluated savings, at 562 kW and 1,562,397 kWh, were less than the reported savings. These adjustments resulted in a 23 percent decrease in the evaluated energy and demand savings for these measures. After further discussions with the utility, a decision to use only Entergy’s PY2016 M&V tune-up results and not a statewide average was made. This further resulted in a 100 realization rate for this measure. The EM&V team notes that the Entergy PY2016 M&V tune-up sample was small with only 46 full M&V measurements completed (17 without a refrigerant charge and 29 with a refrigerant charge). Due to the small sample size and also the variability found in the M&V sample, the EM&V team used the statewide M&V data was for evaluated savings, but did not recommend any savings adjustments based on Entergy’s PY2016 M&V data.

The EM&V team was able to verify key inputs and assumptions (e.g., equipment quantity and specifications, DLC certifications, AHRI certifications) for eight of the eight projects that had desk reviews completed because sufficient documentation was provided for the sites. Since sufficient documentation was provided for 100 percent of the sampled projects, the program documentation for these estimates is Good.

5.3 DETAILED FINDINGS—LOAD MANAGEMENT (HIGH/MEDIUM EVALUATION PRIORITY)

5.3.1 Load Management Standard Offer Program

Program Contribution To Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Program Documentation Score
44.3%	8,749	8,749	100.0%	0.0%	17,329	17,329	100.0%	Good

Completed Desk Reviews*	On-site M&V
0	0

* The review for the load management program included a census 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.

The EM&V team evaluated Entergy’s Load Management Standard Offer Program by applying the TRM calculation methodology to interval meter data. The meter data was supplied in 15 minute increments at the ESIID level. Three load management events occurred during PY2016. The dates and times were:

- June 16, 2016 from 1 p.m. to 2 p.m. (scheduled)
- June 29, 2016 from 1 p.m. to 2 p.m. (scheduled)
- September 9, 2016 from 1 p.m. to 2 p.m. (unscheduled).

Depending on the meter, one group of participants controlled loads on the scheduled event of June 16th, while another group of meters controlled loads on the scheduled event of June 29th.

Entergy supplied the EM&V team with individual participant results for each event and 15 minute interval meter data from which to evaluate savings. Entergy supplied the total PY2016 kW and kWh claimed for the program year.

The savings calculated by EM&V team matched with those provided by Entergy with one minor exception. One meter had an unusual situation in which potential baseline days in the High 5 of 10 method had the same load. The effect on savings calculations relate to the pre-event adjustment period. While the loads during event hours on baseline days may be the same, the pre-event hours on baseline days may differ and affect the day-of adjustment to the baseline. In TRM 4.0, in effect for PY2017, but not PY2016, this situation is addressed, with the days closest to the event day selected if the loads “tie” in terms of event-hour baseline days. The effect on savings is minor for the meter in question and similar to a rounding difference. As a result, the EM&V team made no adjustment to the claimed savings.

Evaluated savings for the Entergy Load Management SOP were 8,749 kW and 17,329 kWh. The realization rate for kW was 100 percent and the realization rate for kWh was 100 percent.

5.4 SUMMARY OF LOW PRIORITY EVALUATION PROGRAMS

Table 1-4 provides a summary of claimed savings for Entergy’s low evaluation priority programs in PY2016, including programs’ overall contribution to portfolio savings. Low priority programs’ claimed savings were verified against the final PY2016 tracking data provided to the EM&V team for the EM&V Database.

Table 5-4. PY2016 Claimed Savings (Low Evaluation Priority Programs)

Program	Contribution to Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Contribution to Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)
Residential SOP	17.1%	3,378	3,378	100.0%	27.0%	12,162,000	12,162,000	100.0%
Hard-to-Reach SOP	7.2%	1,424	1,424	100.0%	11.0%	4,977,213	4,977,213	100.0%
Entergy Solutions Premium Homes MTP	4.8%	941	941	100.0%	6.7%	3,017,682	3,017,682	100.0%
A/C Distributor MTP	0.7%	141	141	100.0%	0.9%	397,080	397,080	100.0%

6.0 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 that had a high or medium evaluation priority. Finally, a list of the low evaluation priority for which claimed savings were verified through the EM&V database are included.

6.1 KEY FINDINGS

6.1.1 Evaluated Savings

Oncor’s evaluated savings for PY2016 were 129,118 in demand (kW) and 199,673,742 in energy (kWh) savings. The overall kW portfolio realization rate is 100.2 percent due to slightly higher evaluated savings for the commercial sector. The overall portfolio realization rate for kWh is 100.5 also due to the commercial sector.

Table 6-1 shows the claimed and evaluated demand savings for Oncor’s portfolio and broad customer sector/program categories for PY2016.

Table 6-1. Oncor PY2016 Claimed and Evaluated Demand Savings

Level of Analysis	Percent Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Precision at 90% Confidence
Total Portfolio	100.0%	128,831	129,118	100.2%	0.3%
Commercial	15.0%	19,312	19,599	101.5%	1.6%
Residential	33.0%	42,464	42,464	100.0%	0.0%
Low Income	1.7%	2,152	2,152	100.0%	n/a
Load Management	46.6%	60,017	60,017	100.0%	0.0%
Pilot	3.8%	4,886	4,886	100.0%	0.0%

*The residential sector realization rate is based on a census review of deemed measures to verify they were calculated in accordance with the PY2016 TRM 3.1.

** The review for the load management program included a census 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 Oncor’s portfolio and broad customer sector/program categories for PY2016.

Table 6-2. Oncor PY2016 Claimed and Evaluated Energy Savings

Level of Analysis	Percent Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Precision at 90% Confidence
Total Portfolio	100.0%	198,777,156	199,673,742	100.5%	0.8%
Commercial	45.2%	89,863,178	90,759,763	101.0%	0.9%
Residential	52.7%	104,789,032	104,789,032	100.0%	0.0%
Low Income	2.0%	3,915,584	3,915,584	100.0%	n/a
Load Management	0.1%	180,050	180,050	100.0%	0.0%
Pilot	0.0%	29,313	29,313	100.0%	0.0%

*The residential sector realization rate is based on a census review of deemed measures to verify they were calculated in accordance with the PY2016 TRM 3.1.

** The review for the load management program included a census 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.

In program-level realization rates, we have also included a program documentation score of good, fair, or limited as discussed in Section 3. For the overall utility program documentation score, the score of “good” was given if 90 percent or more of the evaluated savings estimates received a score of good or fair due to program documentation received as indicated in detailed program findings. A score of “fair” was given if 70 percent–89 percent of the evaluated savings estimates received a score of good or fair. A score of “limited” was given if less than 70 percent of savings received score of good or fair. In general, a score of “good” indicates the utility has established processes to collect sufficient documentation to verify savings; a score of “fair” also indicates established processes with some areas of improvements identified; and a score of “limited” indicates program documentation improvements across more individual programs and/or high savings programs have been identified. Oncor received a good kW program documentation score and a good kWh program documentation score for PY2016.

6.1.2 Cost-Effectiveness Results

Oncor’s overall portfolio had a cost-effectiveness of 2.23, or 2.43 excluding low-income programs.

The more cost-effective programs were Commercial Standard Offer program (SOP) and Home Energy Efficiency SOP. The less cost-effective programs were Targeted Weatherization Low Income SOP and Residential Demand Response Pilot Market Transformation program (MTP). All of Oncor’s programs passed cost-effectiveness testing.

The lifetime cost of PY2016 evaluated savings was \$0.011 per kWh and \$17.55 per kW.

Table 6-3. Oncor Cost-Effectiveness Results

Level of Analysis	Claimed Savings Results	Evaluated Savings Results	Net Savings Results
Total Portfolio	2.22	2.23	1.92
Total Portfolio excluding low-income programs	2.42	2.43	2.09
Commercial	2.67	2.69	2.34
Commercial SOP (Basic)	3.29	3.35	2.69
Small Business Direct Install MTP	1.66	1.66	1.58
Solar PV SOP	2.07	2.07	2.09
Healthcare MTP	1.57	1.58	1.34
Commercial SOP (Custom)	3.44	3.45	2.74
Residential	2.38	2.38	2.01
Home Energy Efficiency SOP	2.85	2.85	2.22
Solar PV SOP	1.54	1.54	1.47
Hard-to-Reach SOP	1.92	1.92	1.92
Low Income*	1.11	1.11	1.11
Targeted Weatherization LI SOP*	1.11	1.11	1.11
Load Management	1.38	1.38	1.38
Commercial Load Management SOP	1.38	1.38	1.38
Pilot	1.19	1.19	1.19
Residential Demand Response Pilot MTP	1.19	1.19	1.19

* The Low-Income sector and Low Income Weatherization program are evaluated using the savings-to-investment ratio (SIR).

6.2 DETAILED FINDINGS—COMMERCIAL (HIGH/MEDIUM EVALUATION PRIORITY)

6.2.1 Commercial Standard Offer

6.2.1.1 Commercial Standard Offer Program (Basic)

Program Contribution To Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution to Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Program Documentation Score
6.8%	8,717	8,990	103.1%	25.5%	50,603,754	51,470,244	101.7%	Good

Completed Desk Reviews*	On-Site M&V
4	2

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

The PY2016 Basic CSOP evaluation efforts focused on desk reviews and on-site M&V. The sample of completed desk reviews and on-site M&V projects for this program are listed above.

The EM&V team made an adjustment to the claimed savings for two projects. One project had an adjustment of less than five percent and one had an adjustment of greater than five percent and for whom further details are provided below.

Project ID #944639: The energy efficiency project involved a lighting retrofit at a non-refrigerated warehouse. During the desk review and on-site M&V visit, the EM&V team identified multiple adjustments needed within the reported lighting savings calculations. During the desk review, the pre-inspection documents indicated that two additional pre-project fixtures were found not operating. The post-inspection documents also found one fewer linear fluorescent fixture than were present in the final calculator. The calculator was updated so that correct quantities reflected the utilities inspection documents. The desk review savings adjustment resulted in slightly lower savings. During the on-site M&V visit of this lighting project, the EM&V team found that an adjustment in space air conditioning type from “non-conditioned” to “comfort conditioned” was needed. The warehouse used rooftop units to feed conditioned air down into the space. The warehouse space was maintained with conditioned air at the time of site visit. Per the site contact, the space was unoccupied for some time, but was recently leased out to a tenant. It is possible that at the time of the initial survey and post inspection by Oncor that the space had not yet been occupied, so the space air conditioning type was set to “non-conditioned” to reflect the actual operation at the time. Based on these results, the EM&V team updated the project savings, which resulted in a 3 percent increase in the evaluated energy savings and an 8 percent increase in the evaluated demand savings as compared to the reported project savings.

The EM&V team was able to verify key inputs and assumptions that went into the savings calculations for these projects, including equipment quantities and equipment specifications (e.g., wattages, efficiencies, ballast factors, etc.) for four of the four projects that had desk reviews completed because sufficient documentation was provided. Since sufficient documentation was provided for 90 percent of the sampled projects, the program documentation score for these estimates is Good.

6.2.1.2 Commercial Standard Offer Program (Custom)

Program Contribution To Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution to Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Program Documentation Score
1.4%	1,849	1,856	100.3%	8.0%	15,975,618	15,986,961	100.1%	Good

Completed Desk Reviews*	On-Site M&V
4	2

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

The PY2016 Custom CSOP evaluation efforts focused on desk reviews and on-site M&V. The sample of completed desk reviews and on-site M&V projects for this program are listed above.

The EM&V team made a savings adjustment for two projects. Both projects had an adjustment of less than one percent, therefore, it was not recommended that Oncor change their claimed savings since the difference was less than five percent. In addition, evaluated savings overall were not significantly impacted and nearly equal to the claimed savings, with realization rates for both kW and kWh equaling 100 percent. The EM&V team was able to verify key inputs and assumptions that went into the savings calculations for these projects, including equipment quantities and equipment specifications (e.g., wattages, efficiencies, ballast factors, etc.) for four of the four projects that had desk reviews completed because sufficient documentation was provided. Since sufficient documentation was provided for 90 percent of the sampled projects, the program documentation score for these estimates is Good.

6.3 DETAILED FINDINGS—LOAD MANAGEMENT (HIGH/MEDIUM EVALUATION PRIORITY)

6.3.1 Commercial Load Management Standard Offer Program

Program Contribution To Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution to Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Program Documentation Score
46.6%	60,017	60,017	100.0%	0.1%	180,050	180,050	100.0%	Good

Completed Desk Reviews*	On-Site M&V

*The review for the load management program included a census 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.

The EM&V team evaluated the PY2016 Oncor Commercial Load Management SOP by applying the TRM calculation methodology to interval meter data. The meter data was supplied in 15 minute increments at the Electric Service Identifier (ESI ID) level. A single load management event occurred

during PY2016 on June 15, 2016 and lasted three hours. The EM&V team also received detailed calculation spreadsheet worksheets used by Oncor to develop Oncor’s kW savings.

The EM&V team initially calculated savings as 10 percent higher than Oncor claimed. In discussion with Oncor, the EM&V team found that Oncor’s practice was to calculate the kW savings per the TRM High 5 of 10 method, but to cap program savings at the plan goal (60 MW). In reviewing the calculation details, the EM&V team found that its calculations matched those of Oncor’s at the meter level. The EM&V team accepts Oncor’s calculation of 60,017 kW as a conservative approach. kWh was calculated by multiplying the average kW savings with the number of event hours (3).

Evaluated savings for the Oncor Commercial Load Management SOP are 60,017 kW and 180,050 kWh. The realization rate for kW is 100 percent and the realization rate for kWh is 100 percent.

6.4 DETAILED FINDINGS—PILOT (HIGH/MEDIUM EVALUATION PRIORITY)

6.4.1 Residential Demand Response Pilot

Program Contribution To Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution to Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Program Documentation Score
3.8%	4,886	4,886	100.0%	0.0%	29,313	29,313	100.0%	Good

Completed Desk Reviews*	On-Site M&V

* The review for the load management program included a census 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.

The EM&V team evaluated the PY2016 Oncor Residential Demand Response Pilot Program by applying the TRM calculation methodology to interval meter data. The meter data was supplied in 15 minute increments at the ESI ID level, presented as kW data. Two load management events occurred during PY2016 – one on June 15, 2016 and one on September 8, 2016. Both events started at 3 p.m. and lasted three hours. The EM&V team also received ESI ID specific savings developed by Oncor for each residential participant’s events and average performance between both events.

The EM&V team applied the TRM approach using the High 3 of 5 method for developing the baseline. In that method, the event hours for the prior five non-holiday weekdays are analyzed, with the highest three selected and averaged to set the baseline. An adjustment factor is applied to the baseline by analyzing the hours for the baseline days’ and event day’s average demand two hours prior to the event to account for specific differences that can occur on event days. The adjustment can be additive or subtractive to the event hour’s baseline. Across the more than 5,000 meters participating in the program, the EM&V team’s analysis was nearly identical in total to Oncor’s, with exceedingly minor differences (0.3 kW in total) attributable to rounding, an impressive feat.

The EM&V team calculated 4,886 kW and Oncor calculated 4,886 kW as the average demand reduction between the two events, with the EM&V team finding a 100 percent realization rate. In the case of kWh, the EM&V team calculated total kWh savings for the six event hours at 29,312.7 kWh, a realization rate of 100 percent.

6.5 SUMMARY OF LOW PRIORITY EVALUATION PROGRAMS

Table 6-4 provides a summary of claimed savings for Oncor’s low evaluation priority programs in PY2016, including programs’ overall contribution to portfolio savings. Low priority programs’ claimed savings were verified against the final PY2016 tracking data provided to the EM&V team for the EM&V database.

Table 6-4. PY2016 Claimed Savings (Low Evaluation Priority Programs)

Program	Contribution to Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Contribution to Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)
Solar PV SOP	6.1%	7,859	7,859	100.0%	8.7%	17,253,019	17,253,019	100.0%
Healthcare MTP	0.4%	494	500	101.1%	1.9%	3,805,722	3,819,642	100.4%
Small Business Direct Install MTP	0.3%	392	392	100.0%	1.1%	2,225,065	2,225,065	100.0%
Home Energy Efficiency SOP	23.4%	30,137	30,137	100.0%	37.4%	74,366,440	74,366,440	100.0%
Hard-to-Reach SOP	5.9%	7,640	7,640	100.0%	10.1%	20,135,627	20,135,627	100.0%
Solar PV SOP	3.6%	4,687	4,687	100.0%	5.2%	10,286,966	10,286,966	100.0%
Targeted Weatherization LI SOP	1.7%	2,152	2,152	100.0%	2.0%	3,915,584	3,915,584	100.0%

7.0 IMPACT EVALUATION RESULTS—SHARYLAND

This section presents the evaluated savings and cost-effectiveness results for Sharyland’s energy efficiency portfolio. The key findings are summarized first, followed by details for each program in the portfolio that had a high or medium evaluation priority. Finally, a list of the low evaluation priority for which claimed savings were only verified through the EM&V database are included.

7.1 KEY FINDINGS

7.1.1 Evaluated Savings

Sharyland’s evaluated savings for PY2016 were 600 in demand (kW) and 2,212,449 in energy (kWh) savings. The overall kW and kWh portfolio realization rates are 100 percent. Table 4-1 shows the claimed and evaluated demand savings for Sharyland’s portfolio and broad customer sector/program categories for PY2016.

Table 7-1. Sharyland PY2016 Claimed and Evaluated Demand Savings

Level of Analysis	Percent Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Precision at 90% Confidence
Total Portfolio	100.0%	600	600	100.0%	0.1%
Commercial	15.8%	95	95	99.8%	0.7%
Residential	77.7%	467	467	100.0%	0.0%
Low Income	6.4%	39	39	100.0%	0.0%

*The residential sector realization rate is based on a census review of deemed measures to verify they were calculated in accordance with the PY2016 TRM 3.1.

** The review for the load management program included a census 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 Sharyland’s portfolio and broad customer sector/program categories for PY2016.

Table 7-2. Sharyland PY2016 Claimed and Evaluated Energy Savings

Level of Analysis	Percent Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Precision at 90% Confidence
Total Portfolio	100.0%	2,212,723	2,212,449	100.0%	0.1%
Commercial	18.7%	412,862	412,588	99.9%	0.3%
Residential	77.0%	1,704,764	1,704,764	100.0%	0.0%
Low Income	4.3%	95,097	95,097	100.0%	0.0%

*The residential sector realization rate is based on a census review of deemed measures to verify they were calculated in accordance with the PY2016 TRM 3.1.

** The review for the load management program included a census 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 for high and medium-evaluation priority programs 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.

In program-level realization rates, we have also included a program documentation score of good, fair, or limited as discussed in Section 3. For the overall utility program documentation score, the score of “good” was given if 90 percent or more of the evaluated savings estimates received a score of good or fair due to program documentation received as indicated in detailed program findings. A score of “fair” was given if 70 percent–89 percent of the evaluated savings estimates received a score of good or fair. A score of “limited” was given if less than 70 percent of savings received score of good or fair. In general, a score of “good” indicates the utility has established processes to collect sufficient documentation to verify savings; a score of “fair” also indicates established processes with some areas of improvements identified; and a score of “limited” indicates program documentation improvements across more individual programs and/or high savings programs have been identified. Sharyland received a good program documentation score for PY2016.³

7.1.2 Cost-Effectiveness Results

Sharyland’s overall portfolio had a cost-effectiveness of 2.36, or 2.66 without low-income programs.

The most cost-effective program was Open for Small/Medium Business Market Transformation program (MTP). The least cost-effective program was Customized Commercial MTP, which did not pass cost-effectiveness.

The lifetime cost of PY2016 savings was \$0.010 per kWh and \$15.60 per kW.

³ In PY2016, only high and medium priority programs received documentation scores. Therefore, overall documentation scores are based only on high and medium priority programs.

Table 7-3. Sharyland Cost-Effectiveness Results

Level of Analysis	Claimed Savings Results	Evaluated Savings Results	Net Savings Results
Total Portfolio	2.72	2.72	2.26
Total Portfolio excluding low-income programs	3.07	3.07	2.53
Commercial	2.85	2.85	2.56
Customized Commercial MTP	0.48	0.47	0.40
Open for Small/Medium Business MTP	4.28	4.28	3.85
Residential	3.11	3.11	2.52
Residential Standard Offer program (SOP)	3.39	3.39	2.64
Hard-to-Reach SOP	2.04	2.04	2.04
Low Income*	2.75	2.75	2.75
Targeted Low Income Weatherization Program*	2.75	2.75	2.75

* The Low-Income sector and Low Income Weatherization program are evaluated using the savings-to-investment ratio (SIR).

7.2 DETAILED FINDINGS—COMMERCIAL (HIGH/MEDIUM EVALUATION PRIORITY)

7.2.1 Open for Small/Medium Business Market Transformation Program

Program Contribution To Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution to Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Program Documentation Score
14.6%	87	87	100.0%	18.0%	398,222	398,222	100.0%	Good

Completed Desk Reviews*	On-Site M&V
1	1

The PY2016 Open for Small/Medium Business MTP evaluation efforts focused on desk reviews and on-site M&V. As the program only had one participant in PY2016, the EM&V completed a census review. No sample was needed for selection of the one desk review and on-site M&V project for this program as listed above.

The EM&V team made an adjustment to the claimed savings for one project. This project resulted in an adjustment greater than five percent and further details are provided below.

Details on the project specific savings adjustments are listed below by Project ID:

Project ID # 950594: The energy efficiency project involved a new construction lighting installation within the interior and exterior areas of a manufacturing facility. During the on-site M&V visit, the EM&V team found the predominant building type for the indoor lighting to be in line with a “non-refrigerated warehouse” as compared to the “manufacturing” building type that was claimed. This adjusted the deemed hours of use and summer peak coincidence factors from 5,740/73 percent for manufacturing to 3,501/77 percent for non-refrigerated warehouse. Based on these results, the EM&V team updated the project savings, which resulted in a 36 percent decrease in the evaluated energy savings and a 5 percent increase in the evaluated demand savings as compared to the reported project savings.

The EM&V team was able to verify key inputs and assumptions that went into the savings calculations for the project, including equipment quantities and equipment specifications (e.g., wattages, efficiencies) for the one project that had a desk review completed because sufficient documentation was provided. Only one parameter was not fully captured by the program documentation and that was the full model number of the lighting fixtures on the material invoices to fully confirm whether integrated controls were included or not as part of the equipment purchased. This would have helped to further confirm interior occupancy control and exterior photocell operation assumptions without a site visit. A post inspection was completed by the utility for which the controls were likely confirmed as the interior photos captured some fixtures with occupancy controls identified. Complete documentation enhances the accuracy and transparency of project savings along with ease of evaluation. Since sufficient documentation was provided for 100 percent of the sampled projects, the program documentation score for these estimates is Good.

7.2.2 Customized Commercial Market Transformation Program

Program Contribution To Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution to Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Program Documentation Score
1.3%	8	7	98.1%	0.7%	14,640	14,366	98.1%	Good

Completed Desk Reviews*	On-Site M&V
1	1

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

The PY2016 Customized Commercial MTP evaluation efforts focused on desk reviews and on-site M&V. As the program only had one participant in PY2016, the EM&V completed a census review. No sample was needed for selection of the one desk review and on-site M&V project for this program as listed above.

The EM&V team made adjustments to the claimed savings for one project. The project had an adjustment of less than three percent and therefore it was not recommended that Sharyland change their claimed savings since the difference was less than five percent. In addition, evaluated savings overall were not significantly impacted, with realization rates for both kW and kWh equaling 98 percent.

The EM&V team was able to verify key inputs and assumptions (e.g., equipment quantity and specifications) for the project that had a desk review completed because sufficient documentation was provided for the site. Since sufficient documentation was provided for 100 percent of the sampled projects, the program documentation score for these estimates is Good.

7.3 SUMMARY OF LOW PRIORITY EVALUATION PROGRAMS

Table 7-4 provides a summary of claimed savings for Sharyland's low evaluation priority programs in PY2016, including programs' overall contribution to portfolio savings. Low priority programs' claimed savings were verified against the final PY2016 tracking data provided to the EM&V team for the EM&V database.

Table 7-4. PY2016 Claimed Savings (Low Evaluation Priority Programs)

Program	Contribution to Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Contribution to Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)
Residential SOP	68.1%	409	409	100.0%	66.2%	1,464,974	1,464,974	100.0%
Hard-to-Reach SOP	9.6%	58	58	100.0%	10.8%	239,790	239,790	100.0%
Targeted Low Income Weatherization Program	6.4%	39	39	100.0%	4.3%	95,097	95,097	100.0%

8.0 IMPACT EVALUATION RESULTS—SOUTHWESTERN ELECTRIC POWER COMPANY

This section presents the evaluated savings and cost-effectiveness results for SWEPCO’s energy efficiency portfolio. The key findings are summarized first, followed by details for each program in the portfolio that had a high or medium evaluation priority. Finally, a list of the low evaluation priority for which claimed savings were verified through the EM&V Database are included.

8.1 KEY FINDINGS

8.1.1 Evaluated Savings

SWEPCO’s evaluated savings for PY2016 were 11,939 in demand (kW) 20,648,272 in energy (kWh) savings. Both the kW and kWh realization rates are 100 percent. Table 8-1 shows the claimed and evaluated demand savings for SWEPCO’s portfolio and broad customer sector/program categories for PY2016.

Table 8-1. SWEPCO Program Year 2016 Claimed and Evaluated Demand Savings

Level of Analysis	Percent Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Precision at 90% Confidence
Total Portfolio	100.0%	11,939	11,939	100.0%	0.3%
Commercial Sector	16.9%	2,018	2,018	100.0%	1.5%
Residential Sector	25.0%	2,986	2,986	100.0%	n/a
Load Management	58.1%	6,935	6,935	100.0%	0.0%

*The residential sector realization rate is based on a census review of deemed measures to verify they were calculated in accordance with the PY2016 TRM 3.1.

**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 SWEPCO’s portfolio and broad customer sector/program categories for PY2016.

Table 8-2. SWEPCO Program Year 2016 Claimed and Evaluated Energy Savings

Level of Analysis	Percent Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Precision at 90% Confidence
Total Portfolio	100.0%	20,648,105	20,647,945	100.0%	3.8%
Commercial Sector	54.3%	11,216,100	11,215,773	100.0%	3.8%
Residential Sector	45.3%	9,348,754	9,348,754	100.0%	n/a
Load Management	0.4%	83,251	83,418	100.2%	0.0%

*The residential sector realization rate is based on a census review of deemed measures to verify they were calculated in accordance with the PY2016 TRM 3.1.

**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 for high and medium-evaluation priority programs 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.

In program-level realization rates, we have also included a program documentation score of good, fair, or limited as discussed in Section 3. In general, a score of “good” indicates the utility has established processes to collect sufficient documentation to verify savings; a score of “fair” also indicates established processes with some areas of improvements identified; and a score of “limited” indicates program documentation improvements across more individual programs and/or high savings programs have been identified. SWEPCO received a good program documentation score for Commercial SOP, SCORE MTP and Commercial Solutions MTP for PY2016.⁴ We would like to particularly note and thank SWEPCO for their continued work to successfully improve CSOP program documentation scores and providing excellent file organization, file naming and backup documentation for projects.

8.1.2 Cost-Effectiveness Results

SWEPCO’s overall portfolio had a cost-effectiveness of 2.77.

The more cost-effective programs were SCORE MTP and Commercial SOP. The less cost-effective programs were Open MTP and Load Management SOP. All of SWEPCO’s programs were cost effective.

The lifetime cost of PY2016 evaluated savings was \$0.010 per kWh and \$15.69 per kW.

⁴ In PY2016, only high and medium priority programs received documentation scores.

Table 8-3. SWEPCO Cost-effectiveness Results

Level of Analysis	Claimed Savings Results	Evaluated Savings Results	Net Savings Results
Total Portfolio	2.77	2.77	2.39
Commercial	2.90	2.90	2.46
Commercial Solutions MTP	2.99	2.99	2.54
Commercial SOP	3.19	3.19	2.55
Open MTP	1.68	1.68	1.51
SCORE MTP	3.21	3.21	2.98
Residential	2.75	2.75	2.39
Residential SOP	3.04	3.04	2.37
Hard-to-Reach SOP	2.42	2.42	2.42
Load Management	1.87	1.87	1.87
Load Management SOP	1.87	1.87	1.87

8.2 DETAILED FINDINGS—COMMERCIAL (HIGH/MEDIUM EVALUATION PRIORITY)

8.2.1 Commercial Standard Offer Program

Program Contribution To Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Program Documentation Score
7.1%	842	842	100.0%	26.2%	5,413,907	5,413,580	100.0%	Good

Completed Desk Reviews*	On-site M&V
4	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.

Desk reviews were performed for all sites where on-site M&V was performed to ensure consistency between on-site results and desk review results.

The PY2016 CSOP evaluation efforts focused on desk reviews and on-site M&V. The sample of completed desk reviews and on-site M&V projects for this program are listed above.

The EM&V team made a savings adjustment for three projects. All three projects had an adjustment of less than one percent and therefore it was not recommended that SWEPCO change their claimed savings since the difference was less than five percent. In addition, evaluated savings overall were not

significantly impacted and nearly equal to the claimed savings, with realization rates for both kW and kWh equaling 100 percent.

The EM&V team was able to verify key inputs and assumptions (e.g., equipment quantity and specifications, DLC certifications) for four of the four projects that had desk reviews completed because sufficient documentation was provided for the sites. Since sufficient documentation was provided for 100 percent of the sampled projects, the program documentation for these estimates is Good.

8.2.2 Commercial Market Transformation Programs

8.2.2.1 SCORE Market Transformation Program

Program Contribution To Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Program Documentation Score
4.1%	484	484	100.0%	10.8%	2,230,001	2,230,001	100.0%	Good

Completed Desk Reviews*	On-site M&V
2	1

*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.

Desk reviews were performed for all sites where on-site M&V was performed to ensure consistency between on-site results and desk review results.

The PY2016 SCORE MTP evaluation efforts focused on desk reviews and on-site M&V. The sample of completed desk reviews and on-site M&V projects for this program are listed above.

The EM&V team made no adjustments to any of the savings calculations for the projects reviewed. Therefore, evaluated savings were equal to the claimed savings, with realization rates for both kW and kWh equaling 100 percent.

The EM&V team was able to verify key inputs and assumptions (e.g., equipment quantity, equipment specifications, M&V plan/report, custom calculations) for two of the two projects that had desk reviews completed because sufficient documentation was provided for the sites. Since sufficient documentation was provided for 100 percent of the sampled projects, the program documentation for these estimates is Good.

8.2.2.2 Commercial Solutions Market Transformation Program

Program Contribution To Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Program Documentation Score
3.8%	456	456	100.0%	12.1%	2,489,513	2,489,513	100.0%	Good

Completed Desk Reviews*	On-site M&V
2	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.

Desk reviews were performed for all sites where on-site M&V was performed to ensure consistency between on-site results and desk review results.

The PY2016 Commercial Solutions MTP evaluation efforts focused on desk reviews and on-site M&V. The sample of completed desk reviews and on-site M&V projects for this program are listed above.

The EM&V team made no adjustments to any of the savings calculations for the projects reviewed. Therefore, evaluated savings were equal to the claimed savings, with realization rates for both kW and kWh equaling 100 percent.

The EM&V team was able to verify key inputs and assumptions (e.g., equipment quantity and specifications) for two of the two projects that had desk reviews completed because sufficient documentation was provided for the sites. Since sufficient documentation was provided for 100 percent of the sampled projects, the program documentation for these estimates is Good.

8.3 DETAILED FINDINGS—LOAD MANAGEMENT (HIGH/MEDIUM EVALUATION PRIORITY)

8.3.1 Load Management Standard Offer Program

Program Contribution To Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Program Documentation Score
58.1%	6,935	6,935	100.0%	0.4%	83,251	83,418	100.2%	Good

Completed Desk Reviews*	On-site M&V
0	0

*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.

The EM&V team evaluated SWEPCO's Load Management Standard Offer Program by applying the TRM calculation methodology to interval meter data. The EM&V team received meter data in 15 minute increments at the ESIID level. A total of 12 load management events occurred during PY2016, though only four unscheduled events were used for purposes of developing program kW savings. The dates and times of the unscheduled events were:

- July 21, 2016 from 2 p.m. to 6 p.m.
- July 22, 2016 from 2 p.m. to 6 p.m.
- August 3, 2016 from 2 p.m. to 6 p.m.
- August 4, 2016 from 2 p.m. to 6 p.m.

The EM&V team analyzed the meter level data, calculating savings by following the TRM methodology. The EM&V team's calculated savings for the seven participants, across nine sites, aligned with the savings reported by SWEPCO to the EM&V team. Two sites did not participate in two of the events, but all other participants participated in all four events. Demand savings (kW) were developed by averaging each site's kW savings for the unscheduled events they participated in. Minor differences in the kW savings were due to rounding, with no material difference between the EM&V team and SWEPCO's analysis. Minor differences in kWh savings were due to one site and one unscheduled event, with the EM&V team calculating higher savings than SWEPCO. The EM&V team developed kWh savings by analyzing the individual hourly performance of each participant during both the scheduled and unscheduled events and summing the results.

Evaluated savings for the SWEPCO Load Management SOP were 6,935 kW and 83,418 kWh. The realization rate for kW is 100 percent and 100.2 percent for kWh.

8.4 SUMMARY OF LOW PRIORITY EVALUATION PROGRAMS

Table 8-4 provides a summary of claimed savings for SWEPCO's low evaluation priority programs in PY2016, including programs' overall contribution to portfolio savings. Low priority programs' claimed savings were verified against the final PY2016 tracking data provided to the EM&V team for the EM&V Database.

Table 8-4. PY2016 Claimed Savings (Low Evaluation Priority Programs)

Program	Contribution to Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Contribution to Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)
Open MTP	2.0%	236	236	100.0%	5.2%	1,082,679	1,082,679	100.0%
Residential SOP	14.8%	1,770	1,770	100.0%	26.2%	5,412,215	5,412,215	100.0%
Hard-to-Reach SOP	10.2%	1,217	1,217	100.0%	19.1%	3,936,540	3,936,540	100.0%

9.0 IMPACT EVALUATION RESULTS—TEXAS NEW MEXICO POWER COMPANY

This section presents the evaluated savings and cost-effectiveness results for Entergy’s energy efficiency portfolio. The key findings are summarized first, followed by details for each program in the portfolio that had a high or medium evaluation priority. Finally, a list of the low evaluation priority for which claimed savings were verified through the EM&V database are included.

9.1 KEY FINDINGS

9.1.1 Evaluated Savings

TNMP’s evaluated savings for PY2016 were 12,252 in demand (kW) and 21,718,653 in energy (kWh) savings. The overall kW portfolio realization rate is 100 percent and the overall portfolio realization rate for kWh is 100 percent.

Table 4-1 shows the claimed and evaluated demand savings for TNMP’s portfolio and broad customer sector/program categories for PY2016.

Table 4-1. TNMP PY2016 Claimed and Evaluated Demand Savings

Level of Analysis	Percent Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Precision at 90% Confidence
Total Portfolio	100.0%	12,253	12,252	100.0%	0.0%
Commercial	17.3%	2,124	2,124	100.0%	0.1%
Residential	31.1%	3,809	3,809	100.0%	n/a
Low Income	3.6%	438	438	100.0%	n/a
Load Management	47.9%	5,873	5,873	100.0%	0.0%
Pilot	0.1%	8	8	100.0%	n/a

*The residential sector realization rate is based on a census review of deemed measures to verify they were calculated in accordance with the PY2016 TRM 3.1.

** The review for the load management program included a census 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 TNMP’s portfolio and broad customer sector/program categories for PY2016.

Table 4-2. TNMP PY2016 Claimed and Evaluated Energy Savings

Level of Analysis	Percent Portfolio Savings (kWh)	Claimed Savings (kWh)	Evaluated Demand Savings (kWh)	Realization Rate (kWh)	Precision at 90% Confidence
Total Portfolio	100.0%	21,716,040	21,718,653	100.0%	0.0%
Commercial	43.7%	9,480,574	9,483,187	100.0%	0.0%
Residential	52.6%	11,425,075	11,425,075	100.0%	n/a
Low Income	3.5%	764,801	764,801	100.0%	n/a
Load Management	0.0%	5,873	5,873	100.0%	0.0%
Pilot	0.2%	39,717	39,717	100.0%	n/a

*The residential sector realization rate is based on a census review of deemed measures to verify they were calculated in accordance with the PY2016 TRM 3.1.

** The review for the load management program included a census 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.

In program-level realization rates, we have also included a program documentation score of good, fair, or limited as discussed in Section 3. For the overall utility program documentation score, the score of “good” was given if 90 percent or more of the evaluated savings estimates received a score of good or fair due to program documentation received as indicated in detailed program findings. A score of “fair” was given if 70 percent to 89 percent of the evaluated savings estimates received a score of good or fair. A score of “limited” was given if less than 70 percent of savings received score of good or fair. In general, a score of “good” indicates the utility has established processes to collect sufficient documentation to verify savings; a score of “fair” also indicates established processes with some areas of improvements identified; and a score of “limited” indicates program documentation improvements across more individual programs and/or high savings programs have been identified. TNMP received a good program documentation score for PY2016.⁵

9.1.2 Cost-Effectiveness Results

TNMP’s overall portfolio had a cost-effectiveness of 2.22, or 2.38 excluding low-income programs.

The more cost-effective programs were High Performance New Homes market transformation program (MTP) and Commercial Solutions MTP. The less cost-effective programs were Load Management standard offer program (SOP) and Open for Small Business MTP. The Education Kits program, which was in its first year of operation, did not pass cost-effectiveness, but it is not planned to continue in PY2017. The Efficiency Connection Pilot was in its first year of operation, so was not required to pass cost-effectiveness.

The lifetime cost of PY2016 evaluated savings was \$0.010 per kWh and \$15.87 per kW.

⁵ In PY2016, only high and medium priority programs received documentation scores. Therefore, overall documentation scores are based only on high and medium priority programs.

Table 4-3. TNMP Cost-Effectiveness Results

Level of Analysis	Claimed Savings Results	Evaluated Savings Results	Net Savings Results
Total Portfolio	2.22	2.22	1.86
Total Portfolio excluding low-income programs	2.38	2.38	1.97
Commercial	2.29	2.29	2.03
Open for Small Business MTP	1.56	1.56	1.41
SCORE/CitySmart MTP	2.19	2.19	2.04
Commercial Solutions MTP	3.00	3.00	2.55
Residential	2.60	2.60	2.05
High Performance New Homes MTP	3.34	3.34	2.34
Residential SOP	2.68	2.68	2.09
Hard-to-Reach SOP	1.99	1.99	1.99
Education Kits	0.72	0.72	0.57
Low Income*	2.35	2.35	2.35
Low Income Weatherization*	2.35	2.35	2.35
Load Management	1.16	1.16	1.16
Load Management SOP	1.16	1.16	1.16
Pilot	0.83	0.83	0.75
Efficiency Connection Pilot MTP	0.83	0.83	0.75

* The Low-Income sector and Low Income Weatherization program are evaluated using the savings-to-investment ratio (SIR).

9.2 DETAILED FINDINGS—COMMERCIAL (HIGH/MEDIUM EVALUATION PRIORITY)

9.2.1 Commercial Solutions Market Transformation Program

Program Contribution To Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution to Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Program Documentation Score
7.3%	891	891	100.0%	22.8%	4,947,257	4,947,257	100.0%	Good

Completed Desk Reviews*	On-Site M&V
4	2

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

Desk reviews were performed for all sites where on-site M&V was performed to ensure consistency between on-site results and desk review results.

The PY2016 Commercial Solutions MTP evaluation efforts focused on desk reviews and on-site M&V. The sample of completed desk reviews and on-site M&V projects for this program are listed above.

The EM&V team made no adjustments to any of the savings calculations for the projects reviewed. Therefore, evaluated savings were equal to the claimed savings, with realization rates for both kW and kWh equaling 100 percent.

The EM&V team was able to verify key inputs and assumptions that went into the savings calculations for these projects, including equipment quantities and equipment specifications (e.g., wattages, efficiencies) for two of the two projects that had desk reviews completed because sufficient documentation was provided. Since sufficient documentation was provided for 100 percent of the sampled projects, the program documentation score for these estimates is Good.

9.2.2 SCORE/CitySmart Market Transformation Program

Program Contribution To Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution to Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Program Documentation Score
6.5%	801	801	99.9%	10.5%	2,286,567	2,289,180	100.1%	Good

Completed Desk Reviews*	On-Site M&V
4	2

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

Desk reviews were performed for all sites where on-site M&V was performed to ensure consistency between on-site results and desk review results.

The PY2016 SCORE/CitySmart MTP evaluation efforts focused on desk reviews and on-site M&V. The sample of completed desk reviews and on-site M&V projects for this program are listed above.

The EM&V team made adjustments to the claimed savings for one project. The project had an adjustment of less than three percent and therefore it was not recommended that TNMP change their claimed savings since the difference was less than five percent. In addition, evaluated savings overall were not significantly impacted and nearly equal to the claimed savings, with realization rates for both kW and kWh equaling 100 percent.

The EM&V team was able to verify key inputs and assumptions that went into the savings calculations for these projects, including equipment quantities and equipment specifications (e.g., wattages, efficiencies) for two of the two projects that had desk reviews completed because sufficient documentation was provided. Since sufficient documentation was provided for 100 percent of the sampled projects, the program documentation score for these estimates is Good.

9.3 DETAILED FINDINGS—LOAD MANAGEMENT (HIGH/MEDIUM EVALUATION PRIORITY)

9.3.1 Load Management Standard Offer Program

Program Contribution To Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution to Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Program Documentation Score
48.1%	5,873	5,873	100.0%	0.0%	5,873	5,873	100.0%	Good

Completed Desk Reviews*	On-Site M&V
0	0

* The review for the load management program included a census 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.

The EM&V team evaluated TNMP’s Load Management SOP by applying the TRM calculation methodology to interval meter data. The meter data was supplied in 15 minute increments at the Electric Service Identifier (ESIID) level. One load management event occurred during PY2016, on June 8, 2016 from 2 p.m. to 3 p.m.

From TNMP the EM&V team received meter level data covering the event and baseline time periods in 15 minute intervals. Additionally, the EM&V team received savings results for 96 meters across 9 sponsors. The EM&V team analyzed the meter data to calculate site level savings by applying the TRM High 5 of 10 baseline methodology. The EM&V team compared its site level savings results to those supplied by TNMP. TNMP’s calculations matched the EM&V team’s results for both kW and kWh. Evaluated savings for the TNMP Load Management SOP were 3,873 kW and 3,873 kWh. The realization rate for kW was 100 percent and the realization rate for kWh was 100 percent.

9.4 SUMMARY OF LOW PRIORITY EVALUATION PROGRAMS

Table 1-4 provides a summary of claimed savings for TNMP's low evaluation priority programs in PY2016, including programs' overall contribution to portfolio savings. Low priority programs' claimed savings were verified against the final PY2016 tracking data provided to the EM&V team for the EM&V database.

Table 9-4. TNMP PY2016 Claimed Savings (Low Evaluation Priority Programs)

Program	Contribution to Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Contribution to Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)
Open for Small Business MTP	3.5%	432	432	100.0%	10.3%	2,246,750	2,246,750	100.0%
Residential SOP	20.3%	2,487	2,487	100.0%	33.6%	7,302,157	7,302,157	100.0%
High Performance New Homes MTP	6.6%	808	808	100.0%	12.1%	2,638,239	2,638,239	100.0%
Hard-to-Reach SOP	3.8%	463	463	100.0%	6.1%	1,319,595	1,319,595	100.0%
Education Kits	0.4%	51	51	100.0%	0.8%	165,085	165,000	99.9%
Low Income Weatherization	3.6%	438	438	100.0%	3.5%	764,801	764,801	100.0%
Efficiency Connection Pilot MTP	0.1%	8	8	100.0%	0.2%	39,717	39,717	100.0%

10.0 IMPACT EVALUATION RESULTS—XCEL ENERGY SOUTHWESTERN PUBLIC SERVICE COMPANY

This section presents the evaluated savings and cost-effectiveness results for Xcel SPS’s energy efficiency portfolio. The key findings are summarized first, followed by details for each program in the portfolio that had a high or medium evaluation priority. Finally, a list of the low evaluation priority for which claimed savings were only verified through the EM&V database are included.

10.1 KEY FINDINGS

10.1.1 Evaluated Savings

Xcel SPS Electric’s evaluated savings for PY2016 were 8,187 in demand (kW) and 14,450,414 in energy (kWh) savings. The overall kW and kWh portfolio realization rates are 100 percent. Xcel SPS was responsive to all EM&V recommendations to adjust claimed savings based on EM&V results.

Table 10-1 shows the claimed and evaluated demand savings for Xcel SPS’s portfolio and broad customer sector/program categories for PY2016.

Table 10-1. Xcel SPS PY2016 Claimed and Evaluated Demand Savings

Level of Analysis	Percent Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Precision at 90% Confidence
Total Portfolio	100.0%	8,188	8,187	100.0%	0.9%
Commercial	21.7%	1,775	1,774	100.0%	3.9%
Residential	19.5%	1,600	1,600	100.0%	0.0%
Low-Income	3.0%	242	242	100.0%	0.0%
Load Management	55.8%	4,571	4,571	100.0%	0.0%

* The residential sector realization rate is based on a census review of deemed measures to verify they were calculated in accordance with the PY2016 TRM 3.1.

** The review for the load management program included a census 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 Xcel SPS’s portfolio and broad customer sector/program categories for PY2016.

Table 10-2. Xcel SPS PY2016 Claimed and Evaluated Energy Savings

Level of Analysis	Percent Portfolio Savings (kWh)	Claimed Demand Savings (kWh)	Evaluated Demand Savings (kWh)	Realization Rate (kWh)	Precision at 90% Confidence
Total Portfolio	100.0%	14,451,094	14,450,414	100.0%	1.6%
Commercial	58.4%	8,434,071	8,433,391	100.0%	2.8%
Residential	36.5%	5,278,590	5,278,590	100.0%	0.0%
Low-Income	4.9%	706,546	706,546	100.0%	0.0%
Load Management	0.2%	31,887	31,887	100.0%	0.0%

* The residential sector realization rate is based on a census review of deemed measures to verify they were calculated in accordance with the PY2016 TRM 3.1.

** The review for the load management program included a census 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.

In program-level realization rates, we have also included a program documentation score of good, fair, or limited as discussed in Section 3. In general, a score of “good” indicates the utility has established processes to collect sufficient documentation to verify savings; a score of “fair” also indicates established processes with some areas of improvements identified; and a score of “limited” indicates program documentation improvements across more individual programs and/or high savings programs have been identified. Xcel SPS received a fair program documentation score for Commercial SOP and Retro-Commissioning MTP for PY2016.⁶

10.1.2 Cost-Effectiveness Results

Xcel SPS’s overall portfolio had an evaluated cost-effectiveness of 2.42, or 2.63 excluding low-income programs.

The more cost-effective programs were Commercial SOP and Residential SOP. The less cost-effective programs were Load Management SOP and Retro-commissioning MTP. All of Xcel Energy’s programs passed cost-effectiveness.

The lifetime cost of PY2016 evaluated savings was \$0.011 per kWh and \$18.62 per kW.

⁶ In PY2016, only high and medium priority programs received documentation scores.

Table 10-3. Xcel SPS Cost-Effectiveness Results

Level of Analysis	Claimed Savings Results	Evaluated Gross Savings Results	Evaluated Net Savings Results
Total Portfolio	2.42	2.42	2.12
Total Portfolio excluding low-income programs	2.63	2.63	2.28
Commercial	2.87	2.87	2.44
Commercial SOP	4.22	4.22	3.41
Retro-Commissioning MTP	2.07	2.07	1.86
Residential	2.70	2.70	2.36
Residential SOP	2.76	2.76	2.15
Hard-to-Reach SOP	2.62	2.62	2.62
Low-Income*	2.38	2.38	2.38
Low Income Weatherization*	2.38	2.38	2.38
Load Management	1.11	1.11	1.11
Load Management SOP	1.11	1.11	1.11

* The Low-Income sector and Low Income Weatherization program are evaluated using the savings-to-investment ratio (SIR).

10.2 DETAILED FINDINGS—COMMERCIAL (HIGH/MEDIUM EVALUATION PRIORITY)

10.2.1 Commercial Standard Offer Program

Program Contribution To Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution to Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Program Documentation Score
13.8%	1,129	1,129	100.0%	27.9%	4,035,023	4,035,023	100.0%	Fair

Completed Desk Reviews*	On-Site M&V
6	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.

Desk reviews were performed for all sites where on-site M&V was performed to ensure consistency between on-site results and desk review results.

The PY2016 Commercial SOP evaluation efforts focused on desk reviews and on-site M&V. The sample of completed desk reviews and on-site M&V projects for this program are listed above.

The EM&V team made adjustments to the claimed savings for four projects. All four projects had an adjustment of greater than five percent and further details are provided below by Project ID.

Project ID #904241: During the desk review of this lighting retrofit project, the EM&V team found two errors that affected the savings across multiple lighting measures. Five fixtures that were documented within the inspection notes were found omitted in the final reported savings calculator. Also, the new LED wall packs that replaced the exterior metal halide fixtures were reported as 43 watts, but the model number captured on the project invoice confirmed the fixtures were 81 watts. These adjustments resulted in a 4 percent increase in the evaluated energy savings and a 5 percent increase in the evaluated demand savings as compared to the reported project savings. This project did not receive an on-site visit.

Project ID #904249: The energy efficiency project involved a new construction lighting and heating, ventilation, and air conditioning (HVAC) project at a middle school. During the desk review and on-site M&V visit, the EM&V team identified multiple errors within the reported HVAC savings calculations. The HVAC portion of the project included the installation of 43 high-efficiency air-cooled heat pumps. The ex-ante HVAC calculator was found to be incorrectly filled out for all of the heat pump units. The part load or seasonal energy efficiency rating (SEER) had been entered into the cooling full load efficiency rating column of the inventory worksheet whereas the full load energy efficiency rating (EER) should have been entered. Also, the cooling part load efficiency rating column entries included “SEER” instead of any values. This caused the reported kWh energy savings to be calculated as zero and the reported kW demand savings to be overstated, as the SEER values entered were higher than the corresponding EER values. The AHRI certifications were verified for all nine unique model numbers and the calculator was corrected for capacities, EER, SEER values, where appropriate. These updates to the HVAC portion of the project savings resulted in an overall 28 percent increase in the evaluated energy savings and a 28 percent decrease in the evaluated peak demand savings as compared to the total reported project savings.

Project ID #904263: The energy efficiency project involved a retrofit lighting and HVAC project at multiple schools in the region. During the on-site M&V visit, the EM&V team identified multiple corrections needed for the reported lighting and HVAC savings calculations. The lighting retrofits were found with different quantities (both higher and lower than reported) between the different usage areas of the project. The HVAC portion of the project included the one-for-one installation of numerous air-cooled direct exchange air conditioning units. The ex-ante HVAC calculator was found to be incorrectly filled out for all of the HVAC units. The full load energy efficiency rating (EER) had been entered into the cooling part load efficiency rating column of the inventory worksheet whereas the part load or seasonal energy efficiency rating (SEER) should have been entered. This caused the reported kWh energy savings to be understated, as the SEER values entered were higher than the corresponding EER values. Also, the ex-ante calculator was found to include both the indoor and outdoor portions of split systems on separate lines, while the ex-post calculator includes them on the same line items for accuracy. This caused the reported kW peak demand to be overstated due to the duplicate line items that were consolidated for the indoor and outdoor portions of the split systems. In addition, the building types associated with the HVAC units were split into primary and secondary school building types based on the schools where the units were found to be installed. Collectively, these updates to the lighting and HVAC portions of the project savings resulted in an overall 86 percent increase in the evaluated energy savings and a 30 percent decrease in the evaluated peak demand savings as compared to the total reported project savings.

Project ID #904289: During the desk review of this lighting retrofit project, the EM&V team found the new LED fixtures were reported as 239 watts, however, the model number captured on the project invoice and verified through the products DLC certification confirmed the fixtures were 197 watts. These adjustments resulted in a 5 percent increase in the evaluated energy and demand savings as compared to the reported project savings. This project did not receive an on-site visit.

As part of prior evaluation reports, the EM&V team recommended that the utility provide all pertinent documentation to aid in the independent evaluation of any commercial project. There is still improvement needed for the Commercial SOP in this area as only four out of the six projects reviewed had sufficient documentation. A documentation score of 78 percent was assessed for the program, as partial documentation was provided for portions of two projects. In particular for both lighting and HVAC portions of these projects, pre and/or post inspections mostly included a revised calculator as documentation which are significant efforts by the utility to verify equipment installations and in general quantities. However, key documentation found submitted for the other four projects that were omitted for these two included missing invoices, onsite inspection field notes, and/or photos. In addition, lighting calculators do not provide the lighting equipment make or model information and do not confirm products meet qualification requirements. The EM&V team recommends that at a minimum make and model information is provided for lighting projects. Typically this is done best by providing an equipment cut sheet, DLC certification screen print, and/or invoices with such information described. In addition, many projects also included HVAC components for which two did not include appropriate HVAC make, model and capacity information. While manufacture equipment specifications were provided for one, they did not include the detailed capacity and energy efficiency (full and part load) ratings for all units. This HVAC information is typically best provided with air-conditioning, heating and refrigeration institute (AHRI) certified performance records. Like the lighting information, not all HVAC units included these details. Complete documentation enhances the accuracy and transparency of project savings along with ease of evaluation. Since sufficient documentation was provided for greater than 70 percent, but less than 90 percent of the sampled projects, the EM&V team assigned a program documentation score of Fair.

10.2.1.1 Retro-Commissioning Market Transformation Program

Program Contribution To Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution To Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Program Documentation Score
7.9%	646	646	99.9%	30.4%	4,399,048	4,398,368	100.0%	Fair

Completed Desk Reviews*	On-Site M&V
4	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.

Desk reviews were performed for all sites where on-site M&V was performed to ensure consistency between on-site results and desk review results.

The PY2016 the Retro-Commissioning MTP evaluation efforts focused on desk reviews and on-site M&V. The sample of completed desk reviews and on-site M&V projects for this program are listed above.

The EM&V team made an adjustment to the claimed savings for one project. This project had an adjustment of less than one percent. Therefore, evaluated savings overall were not significantly impacted and nearly equal to the claimed savings, with realization rates for both kW and kWh equaling 100 percent.

As part of prior evaluation reports, the EM&V team recommended that the utility provide all pertinent documentation to aid in the independent evaluation of any commercial project. There is still

improvement needed for the Retro-Commissioning MTP in this area as only two out of the four projects reviewed had sufficient documentation. A documentation score of 88 percent was assessed for the program, as partial documentation was provided for portions of two projects and they were limited in specific areas. In particular for lighting projects, pre and/or post inspections mostly included a revised calculator and photo documentation which are significant efforts by the utility to verify equipment installations and in general quantities. For some products, DLC certificates and specification sheets were also included, but were lacking for most. These documents are necessary for all lighting products incentivized to confirm key equipment and savings parameters such as new lighting wattages.

Also, calculators do not provide the lighting equipment make or model information. The EM&V team recommends that at a minimum make and model information is provided for lighting projects. Typically this is done best by providing an equipment cut sheet, DLC certification screen print, and/or invoice with such information described. These projects also included HVAC components for which one did not include appropriate HVAC make, model and capacity information. While manufacture equipment specifications were provided, they did not include the detailed capacity and energy efficiency (full and part load) ratings for all units. This information is typically best provided with air-conditioning, heating and refrigeration institute (AHRI) certified performance records. Like the lighting information, not all HVAC units included these details. Complete documentation enhances the accuracy and transparency of project savings along with ease of evaluation. Since sufficient documentation was provided for greater than 70 percent, but less than 90 percent of the sampled projects, the EM&V team assigned a program documentation score of Fair.

10.3 DETAILED FINDINGS—LOAD MANAGEMENT (HIGH/MEDIUM EVALUATION PRIORITY)

10.3.1 Load Management Standard Offer Program

Program Contribution To Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Program Contribution to Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Program Documentation Score
55.8%	4,571	4,571	100.0%	0.2%	31,887	31,887	100.0%	Good

Completed Desk Reviews*	On-Site M&V
0	0

*The review for the load management program included a census 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.

The EM&V team evaluated the Xcel SPS Load Management Standard Offer Program by applying the TRM calculation method to interval meter data. The meter data was supplied in 15 minute increments at the Electric Service Identifier (ESI ID) level. Two load management events occurred during PY2016. The dates and times were:

- July 8, 2016 from 2:00 p.m. to 6:00 p.m.
- August 9, 2016 from 4:00 p.m. to 7:00 p.m.

In analyzing the meter data for the eight participants across the 15 enrolled sites with claimed savings results, the EM&V team found that the meter level analysis aligned with the savings reported by Xcel

SPS to the EM&V team. Two enrolled sites did not have any load data associated with them, as they did not participate in either event. The EM&V team calculated kWh savings by summing the hourly kW savings for each site and event. The table above shows both the EM&V team and Xcel SPS' calculated kW and kWh savings.

Evaluated savings for the Xcel SPS Load Management SOP are 4,571 kW and 31,887 kWh. The realization rate for kW is 100 percent and the realization rate for kWh is also 100 percent.

10.4 SUMMARY OF LOW PRIORITY EVALUATION PROGRAMS

provides a summary of claimed savings for Xcel SPS's low evaluation priority programs in PY2016, including programs' overall contribution to portfolio savings. Low priority programs' claimed savings were verified against the final PY2016 tracking data provided to the EM&V team for the EM&V database.

Table 10-4. PY2016 Claimed Savings (Low Evaluation Priority Programs)

Program	Contribution to Portfolio Savings (kW)	Claimed Demand Savings (kW)	Evaluated Demand Savings (kW)	Realization Rate (kW)	Contribution to Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)
Residential SOP	11.8%	963	963	100.0%	20.4%	2,945,526	2,945,526	100.0%
Hard-to-Reach SOP	7.8%	638	638	100.0%	16.1%	2,333,064	2,333,064	100.0%
Low-Income Weatherization	3.0%	242	242	100.0%	4.9%	706,546	706,546	100.0%