

5.3 Detailed Findings—Commercial (Medium Evaluation Priority)

5.3.1 Large C&I Solutions MTP

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
11.9%	2,011	2,011	100.0%	52.6%	10,901,315	10,901,315	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.

The PY2018 Large C&I Solutions MTP evaluation efforts focused on desk reviews and on-site M&V. The number of completed desk reviews and on-site M&V projects for this program are listed above.

The EM&V team adjusted the claimed savings for four projects. One project had adjustments of less than 5 percent and three projects had adjustments greater than 5 percent compared to the original claimed savings. El Paso Electric accepted the evaluated results and matched the claimed savings to those of the evaluations for all projects and therefore the final program realization rate is 100 percent. Further details of the EM&V findings are provided below.

Participant ID 1130723: The energy efficiency project included interior lighting retrofits at a strip mall retail store. During the desk review, the EM&V team identified a calculation error in the LSF calculator v2018.2 used to estimate claimed savings. The evaluation team used the LSF calculator v2018.5, which had correct deemed equivalent full load hours (EFLH) and coincidence factors (CF) that match the Texas TRM 5.0. Earlier versions of the 2018 LSF calculator had wrong EFLH and CF values for retail building types. This adjustment increased energy savings and realization rates of 100 percent kW and 108 percent kWh.

Participant ID 1133681: The energy efficiency project included an early replacement of HVAC equipment at a retail building. During the desk review and on-site M&V visit, the EM&V team updated the pre-retrofit HVAC cooling capacities from nominal to rated capacities. During the on-site M&V visit, the EM&V team made additional adjustments to the baseline cooling capacity finding that the model number had varied slightly. The capacities were adjusted for two HVAC units from 12.5 tons (150,000 BTU/hour) to 146,000 BTU/hour and for another HVAC unit from 5 tons (60,000 BTU/hour) to 59,500 BTU/hour. All post-retrofit cooling capacities were updated from tons to BTU/hour to coincide with the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) rated capacities. Overall, the corrections reduced peak demand and energy savings significantly and resulted in realization rates of 76 percent kW and 53 percent kWh.

Participant ID 1154675: The energy efficiency project included interior lighting retrofits at an enclosed mall retail store. During the desk review, the EM&V team identified a calculation error in the LSF calculator v2017.1 used to estimate claimed savings. The evaluation team used the LSF calculator v2018.5, which had correct deemed equivalent full load hours (EFLH) and coincidence factors (CF) that match the TRM. The difference in HOU and CF values increased energy and peak demand savings. The EM&V team also adjusted fixture wattages to match DLC certification from 10W to 9.5W and from 7W to 6.5W since version 2018.5 of the LSF calculator allows for

wattages in 0.5 increments (up to 25W) that match the rated wattages. Overall, the adjustments resulted in realization rates of 104 percent kW and 123 percent kWh.

Participant ID 1154729: The energy efficiency project included interior lighting retrofits at an enclosed mall retail store. During the desk review and on-site M&V visit, the EM&V team corrected fixtures quantities. The post-retrofit LED wall pack fixture quantities were adjusted to match the existing quantities, as five fewer wall packs were installed per on-site M&V visit findings. This adjustment slightly increased the energy and demand savings and resulted in realization rates of 101 percent kW and kWh.

Documentation Score

The EM&V team was able to verify key inputs and assumptions (e.g., equipment quantity, equipment capacity, QPL qualifications, AHRI certifications) for all projects that had desk reviews completed because sufficient documentation was provided for the sites. Project documentation included invoices, QPL qualifications and/or AHRI certifications, pre-and post-inspection notes, the project savings calculators, and photographic documentation of existing and new equipment, which are significant efforts by the utility to verify equipment conditions and quantities. However, partial documentation was provided for one HVAC project. AHRI certification was missing for the project, but the EM&V team was able to obtain the information from the AHRI website. Since sufficient documentation was provided for all projects, the EM&V team assigned a program documentation score of Good.

5.3.2 Texas SCORE MTP

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
3.0%	507	507	100.0%	4.9%	1,016,120	1,016,120	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.

The PY2018 Texas SCORE MTP evaluation efforts focused on desk reviews and on-site M&V. The number of completed desk reviews and on-site M&V projects for this program are listed above. The EM&V team did not suggest any savings adjustments and therefore the final program realization rate is 100 percent.

Documentation Score

The EM&V team was able to verify key inputs and assumptions (e.g., equipment quantity, equipment capacity, QPL qualifications, AHRI certifications) for all projects that had desk reviews completed because sufficient documentation was provided for the sites. Project documentation included invoices, QPL qualifications and/or AHRI certifications, pre-and post-inspection notes, the project savings calculators, and photographic documentation of the existing and new equipment, which are significant efforts by the utility to verify equipment conditions and quantities. However, partial documentation was provided for one HVAC project. In this case, the provided AHRI certifications did not match the final equipment inventory, but the EM&V team was able to obtain the correct certifications from the AHRI

website. Complete and accurate documentation enhances the accuracy and transparency of project savings and ease of evaluation. Since sufficient documentation was provided for all projects, the EM&V team assigned a program documentation score of Good.

5.3.3 Small Commercial Solutions MTP

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
4.5%	765	765	100.0%	17.1%	3,548,068	3,548,068	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 PY2018 Small Commercial Solutions MTP evaluation efforts focused on desk reviews and on-site M&V. The number of completed desk reviews and on-site M&V projects for this program are listed above.

The EM&V team adjusted the claimed savings for eight projects. Two projects had adjustments of less than 5 percent and six projects had adjustments greater than 5 percent compared to the original claimed savings. El Paso Electric accepted the evaluated results and matched the claimed savings to those of the evaluations for all projects with significant adjustments and therefore the final program realization rate is 100 percent. Further details of the EM&V findings are provided below.

Participant ID 1129056: The energy efficiency project included interior and exterior lighting retrofits at a non-24-hr. supermarket. During the desk review and on-site M&V visit, the EM&V team identified a calculation error in the LSF calculator v2018.3 used to estimate claimed savings. The evaluation team used the LSF calculator v2018.5, which had correct deemed equivalent full load hours (EFLH) and coincidence factors (CF) that match the Texas TRM 5.0. Earlier versions of the 2018 LSF calculator had wrong EFLH and CF values for supermarket building types. In addition, the EM&V team verified fixture wattages, qualification and quantities: wattages were adjusted for some fixtures from 150W to 100W (pre-retrofit) and from 30W to 31W (post-retrofit) per DLC certification wattage; the qualification was adjusted for one exterior fixture from “DLC” to “Non-Qualified”; and the installed quantity of 68W LED interior fixtures was adjusted from 1 to 2 per on-site M&V visit findings. Overall, the corrections significantly reduced energy and peak demand savings and resulted in realization rates of 73 percent kW and 71 percent kWh.

Participant ID 1129146: The energy efficiency project involved interior lighting retrofits at a non-food service building. During the desk review and on-site M&V visit, the EM&V team adjusted the air-conditioning type from “Other” to “Air-Conditioned” for the entire building. This adjustment resulted in an increase in energy and peak demand savings and realization rates of 112 percent kW and 105 percent kWh.

Participant ID 1129240: The energy efficiency project included interior and exterior lighting retrofits at a religious building. During the desk review and on-site M&V visit, the EM&V team verified fixture wattages, quantities, and lighting controls. Wattages were adjusted for some fixtures from 12W to 11.5W since version 2018.5 of the LSF calculator allows for wattages in 0.5 increments

(up to 25W) that match the rated wattages. Per on-site M&V visit findings, a 48W LED fixture that replaced a 250W HPS fixture was added to the exterior lighting inventory. Lighting controls were also adjusted for exterior lighting fixtures: from "Timeclock" to "None" for 18W LED tubes, and from "Timeclock" to "Photocell" for wall pack fixtures. Overall, the corrections resulted in a slight increase of energy and peak demand savings and realization rates of 101 percent kW and kWh.

Participant ID 1129285: The energy efficiency project included interior lighting retrofits at a retail building. During the desk review and on-site M&V visit, the EM&V team identified a calculation error in the LSF calculator v2018.3 used to estimate claimed savings. The evaluation team used the LSF calculator v2018.5, which had correct deemed equivalent full load hours (EFLH) and coincidence factors (CF) that match the Texas TRM 5.0. Earlier versions of the 2018 LSF calculator had wrong EFLH and CF values for retail building types. In addition, the EM&V adjusted the qualification of 12W LED tubes from "Non-Qualified" to "DLC." Overall, the corrections decreased energy and peak demand savings and resulted in realization rates of 97 percent kW and 77 percent kWh.

Participant ID 1130126: The energy efficiency project involved interior and exterior lighting retrofits at a non-24-hr. supermarket. During the desk review, the EM&V team adjusted the air-conditioning type for the walk-in cooler to "Med. Temp. (33-41° F)." This correction slightly increases energy and peak demand savings and resulted in realization rates of 102 percent kW and kWh.

Participant ID 1130514: The energy efficiency project included the installation of an ENERGY STAR® roof at a retail building. During the desk review, the EM&V team was not supplied with the calculations and was not able to identify assumptions in the calculator that would yield the exact results. The EM&V team assumed a gray-colored existing roof surface with an R-value of 15.15. This value may be different from the value used to calculate the claimed savings. This resulted in realization rates of 101 percent kW and 90 percent kWh.

Participant ID 1130555: The energy efficiency project included interior lighting retrofits at a retail building. During the desk review, the EM&V team identified a calculation error in the LSF calculator v2018.2 used to estimate claimed savings. The evaluation team used the LSF calculator v2018.5, which had correct deemed equivalent full load hours (EFLH) and coincidence factors (CF) that match the Texas TRM 5.0. Earlier versions of the 2018 LSF calculator had wrong EFLH and CF values for retail building types. This adjustment resulted in realization rates of 97 percent kW and 76 percent kWh.

Participant ID 1152529: The energy efficiency project included interior lighting retrofits at a retail building. During the desk review, the EM&V team identified a calculation error in the LSF calculator v2018.4 used to estimate claimed savings. The evaluation team used the LSF calculator v2018.5, which had correct deemed equivalent full load hours (EFLH) and coincidence factors (CF) that match the Texas TRM 5.0. Earlier versions of the 2018 LSF calculator had wrong EFLH and CF values for retail building types. In addition, the EM&V team adjusted the building type from "Retail (Other)" to "Retail Strip Mall." Overall, the corrections decreased energy and peak demand savings and resulted in realization rates of 97 percent kW and 76 percent kWh.

Documentation Score

The EM&V team was able to verify key inputs and assumptions (e.g., equipment quantity, equipment capacity, QPL qualifications) for seven of the 10 projects that had desk reviews completed because sufficient documentation was provided for the sites. Project documentation included invoices, QPL qualifications, pre-and post-inspection notes, the project savings calculators, and photographic documentation of the existing and new lighting types, which are significant efforts by the utility to verify

equipment conditions and quantities. However, partial documentation was provided for the remaining three projects. For two lighting projects, project documentation lacked post-retrofit photos or the provided post-retrofit photos were not sufficient to verify fixture model numbers. For one ENERGY STAR roof installation project, building specs were not provided. Complete documentation enhances the accuracy and transparency of project savings and ease of evaluation. Since sufficient documentation was provided for most of the projects, the EM&V team assigned a program documentation score of Good.

5.4 Detailed Findings—Residential (Medium Evaluation Priority)

5.4.1 Hard-to-Reach Solutions MTP

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 4%	741	741	100.0%	7 9%	1,640,748	1,640,748	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 small sample sizes.

The PY2018 evaluation efforts focused on desk reviews and on-site M&V. The number of completed desk reviews and on-site M&V projects for this program are listed above.

The EM&V team did not make any adjustments to this program. Overall, the EM&V team assessed ex-ante claimed energy and demand savings across the following two activities:

- For a sample of projects, desk reviews were completed to check that measure data collected by contractors on forms aligned correctly with data in the tracking system.
- On-site M&V was completed for a sample of projects to verify that measures remained installed and matched project documentation.

Desk reviews were completed for six projects and resulted in desk review realization rates of 100.0 percent and 100.0 percent for demand and energy savings, respectively. On-site M&V was completed for three projects and resulted in on-site realization rates of 100.0 percent and 100.0 percent for demand and energy savings, respectively.

Documentation Score

The EM&V team was able to verify key inputs and assumptions (e.g., pre- and post- condition) for central heat pumps and ceiling insulation. Because sufficient documentation was provided across all the reviewed projects, the EM&V team assigned a program documentation score of Good.

5.4.2 Residential Solutions MTP

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
4.8%	809	809	100.0%	7.6%	1,577,535	1,577,535	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.

The PY2018 evaluation efforts focused on desk reviews and on-site M&V. The number of completed desk reviews and on-site M&V projects for this program are listed above.

The EM&V team made an adjustment of more than 5 percent to the claimed savings for one project. Overall, the EM&V team assessed ex-ante claimed energy and demand savings across the following two activities:

- For a sample of projects, desk reviews were completed to check that measure data collected by contractors on forms aligned correctly with data in the tracking system.
- On-site M&V was completed for a sample of projects to verify that measures remained installed and matched project documentation.

Desk reviews were completed for four projects and resulted in desk review realization rates of 102.1 percent and 101.9 percent for demand and energy savings, respectively. On-site M&V was completed for two projects and resulted in on-site realization rates of 100.0 percent and 100.0 percent for demand and energy savings, respectively. Further details of the EM&V team's findings for the single project where an adjustment of more than 5 percent to the claimed savings was made is provided below.

Participant ID 1129066: The energy efficiency project included implementation of ENERGY STAR windows. During the desk review, the EM&V team corrected the baseline to a single-pane window from a double-pane window based on the documentation provided. Overall, the adjustments resulted in project level realization rates of 139.8 percent and 134.7 percent for demand and energy savings, respectively.

Documentation Score

For all sampled projects, the EM&V team was able to verify key inputs and assumptions (e.g., window area square footage) for windows. Because sufficient documentation was provided for across all the reviewed projects, the EM&V team assigned a program documentation score of Good.

5.5 Detailed Findings—Load Management (High/Medium Evaluation Priority)

5.5.1 Load Management SOP

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
57.0%	9,604	9,604	100.0%	0.1%	24,591	24,591	100.0%	Good

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

* 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 El Paso Electric Load Management program by applying the “high 5 of 10 baseline” TRM calculation methodology to interval meter data. The meter data was supplied in 30-minute increments at the meter level. Load management events occurred on the following dates and times:

- June 15, 2018, from 1 p.m. to 2:30 p.m. (scheduled)
- July 19, 2018, from 4:30 p.m. to 5:30 p.m. (unscheduled)

The EM&V team received the interval meter data and spreadsheets detailing the El Paso Electric calculated baseline load, event load, and savings results for each event and meter. During the review process, the EM&V team collaborated with El Paso Electric to develop savings for a participant on an interruptible tariff that received the interruption request during the unscheduled event. After the EM&V team applied the “high 5 of 10 baseline” calculation method, we found that the evaluated savings matched the savings El Paso Electric provided.

Evaluated savings for the El Paso Electric Load Management program are 9,679 kW and 24,993 kWh. The realization rate for both kW and kWh is 100.0 percent.

5.6 Detailed Findings—Pilot Programs (High Evaluation Priority)

5.6.1 Demand Response Pilot 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
10.5%	1,774	1,774	100.0%	0.2%	42,574	42,574	100.0%	Fair

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

* 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 El Paso Electric Demand Response program by applying the deemed savings value seen in Volume Two of TRM version 5.0. The meter data was supplied in 30-minute increments at the meter level. Demand Response events occurred on the following dates and times:

- June 20, 2018, from 3 p.m. to 5 p.m. (unscheduled)
- June 22, 2018, from 3 p.m. to 5 p.m. (unscheduled)
- June 27, 2018, from 3 p.m. to 5 p.m. (unscheduled)
- July 23, 2018, from 3 p.m. to 5 p.m. (unscheduled)
- August 16, 2018, from 3 p.m. to 5 p.m. (unscheduled)
- August 20, 2018, from 3 p.m. to 5 p.m. (unscheduled)
- August 27, 2018, from 3 p.m. to 5 p.m. (unscheduled)
- August 29, 2018, from 3 p.m. to 5 p.m. (unscheduled)
- September 5, 2018, from 3 p.m. to 5 p.m. (unscheduled)
- September 10, 2018, from 3 p.m. to 5 p.m. (unscheduled)
- September 12, 2018, from 3 p.m. to 5 p.m. (unscheduled)
- September 18, 2018, from 3 p.m. to 5 p.m. (unscheduled)

The EM&V team received a list of participants enrolled in the program and event summary documentation from both program implementers (Nest and Bring Your Own Thermostat). The EM&V team was able to gather the necessary information from the participant list and summary documentation to apply the deemed savings value from TRM 5.0.

During the initial calculation of program savings, the EM&V team applied the deemed savings value to meters that showed full participation in a per-event basis, which was clearly presented in the summary documentation provided by El Paso Electric. After this first round of calculation was complete, the EM&V team found that the savings calculated were lower than what El Paso Electric was claiming. This difference in savings prompted a discussion between the EM&V team and El Paso Electric. During the discussion, it was found that the language in TRM 5.0 was being interpreted differently by each party. The TRM 5.0 language in question reads, "Event-level savings are calculated by multiplying kW savings per household/device by the participating number of devices on that event, then adding all the groups savings together." The EM&V team understood this statement to mean that the kW savings per household/device were to be applied to meters that did not op-out of, and otherwise had full participation in, an event, whereas El Paso Electric applied the kW savings per household/device to meters that participated/were enrolled in the program during the 2018 program year, regardless of op-out status at the event level.

After this initial discussion with El Paso Electric, more clarification was needed to understand how the deemed savings value was calculated. At this time, Frontier (who produced the deemed savings value), was brought into the discussion. It was found that the deemed savings value was produced using a sample of 50 homes in the El Paso Electric territory. It was assumed by Frontier that this sample of 50 homes would contain op-out rates similar to those the entire program population would exhibit. Therefore, the effects of op-out meters are accounted for in the deemed savings value.

With an understanding of how the deemed savings value was calculated, the EM&V team agreed with El Paso Electric that the deemed savings value in TRM 5.0 is to be applied to participating meters in the program, regardless of participation at the event level.

Evaluated savings for the El Paso Electric Demand Response program are 1,773.9 kW and 42,573.6 kWh. The realization rate for both kW and kWh is 100.0 percent.

5.7 Summary of Low Priority Evaluation Programs

Table 5-5 provides a summary of claimed savings for El Paso Electric's low evaluation priority programs in PY2018, which includes each program's overall contribution to portfolio savings. Low priority programs' claimed savings were verified against the final PY2018 tracking data provided to the EM&V team for the EM&V database.

Table 5-5. PY2018 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)
LivingWise MTP	3.4%	573	573	100.0%	7.1%	1,476,778	1,476,778	100.0%
Texas Appliance Recycling MTP	0.4%	62	62	100.0%	2.4%	498,576	498,576	100.0%

6.0 ENTERGY IMPACT EVALUATION RESULTS

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.

6.1 Key Findings

6.1.1 Evaluated Savings

Entergy's evaluated savings for PY2018 were 19,665 in demand (kW) and 48,099,849 in energy (kWh) savings. The overall kW and kWh portfolio realization rates are 100 percent. Entergy was responsive to all EM&V recommendations to adjust claimed savings based on EM&V results, which helped support healthy realization rates. (See Table 6-4.)

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

Table 6-1. Entergy PY2018 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%	19,665	19,665	100.0%	0.0%
Commercial	36.2%	7,126	7,126	100.0%	0.0%
Residential	34.1%	6,714	6,714	100.0%	0.0%
Load Management*	29.6%	5,825	5,825	100.0%	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

Table 6-2 shows the claimed and evaluated energy savings for Entergy's portfolio and broad customer sector/program categories for PY2018.

Table 6-2. Entergy PY2018 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%	48,099,849	48,099,849	100.0%	0.0%
Commercial	75.2%	36,173,250	36,173,250	100.0%	0.0%
Residential	24.8%	11,906,591	11,906,591	100.0%	0.0%
Load Management*	0.0%	20,008	20,008	100.0%	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.

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. 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 received Good documentation scores for all of its evaluated programs in PY2018.

6.1.2 Cost-effectiveness Results

Entergy's overall portfolio had a cost-effectiveness of 2.62. (See Table 6-3.)

The more cost-effective programs were Commercial Solutions MTP and Entergy Solutions High Performance Homes MTP. The less cost-effective programs were A/C Distributor Program, Load Management SOP, and Hard-To-Reach SOP. All of Entergy's programs passed cost-effectiveness in 2018.

The lifetime cost of PY2018 evaluated savings was \$0.008 per kWh and \$16.59 per kW.

Table 6-3. Entergy Cost-effectiveness Results

Level of Analysis	Claimed Savings Results	Evaluated Savings Results	Net Savings Results
Total Portfolio	2.62	2.62	2.33
Commercial	3.72	3.72	3.34
Commercial Solutions MTP	3.72	3.72	3.34

Level of Analysis	Claimed Savings Results	Evaluated Savings Results	Net Savings Results
Residential	1.87	1.87	1.63
Residential SOP	1.97	1.97	1.75
Entergy Solutions High Performance Homes MTP	2.57	2.57	1.80
A/C Distributor MTP	1.30	1.30	1.09
Hard-To-Reach SOP	1.53	1.53	1.53
Load Management	1.56	1.56	1.56
Load Management SOP	1.56	1.56	1.56

6.2 Claimed Savings Adjustments

Utilities are provided the opportunity to adjust savings at the project-level based on interim EM&V findings. Table 6-4 summarizes claimed savings adjustments recommended by the EM&V team prior to the Energy Efficiency Plan and Report (EEPR) filing on April 1, 2018, which were included in the April 1 EEPR. Realization rates assume the following adjustments will be included in Entergy's May 1 filing.

Table 6-4. EM&V Claimed Savings Adjustments by Program (Prior to EEPR⁹ Filing)

Program	EM&V Demand Claimed Savings Adjustments (kW)	EM&V Energy Claimed Savings Adjustments (kWh)
Commercial Solutions MTP (Com)	174.10	46,996.30
Hard-To-Reach SOP (HTR)	-2.50	-5,129.10
A/C Distributor MTP (Res)	0.00	-8.80
Residential SOP (Res)	0.00	-183.70
Total	171.60	41,674.70

6.3 Detailed Findings—Commercial (Medium Evaluation Priority)

6.3.1 Commercial Solutions MTP¹⁰

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
36.2%	7,126	7,126	100.0%	75.2%	36,173,250	36,173,250	100.0%	Good

⁹ Energy Efficiency Cost Recovery

¹⁰ Commercial Solutions MTP also includes two sub-programs, Commercial Midstream Lighting and Resource Management Services (RMS), which have distinct program design and delivery. These sub-programs were included in the PY2018 EM&V.

Completed Desk Reviews*	On-Site M&V
12	6

*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 PY2018 Commercial Solutions MTP evaluation efforts focused on desk reviews and on-site M&V. The number of completed desk reviews and on-site M&V projects for this program are listed above.

The EM&V team adjusted the claimed savings for five projects. Two projects had adjustments of less than 5 percent and three projects had adjustments greater than 5 percent compared to the original claimed savings. Entergy accepted the evaluated results and matched the claimed savings to those of the evaluations for all projects and therefore the final program realization rate is 100 percent. Further details of the EM&V findings are provided below.

Participant ID 1131638: The energy efficiency project included an air compressor retrofit at a manufacturing building. During the desk review and on-site M&V visit, the EM&V team reviewed several parameters used to calculate energy and peak demand savings in the International Performance Measurement and Verification Protocol (IPMVP) Option B methodology. The EM&V team agree with the protocols followed in the calculations and found that energy use values for pre-retrofit equipment were missing in the ex-ante calculator for flow rates above 5500 cubic feet per minute (CFM), leading to a slight understatement of the energy savings. The evaluated calculations incorporated the energy use values of the highest available flow rate interval (5375 CFM - 5499 CFM), which slightly increased the overall kWh savings. In addition, the kW claimed estimate did not reflect the guidance in Volume 1 of the Texas TRM 5.0. The reported savings assumed that the highest flow rate measured in the facility would be sufficient for calculating savings in the peak demand period. However, the EM&V team analyzed the distribution of flow rates and found that they were random across all hours and days of the monitoring period. The savings calculations were adjusted to strictly use the utility's peak demand period, Zone 3 (M-F 4-8 p.m.) and the proportional separation is not relevant. With the flow rate distribution, the kW savings between the pre- and post-measurements were greatly increased from the reported savings. Overall, the corrections resulted in realization rates of 152 percent kW and 101 percent kWh.

Participant ID 1133415: The energy efficiency project is a midstream lighting project that incentivizes select ENERGY STAR-qualified lights sold through the online retailer Bulbs.com. During the desk review, the EM&V team found that most of the difference between claimed and evaluated savings is associated with the 2-foot LED tube measures, where the coincidence factor (CF) was adjusted from 0.0707 to match the Texas TRM 5.0 value of 0.830, and the baseline wattage was adjusted from 15.2W to match the QPL certificate value of 17W. The 4-foot LED tubes and downlight fixture baseline wattages were also rounded to 2 decimals, which adjusted savings slightly. Overall, the corrections resulted in a negligible decrease in energy and peak demand savings and realization rates of 100 percent kW and kWh.

Participant ID 1133422: The energy efficiency project is a midstream lighting project that incentivizes select ENERGY STAR qualified lights sold through the online retailer Bulbs.com. During the desk review, the EM&V team found that most of the difference between claimed and evaluated savings is associated with the 2-foot LED tube measures, where the CF was adjusted from 0.0707 to match the Texas TRM 5.0 value of 0.830, and the baseline wattage was adjusted from 15.2W to match the QPL certificate value of 17W. In addition, the 4-foot LED tubes and downlight fixture baseline wattages were also rounded to 2 decimals, which adjusted savings slightly. The wattage

was also adjusted for a 4-foot LED tube that only consumed 10 watts, although it was not clear from the documentation whether the difference from the claimed savings was attributed to the baseline or other assumptions. Some fixtures categorized as T8 LED tubes were in fact T8 fluorescent tubes; these wattages were adjusted from 24.75 watts to 28 watts. Overall, the corrections resulted in a slight increase in energy and peak demand savings and realization rates of 108 percent kW and 103 percent kWh.

Participant ID 1133565: The energy efficiency project included interior and exterior lighting retrofits at a school. During the desk review and on-site M&V visit, the EM&V team found minor corrections to lighting quantity. Thirteen 15W LED tubes were not found in one of the interior spaces, resulting in a slight increase in peak demand and energy savings and realization rates of 102 percent kW and kWh.

Participant ID 1133644: The energy efficiency project included an early replacement of a chiller at an office. During the desk review, the EM&V team adjusted the existing capacity of the pre-retrofit equipment to match the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) rated capacity. The ex-ante calculation utilized the nominal capacity of the existing HVAC unit. This correction resulted in a significant decrease in peak demand savings and realization rates of 64 percent kW and 88 percent kWh.

Documentation Score

The EM&V team was able to verify key inputs and assumptions (e.g., equipment quantity, equipment capacity, QPL qualifications, AHRI certifications) for all projects that had desk reviews completed because sufficient documentation was provided for the sites. The project documentation included invoices, QPL qualifications, AHRI certifications, pre- and post-inspection notes, the project savings calculators, and photographic documentation of the existing and new lighting types, which are significant efforts by the utility to verify equipment conditions and quantities. For the midstream lighting projects, however, the tracking system did not include the deemed equivalent full load hours (EFLH), coincidence factor (CF), and baseline and new wattages. Savings calculations for these projects were completed based on some provided documentation and researched manufactured values. Tracking the mentioned values will facilitate evaluation efforts in the future. Overall, the EM&V team was satisfied with the project documentation provided and assigned a program documentation score of Good.

6.4 Detailed Findings—Residential (High/Medium Evaluation Priority)

6.4.1 Entergy Solutions High Performance Homes MTP

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
4.5%	881	881	100.0%	5.9%	2,840,024	2,840,024	100.0%	Good

Completed Desk Reviews*	On-Site M&V
9	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 PY2018 evaluation efforts focused on desk reviews. The number of completed desk reviews for this program is listed above.

The EM&V team focused on reviewing documentation for program homes. This program relies on a proprietary energy model, however that model is built on DOE-2 energy modeling software that is listed as an acceptable savings estimation method in the TRM.

We received two types of documentation from the program: REM/Rate files that provided the inputs that fed into the energy models and detailed output files that provided the results of the energy model analysis. We reviewed the REM/Rate files to ensure that all homes met stated program requirements, and that the files contained all inputs required by the DOE-2-based model. We compared the results of the model to the claimed savings in the tracking database and found that all of the model output files matched the claimed savings in the tracking data. We did not recommend any adjustments for this program.

Documentation Score

For all sampled projects, the EM&V team was able to verify key inputs and assumptions (e.g., energy model inputs and detailed model outputs). Because sufficient documentation was provided for all the reviewed projects, the EM&V team assigned a program documentation score of Good.

6.4.2 A/C Distributor MTP

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%	350	350	100.0%	1.8%	857,560	857,560	100.0%	Good



*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 PY2018 evaluation efforts focused on desk reviews. The number of completed desk reviews for this program is listed above.

The EM&V team made minor adjustments to three projects within the 5 percent threshold, and at Entergy's discretion these adjustments were claimed by Entergy. Overall, the EM&V team assessed ex-ante claimed energy and demand savings across a sample of projects by completing desk reviews to check that measure data collected by contractors on forms aligned correctly with that in the tracking system.

Desk reviews were completed for four projects and resulted in desk review realization rates of 99.9 percent and 99.9 percent for demand and energy savings, respectively. Further details for the projects where adjustments were made, including the EM&V findings, are provided below.

Participant ID 1111140, 1111162, 1111209, 1138476: These energy efficiency projects included implementation of central air conditioner units. There were minor differences between ex-ante and ex post savings for central air conditioners, likely due to rounding within the early retirement calculator.

Each Participant ID yielded realization rates of 99.9 percent and 99.9 percent for demand and energy savings, respectively.

Documentation Score

The EM&V team was able to verify key inputs and assumptions (e.g., pre- and post-unit capacity) for central air conditioners. Because sufficient documentation was provided across all the reviewed projects, the EM&V team assigned a program documentation score of Good.

6.4.3 Residential 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
19.0%	3,728	3,728	100.0%	11.7%	5,617,383	5,617,383	100.0%	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 small sample sizes.

The PY2018 evaluation efforts focused on desk reviews and on-site M&V. The number of completed desk reviews and on-site M&V projects for this program are listed above.

The EM&V team made an adjustment of more than 5 percent to the claimed savings for three projects. In addition, the EM&V team made minor adjustments to four projects that fell within the 5 percent threshold, and at Entergy's discretion these adjustments were claimed by Entergy. Overall, the EM&V team assessed ex-ante claimed energy and demand savings across the following two activities:

- For a sample of projects, desk reviews were completed to check that measure data collected by contractors on forms aligned correctly with data in the tracking system.
- On-site M&V was completed for a sample of projects to verify that measures remained installed and matched project documentation.

Desk reviews were completed for eight projects and resulted in desk review realization rates of 100.0 percent and 98.7 percent for demand and energy savings, respectively. There were minor differences between ex-ante and ex post savings for LEDs and low flow showerheads due to rounding. All identified variations due to rounding were within 1 kWh and 0.01 kW. On-site M&V was completed for four projects and resulted in on-site realization rates of 100.0 percent and 97.1 percent for demand and energy savings, respectively. Further details for the projects where adjustments were made, including the EM&V findings, are provided below.

Participant ID 1109552: The energy efficiency project included implementation of air infiltration, duct sealing, low flow shower heads, and LED measures. The EM&V team's on-site testing resulted in a substantially higher reduction in air infiltration and a substantially lower reduction in duct sealing than what was documented by the program. Using a threshold of ± 10 percent, the EM&V team's blower door test results were quite a bit lower and the duct blaster test results were quite a bit higher than the results found in the tracking data. Minor adjustments were made to the LED measure due to rounding. Overall, the adjustments resulted in project level realization rates of 103.3 percent and 90.9 percent for demand and energy savings, respectively.

Participant ID 1109598: The energy efficiency project included implementation of air infiltration, duct sealing, low flow shower heads, and LED measures. The EM&V team's on-site testing resulted in a substantially lower reduction in air infiltration and duct sealing than what was documented by the program. Using a threshold of ± 10 percent, the EM&V team's blower door and duct blaster test results were quite a bit higher than the results found in the tracking data. The EM&V team noted that the sealing measures around the HVAC equipment had been undone by maintenance staff likely resulting in the increased duct and air infiltration. Minor adjustments were made to the LED measure due to rounding. Overall, the adjustments resulted in project level realization rates of 77.2 percent and 81.0 percent for demand and energy savings, respectively.

Participant ID 1109698: The energy efficiency project included implementation of air infiltration, duct sealing, low flow shower heads, and LED measures. The EM&V team's on-site testing resulted in a substantially higher reduction in air infiltration and duct sealing than what was documented by the program. Using a threshold of ± 10 percent, the EM&V team's blower door and duct blaster test results were quite a bit lower than the results found in the tracking data. Minor adjustments were made to the LED measure due to rounding. Overall, the adjustments resulted in project level realization rates of 123.1 percent and 113.4 percent for demand and energy savings, respectively.

Participant ID 1110617: The energy efficiency project included implementation of air infiltration, duct sealing, low flow shower heads, and LED measures. The EM&V team's on-site testing resulted in a substantially higher reduction in duct leakage than what was documented by the program. Using a threshold of ± 10 percent, the EM&V team's duct blaster test results were quite a bit lower than the results found in the tracking data. Minor adjustments were made to the low flow showerhead and LED measures due to rounding. Overall, the adjustments resulted in project level realization rates of 100.6 percent and 100.8 percent for demand and energy savings, respectively.

Participant ID 1109562, 1109589: These energy efficiency projects included implementation of air infiltration, duct sealing, low flow shower heads, and LED measures. Minor adjustments were made to the LED measure due to rounding.

Documentation Score

For all sampled projects, the EM&V team was able to verify key inputs and assumptions (e.g., pre- and post-condition test results) for air infiltration and duct efficiency. There was limited documentation for direct installs such as LEDs. Because sufficient documentation was provided for most of the measures across all the reviewed projects, the EM&V team assigned a program documentation score of Good.

6.4.4 Hard-to-Reach 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
8.9%	1,755	1,755	100.0%	5.4%	2,591,623	2,591,623	100.0%	Good
Completed Desk Reviews*		On-Site M&V						
7		4						

*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 PY2018 evaluation efforts focused on desk reviews and on-site M&V. The number of completed desk reviews and on-site M&V projects for this program are listed above.

The EM&V team made an adjustment of more than 5 percent to the claimed savings for three projects. In addition, the EM&V team made minor adjustments to four projects that fell within the 5 percent threshold, and at Entergy's discretion these adjustments were claimed by Entergy. Overall, the EM&V team assessed ex-ante claimed energy and demand savings across the following two activities:

- For a sample of projects, desk reviews were completed to check that measure data collected by contractors on forms aligned correctly with data in the tracking system.
- On-site M&V was completed for a sample of projects to verify that measures remained installed and matched project documentation.

Desk reviews were completed for seven projects and resulted in desk review realization rates of 80.2 percent and 75.2 percent for demand and energy savings, respectively. There were minor differences between ex-ante and ex post savings for LEDs and low flow showerheads due to rounding. All identified variations due to rounding were within 1 kWh and 0.01 kW. On-site M&V was completed for four projects and resulted in on-site realization rates of 73.1 percent and 67.4 percent for demand and energy savings, respectively. Further details for the projects where adjustments were made, including the EM&V findings, are provided below.

Participant ID 1111137: The energy efficiency project included implementation of air infiltration, duct sealing, low flow shower heads, and LED measures. The EM&V team found considerable leaks in the ducts and the on-site duct blaster test resulted in leakage exceeding the reported pre-condition. As a result, the EM&V team zeroed out savings for this measure. Overall, the adjustments resulted in project level realization rates of 76.7 percent and 68.3 percent for demand and energy savings, respectively.

Participant ID 1111310: The energy efficiency project included implementation of the ceiling insulation measure. TRM 5.0 Volume 2 contains an eligibility requirement for the ceiling insulation measure, the application of which led to a difference in reported and evaluated savings for this Participant ID. TRM 5.0 Volume 2 states for any reported pre-retrofit R-value that falls below R-5, contractors are required to provide sufficient evidence, including two pictures: 1) a picture showing the entire attic floor, and 2) a close-up picture of a ruler that shows the measurement of the depth of the insulation. In the absence of evidence demonstrating pre-retrofit ceiling insulation below R-5, the lowest level of pre-retrofit ceiling insulation that can be claimed is the R-5 to R-8 range. The baseline reported was less than R5 level insulation and the EM&V team determined the documentation provided did not meet the requirement and adjusted the baseline to R5. Overall, the adjustment resulted in project level realization rates of 39.3 percent and 38.7 percent for demand and energy savings, respectively.

Participant ID 1111318: The energy efficiency project included implementation of air infiltration, duct sealing, and ceiling insulation measures. The EM&V team's on-site testing resulted in a substantially higher reduction in air infiltration and duct sealing than what was documented by the program. Using a threshold of ± 10 percent, the EM&V team's blower door and duct blaster test results were quite a bit lower than the results found in the tracking data. The EM&V team assessed the ceiling insulation found on-site to be a R-30 rather than R-36 that was reported and adjusted accordingly. Overall, the adjustments resulted in project level realization rates of 114.6 percent and 109.0 percent for demand and energy savings, respectively.

Participant ID 1111140, 1111162, 1111209, 1138476: These energy efficiency projects included implementation of air infiltration, duct sealing, low flow shower heads, and LED measures. Minor adjustments were made to the LED measure due to rounding.

Documentation Score

For all sampled projects, the EM&V team was able to verify key inputs and assumptions (e.g., pre- and post-condition test results) for air infiltration and duct efficiency. There was limited documentation for direct installs such as LEDs. Because sufficient documentation was provided for most of the measures across all the reviewed projects, the EM&V team assigned a program documentation score of Good.

6.5 Detailed Findings—Load Management (High Evaluation Priority)

6.5.1 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
29.6%	5,825	5,825	100.0%	0.0%	20,008	20,008	100.0%	Good

Completed Desk Reviews*	On-Site M&V
N/A	N/A

* 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 program by applying the TRM calculation methodology to interval meter data. The meter data was supplied in 15-minute increments. Load management events occurred on the following dates and times:

- June 14, 2018, from 1:00 p.m. to 3:00 p.m. (scheduled)
- June 15, 2018, from 1:00 p.m. to 2:00 p.m. (scheduled)
- June 15, 2018, from 3:00 p.m. to 4:00 p.m. (scheduled)
- August 7, 2018, from 3:00 p.m. to 4:00 p.m. (unscheduled).
- September 19, 2018, from 3:30 p.m. to 5:00 p.m. (unscheduled).

The EM&V team received interval meter data and a summary spreadsheet that detailed the Entergy calculated event-level savings results for each event and meter. All participants participated in the unscheduled events on August 7, 2017, and September 19, 2018, with the preceding unscheduled events used as test events for individual participants. The EM&V team replicated all event-level savings for each participant using the TRM calculation methodology, with results matching Entergy's savings calculations.

Evaluated savings for the Entergy Load Management program are 5,825 kW and 20,008 kWh. The realization rate for both kW and kWh is 100.0 percent.

7.0 ONCOR IMPACT EVALUATION RESULTS

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, we include a list of the low evaluation priority programs for which claimed savings were verified through the EM&V database.

7.1 Key Findings

7.1.1 Evaluated Savings

Oncor's evaluated savings for PY2018 were 172,825 in demand (kW) and 218,340,171 in energy (kWh) savings. The overall kW portfolio realization rates are approximately 100 percent. Oncor was responsive to all EM&V recommendations to adjust claimed savings based on EM&V results (see Table 7-1Table 2-1), which also supported healthy realization rates.

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

Table 7-1. Oncor PY2018 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%	172,402	172,825	100.2%	1.5%
Commercial	13.2%	22,714	22,717	100.0%	0.5%
Residential	25.7%	44,367	44,371	100.0%	6.6%
Low Income	1.7%	2,908	2,908	100.0%	n/a
Load Management	59.4%	102,413	102,829	100.4%	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.

Table 7-2 shows the claimed and evaluated energy savings for Oncor's portfolio and broad customer sector/program categories for PY2018.

Table 7-2. Oncor PY2018 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%	218,304,094	218,340,171	100.0%	2.0%
Commercial	54.7%	119,515,758	119,546,300	100.0%	0.4%
Residential	42.7%	93,189,929	93,194,217	100.0%	5.5%
Low Income	2.4%	5,291,167	5,291,167	100.0%	n/a

Level of Analysis	Percent Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Precision at 90% Confidence
Load Management	0.1%	307,239	308,487	100.4%	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.

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. 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 program documentation score for all but one of its evaluated programs. The exception is its Small Business MTP, which received a documentation score of Fair.

7.1.2 Cost-effectiveness Results

Oncor's overall portfolio had a cost-effectiveness of 2.19, or 2.36 excluding low-income programs. (See Table 7-3.)

The more cost-effective programs were Retail Platform MTP and Commercial Standard Offer Program (SOP). The less cost-effective programs were Solar PV SOP and Small Business Direct Install MTP. All of Oncor's programs were cost-effective in 2018.

The lifetime cost of evaluated savings was \$0.009 per kWh and \$20.78 per kW.

Table 7-3. Oncor Cost-effectiveness Results

Level of Analysis	Claimed Savings Results	Evaluated Savings Results	Net Savings Results
Total Portfolio	2.19	2.19	2.03
Total Portfolio excluding low-income programs	2.36	2.36	2.19
Commercial	2.40	2.40	2.20
Commercial SOP (Custom)	2.53	2.53	2.29
Commercial SOP (Basic)	2.73	2.73	2.47
Solar PV SOP	1.30	1.30	1.31
Small Business Direct Install MTP	1.34	1.34	1.27
Retail Platform MTP	43.20	43.20	38.88
Residential	2.49	2.49	2.29
Home Energy Efficiency SOP	2.18	2.18	1.94
Solar PV SOP	1.19	1.19	1.21
Retail Platform MTP	7.45	7.45	6.70
Hard-to-Reach SOP	1.86	1.86	1.86
Low Income*	1.81	1.81	1.81
Targeted Weatherization Low-Income SOP*	1.81	1.81	1.81
Load Management	1.56	1.57	1.57
Commercial Load Management SOP	1.64	1.65	1.65
Residential Demand Response SOP	1.43	1.43	1.43

* The Low Income sector and Targeted Weatherization Low-Income SOP are evaluated using the savings-to-investment ratio.

7.2 Claimed Savings Adjustments

Utilities are provided the opportunity to adjust savings at the project-level based on interim EM&V findings. Table 7-4 summarizes claimed savings adjustments recommended by the EM&V team. Realization rates assume the following adjustments will be included in Oncor's June 1 filing.

Table 7-4. EM&V Claimed Savings Adjustments by Program (Prior to EECR¹¹ Filing)

Program	EM&V Demand Claimed Savings Adjustments (kW)	EM&V Energy Claimed Savings Adjustments (kWh)
Commercial SOP (Custom) (Com)	11.30	16,319.30
Small Business Direct Install MTP (Com)	-9.90	-126,280.40

¹¹ Energy Efficiency Cost Recovery

Program	EM&V Demand Claimed Savings Adjustments (kW)	EM&V Energy Claimed Savings Adjustments (kWh)
Total	1.40	-109,961.10

7.3 Detailed Findings—Commercial (Medium Evaluation Priority)

7.3.1 Basic Commercial Standard Offer Program (SOP)

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
8.0%	13,766	13,773	100.0%	33.5%	73,230,061	73,258,574	100.0%	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 small sample sizes.

The PY2018 Basic Commercial SOP evaluation efforts focused on desk reviews and on-site M&V. The number of completed desk reviews and on-site M&V projects for this program are listed above.

The EM&V team adjusted the claimed savings for five projects. Four projects had adjustments of less than 5 percent and one project had adjustments greater than 5 percent compared to the original claimed savings. Oncor accepted the evaluated results and matched the claimed savings to those of the evaluations for the project with significant adjustments and therefore the final program realization rate is 100 percent. Further details of the EM&V findings are provided below.

Participant ID 1119480: The energy efficiency project included exterior lighting retrofits at a college. During the desk review, the EM&V team corrected the LED fixture wattage using the DLC qualified products list and inspection notes. Fixtures wattage was adjusted from 155W to 156W, which resulted in a negligible decrease in demand and energy savings and realization rates of 100 percent kW and kWh.

Participant ID 1119500: The energy efficiency project included interior lighting retrofits with controls and exterior retrofits at a non-refrigerated warehouse. During the desk review and on-site M&V visit, the EM&V team adjusted the qualification for several LED fixtures from “Non-Qualified” to “DLC” using the DLC qualified products list and post inspection notes. This correction increased the demand and energy savings and resulted in realization rates of 102 percent kW and kWh.

Participant ID 1152161: The energy efficiency project included the new construction of interior lighting fixtures with some controls and exterior lighting fixtures at a warehouse. During the desk review, occupancy sensors were removed from 17 34W fixtures per inspection report. In addition, the EM&V team corrected the wattage of the 35W fixtures to 34W using the DLC qualified products list. These adjustments resulted in a negligible decrease in demand and energy savings and realization rates of 100 percent kW and kWh.

Participant ID 1168068: The energy efficiency project included new construction of interior and exterior lighting at a non-refrigerated warehouse. During the desk review and on-site M&V visit, the EM&V team adjusted the quantity of the 270W LED fixtures in the exterior parking area from 4 to 1 based on post-inspection findings, which was confirmed during the on-site visit. This adjustment resulted in a negligible increase in demand and energy savings and realization rates of 100 percent kW and kWh.

Participant ID 1168089: The energy efficiency project included interior lighting retrofits at a non-food service building. During the desk review, the EM&V team corrected the qualification of the 150W fixtures from “Non-Qualified” to “DLC” using the DLC qualified products list. This adjustment increased the demand and energy savings and resulted in realization rates of 119 percent kW and kWh.

Documentation Score

The EM&V team was able to verify key inputs and assumptions (e.g., equipment quantity, equipment capacity, QPL qualifications, AHRI certifications) for all projects that had desk reviews completed because sufficient documentation was provided for the sites. Project documentation included invoices, QPL qualifications and/or AHRI certifications, pre- and post-inspection notes, the project savings calculators, and photographic documentation of existing and new equipment, which are significant efforts by the utility to verify equipment conditions and quantities. Since sufficient documentation was provided for all projects, the EM&V team assigned a program documentation score of Good.

7.3.2 Custom Commercial Standard Offer Program (SOP)

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%	1,428	1,429	100.1%	5.8%	12,588,022	12,596,856	100.1%	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 small sample sizes.

The PY2018 Custom Commercial SOP evaluation efforts focused on desk reviews and on-site M&V. The number of completed desk reviews and on-site M&V projects for this program are listed above.

The EM&V team adjusted the claimed savings for three projects. Two projects had adjustments of less than 5 percent and one project had adjustments greater than 5 percent compared to the original claimed savings. Oncor accepted the evaluated results and matched the claimed savings to those of the evaluations for the project with significant adjustments and therefore the final program realization rate is 100 percent. Further details of the EM&V findings are provided below.

Participant ID 1119333: The energy efficiency project included interior lighting retrofits at a public assembly building. During the desk review and on-site M&V visit, the EM&V team adjusted the fixture quantities for two rooms in the building from 7 claimed to 5 and from 18 claimed to 16. This adjustment resulted in a slight increase in demand and energy savings and realization rates of 102 percent kW and kWh.

Participant ID 1119335: The energy efficiency project included exterior lighting retrofits at a college. During the desk review and on-site M&V visit, the EM&V team corrected the LED fixture wattages using the DLC qualified products list for several fixtures: from 18W claimed to 17W, from 21W claimed to 20W, from 34W claimed to 33W, from 26W claimed to 25W, and from 53W claimed to 52W. Overall, these adjustments slightly increased demand and energy savings and resulted in realization rates of 101 percent kW and kWh.

Participant ID 1152090: The energy efficiency project included the new construction of an HVAC system at a school. During the desk review, the EM&V team realized after discussions with Oncor that the ex-ante calculator provided did not sum up the savings for all line items in the calculator. Updating the calculator resulted in an increase in demand and energy savings and realization rates of 117 percent kW and kWh.

Documentation Score

The EM&V team was able to verify key inputs and assumptions (e.g., equipment quantity, equipment capacity, QPL qualifications, AHRI certifications) for all projects that had desk reviews completed because sufficient documentation was provided for the sites. Project documentation included invoices, QPL qualifications and/or AHRI certifications, pre- and post-inspection notes, the project savings calculators, and photographic documentation of existing and new equipment, which are significant efforts by the utility to verify equipment conditions and quantities. Since sufficient documentation was provided for all projects, the EM&V team assigned a program documentation score of Good.

7.3.3 Small Business Direct Install Market Transformation Program (MTP)

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
1.5%	2,567	2,562	99.8%	6.5%	14,143,909	14,137,102	100.0%	Fair

Completed Desk Reviews*	On-Site M&V
15	8

*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 PY2018 Small Business Direct Install MTP evaluation efforts focused on desk reviews and on-site M&V. The number of completed desk reviews and on-site M&V projects for this program are listed above.

The EM&V team adjusted the claimed savings for 15 projects. Thirteen projects had adjustments of less than 5 percent and two projects had adjustments greater than 5 percent compared to the original claimed savings. Oncor accepted the evaluated results and matched the claimed savings to those of the evaluations for the two projects with significant adjustments and therefore the final program realization rate is nearly 100 percent. Further details of the EM&V findings are provided below.

Participant ID 1119570: The energy efficiency project included interior lighting retrofits at a school. During the desk review and on-site M&V visit, the EM&V team adjusted the air conditioning type for all interior LED fixtures from “None” to “Air Conditioned.” In addition, the air conditioning type for 17 80W LED fixtures reported to replace 400W metal halide lights in the parking lot area was

corrected from indoor “Air Conditioned” to outdoor “None.” Overall, these corrections resulted in realization rates of 99 percent kW and 100 percent kWh.

Participant ID 1119573: The energy efficiency project included interior and exterior lighting retrofits at a strip mall retail store. During the desk review and on-site M&V visit, the EM&V team corrected the LED fixture wattages using the DLC qualified products list for several fixtures: from 30W claimed to 27W, from 7W claimed to 6W, from 60 claimed to 58W, from 66W claimed to 65W, and from 180W claimed to 179W. Overall, these adjustments decreased demand savings and increased energy savings and resulted in realization rates of 96 percent kW and 102 percent kWh.

Participant ID 1119580: The energy efficiency project included exterior lighting retrofits at an office building. During the desk review, the EM&V team adjusted the LED fixture wattages to match the DLC qualified products list for several fixtures: from 39W claimed to 42W, from 80W claimed to 81W, and from 155W claimed to 166W. Overall, these corrections resulted in a decrease in demand and energy savings and realization rates of 95 percent kW and 99 percent kWh.

Participant ID 1119583: The energy efficiency project included exterior lighting retrofits at a retail store. During the desk review and on-site M&V visit, the EM&V team corrected the LED fixture wattages using the DLC qualified products list for several fixtures from 235W claimed to 227W, and from 66W claimed to 65W. During the on-site M&V visit, the EM&V team also found that the installed lamps were not photocell-controlled, however, savings were still considered. Overall, these adjustments resulted in a negligible increase in demand and energy savings and realization rates of 100 percent kW and kWh.

Participant ID 1119611: The energy efficiency project included interior lighting retrofits with some controls at a non-food service shop. During the desk review, the EM&V team adjusted the LED fixture wattages using the DLC qualified products list for several fixtures: from 35W claimed to 23W, from 29W claimed to 32W, from 135W claimed to 133W, and from 178W to 176W. Overall, these corrections slightly increased the demand and energy savings and resulted in realization rates of 101 percent kW and kWh.

Participant ID 1119615: The energy efficiency project included interior and exterior lighting retrofits at an in-patient healthcare facility. During the desk review and on-site M&V visit, the EM&V team corrected the LED fixture wattages to match the DLC qualified products list for several fixtures: from 7W claimed to 6W, from 13W claimed to 22W, from 30W claimed to 29W, and from 60W claimed to 58W. Overall, these adjustments resulted in a negligible decrease in demand and energy savings and realization rates of 100 percent kW and 99 percent kWh.

Participant ID 1119616: The energy efficiency project included interior lighting retrofits at a retail building. During the desk review, the EM&V team adjusted the LED fixture wattages using the DLC qualified products list for several fixtures: from 35W claimed to 23W, from 29W claimed to 32W, and from 20W claimed to 22W. These corrections slightly decreased the demand and energy savings and resulted in realization rates of 99 percent kW and kWh.

Participant ID 1119620: The energy efficiency project included exterior lighting retrofits at a strip mall retail building. During the desk review, the EM&V team corrected the LED fixture wattages for some fixtures from 180W claimed to 179W using the DLC qualified products list, which slightly increased the demand and energy savings. This resulted in realization rates of 100 percent kW and kWh.

Participant ID 1147762: The energy efficiency project included exterior lighting retrofits at a parking lot. During the desk review, the EM&V team adjusted the LED fixture wattages to match the DLC

qualified products list for several fixtures from 180W claimed to 179W, from 20W claimed to 21W, and from 60W claimed to 58W. These corrections resulted in a negligible increase in demand and energy savings and realization rates of 100 percent kW and kWh.

Participant ID 1147775: The energy efficiency project included exterior lighting retrofits at a parking lot. During the desk review, the EM&V team corrected the LED fixture wattages using the DLC qualified products list for the pole fixtures from 180W claimed to 179W. In addition, the qualification of the wall pack fixtures was adjusted to "Non-qualified," which significantly decreased demand and energy savings. Overall, these adjustments resulted in realization rates of 85 percent kW and kWh.

Participant ID 1147780: The energy efficiency project included interior lighting retrofits at a non-refrigerated warehouse. During the desk review, the EM&V team adjusted the wattage for two types of fixtures; from 7W claimed to 6W using the ENERGY STAR® qualified products list and from 133W claimed to 135W using the DLC qualified products list. Overall, these adjustments slightly increased the demand and energy savings and resulted in realization rates of 101 percent kW and kWh.

Participant ID 1147785: The energy efficiency project included exterior lighting retrofits at a strip mall parking lot. During the desk review and on-site M&V visit, the EM&V team removed savings for fixtures for seven LED screw-in lamps as these lamps were not installed per on-site visit findings. This adjustment resulted in a decrease in demand and energy savings and realization rates of 98 percent kW and kWh.

Participant ID 1147787: The energy efficiency project included interior lighting retrofits at a manufacturing facility. During the desk review and on-site M&V visit, the EM&V team adjusted the building type from "Manufacturing 2 Shift" to "Manufacturing 1 Shift" since it is the primary space usage per on-site visit findings. The coincidence factor (CF) and the annual operating hours (HOU) decreased, which significantly reduced the demand and energy savings. In addition, the air conditioning type for several areas in the front office portion of the facility was adjusted from "Air Conditioned" to "None" per on-site visit findings. Overall, these corrections resulted in a significant decrease in demand and energy savings and realization rates of 85 percent kW and 52 percent kWh.

Participant ID 1147789: The energy efficiency project included interior lighting retrofits at a strip mall retail store. During the desk review and on-site M&V visit, the EM&V team corrected the wattage for some LED screw-in lamps from 10W claimed to 9.5W to match the ENERGY STAR qualified products list since version 2018.5 of the LSF calculator allows for wattages in 0.5 increments (up to 25W). This adjustment resulted in a negligible increase in demand and energy savings and realization rates of 100 percent kW and kWh.

Participant ID 115722: The energy efficiency project included interior lighting retrofits at a school. During the desk review and on-site M&V visit, the EM&V team adjusted the wattage for 20 LED troffer retrofit fixtures from 20W claimed to 21W to match the DLC qualified products list. During the on-site M&V visit, 10 of the 30 reported LED exit signs could not be found on site. The EM&V team corrected the pre- and post-exit sign quantity from a total of 30 to 20 to reflect these findings. Overall, these adjustments decreased the demand and energy savings and resulted in realization rates of 99 percent kW and kWh.

Documentation Score

The EM&V team was able to verify key inputs and assumptions for two of the 15 projects that had desk reviews completed because sufficient documentation was provided for the sites. However, partial documentation was provided for the other 12 projects. The project documentation lacked in most cases pre- and post-photographs, or photographs were provided but the model numbers could not be verified. In addition, post-inspection notes, invoices and QPL documentation were not provided for several projects. Complete documentation enhances the accuracy and transparency of project savings and ease of evaluation. Since sufficient documentation was provided for just a few projects, the EM&V team assigned a program documentation score of Fair.

7.4 Detailed Findings—Residential (Medium Evaluation Priority)

7.4.1 Home Energy Efficiency Standard Offer Program (SOP)

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
14.1%	24,385	24,386	100.0%	18.7%	40,914,271	40,916,143	100.0%	Good

Completed Desk Reviews*	On-Site M&V
18	9

*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 PY2018 evaluation efforts focused on desk reviews and on-site M&V. All on-site M&V projects also had desk reviews. The number of completed desk reviews and on-site M&V projects for this program are listed in the table above.

The EM&V team did not make any adjustments to this program. Overall, the EM&V team assessed ex-ante claimed energy and demand savings across the following two activities:

- For a sample of projects, desk reviews were completed to check that measure data collected by contractors on forms aligned correctly with data in the tracking system.
- On-site M&V was completed for a sample of projects to verify that measures remained installed and matched project documentation.

Desk reviews were completed for 18 projects and resulted in desk review realization rates of 103.5 percent and 102.2 percent for demand and energy savings, respectively. On-site M&V was completed for nine projects and resulted in on-site realization rates 106.6 percent and 104.2 percent for demand and energy savings, respectively.

The overall realization rates were influenced by three air infiltration projects that fell within the project-level adjustment threshold. Per protocol, the Texas IOUs are not required to make savings modifications for project-level adjustments that would result in added savings, and as such, Oncor elected to not adjust these projects. In summary, high-level findings for these three projects includes:

- Using a threshold of +/-10 percent, the EM&V team's on-site testing for the three air infiltration projects yielded substantially higher reduction than what was reported by the program.

Documentation Score

For all sampled projects, the EM&V team was able to verify key inputs and assumptions (e.g., pre- and post-condition test results) for air infiltration, ceiling insulation, and central air conditioners and heat pumps. Because sufficient documentation was provided across all the reviewed projects, the EM&V team assigned a program documentation score of Good.

7.4.2 Hard-to-Reach Standard Offer Program (SOP)

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%	11,252	11,255	100.0%	7.2%	15,825,595	15,828,010	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 PY2018 evaluation efforts focused on desk reviews and on-site M&V. All on-site M&V projects also had desk reviews. The number of completed desk reviews and on-site M&V projects for this program are listed in the table above.

The EM&V team did not make any adjustments to this program. Overall, the EM&V team assessed ex-ante claimed energy and demand savings across the following two activities:

- For a sample of projects, desk reviews were completed to check that measure data collected by contractors on forms aligned correctly with data in the tracking system.
- On-site M&V was completed for a sample of projects to verify that measures remained installed and matched project documentation.

Desk reviews were completed for 10 projects and resulted in desk review realization rates of 119.3 percent and 118.9 percent for demand and energy savings, respectively. On-site M&V was completed for five projects and resulted in on-site realization rates 143.8 percent and 142.9 percent for demand and energy savings, respectively.

The overall realization rates were influenced by five projects that fell within the project-level adjustment threshold. Per protocol, the Texas IOUs are not required to make savings modifications for project-level adjustments that would result in added savings, and as such, Oncor elected to not adjust these projects. In summary, high-level findings for these five projects includes:

- Using a threshold of +/-10 percent, the EM&V team's on-site testing for four air infiltration projects yielded substantially higher reduction than what was reported by the program.
- The EM&V team's documentation review for one ceiling insulation project revealed the installed ceiling insulation R-value was higher than what was reported by the program.

Documentation Score

For all sampled projects, the EM&V team was able to verify key inputs and assumptions (e.g., pre- and post-condition test results) for air infiltration and ceiling insulation. Because sufficient documentation was provided across all the reviewed projects, the EM&V team assigned a program documentation score of Good.

7.5 Detailed Findings—Load Management (High Evaluation Priority)

7.5.1 Commercial Load Management Standard Offer Program (SOP)

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
39.2%	67,658	68,074	100.6%	0 1%	202,974	204,222	100.6%	Good

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

* 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 Oncor Commercial Load Management program by applying the TRM calculation methodology to interval meter data. The meter data were supplied in 15-minute increments at the Electric Service Identifier (ESI ID) level. A single load management event occurred on June 13, 2018, from 3:00 p.m. to 6:00 p.m.

The EM&V team received the interval meter data and spreadsheets detailing the Oncor calculated baseline load, event load, and savings results for each event and ESI ID. The EM&V team found that its savings calculations were higher than Oncor's total initial savings (67,657.89 kW) with a calculated kW savings of 68,073.93 kW. In reviewing individual meter savings differences, it was found that Oncor did not set savings to zero in cases where the calculation methodology produced a negative savings result. Per TRM 5.0, in cases where the savings algorithm produces a negative savings, a savings can be set to zero. The EM&V team informed Oncor that setting negative savings to zero was allowed, however in the end, Oncor chose not to correct the final savings value to match the EM&V team.

Evaluated savings for the Oncor Commercial Load Management program are 68,074 kW and 204,222 kWh. The realization rate for both kW and kWh is 100.6 percent.

7.5.2 Residential Demand Response Standard Offer Program (SOP)

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
20.2%	34,755	34,755	100.0%	0 0%	104,265	104,265	100 0%	Good

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

* 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 Oncor Residential Demand Response program by applying the TRM calculation methodology to interval meter data. The meter data were supplied in 15-minute increments

at the Electric Service Identifier (ESI ID) level. A single demand response event occurred on June 28, 2018, from 3:00 p.m. to 6:00 p.m.

The EM&V team received the interval meter data and spreadsheets detailing the Oncor calculated baseline load, event load, and savings results for each event and ESI ID. Additionally, Oncor provided documentation on its treatment of meters that required exceptions. For some ESI IDs, there were cases that were inactive for one event or other, which were dropped from the event-level savings calculation. For others, meter data was unavailable due to meter maintenance or other factors, though operability of the program indicated them as participants. For this second set of cases, which totaled less than 1 percent of the program population, the average savings of the remaining participants was applied to these meters, per the TRM and EM&V guidance. Oncor's presentation and discussion of these exceptions was excellent and the EM&V team was able to confirm that verified savings matched Oncor's savings calculation.

Evaluated savings for the Oncor Residential Demand Response program are 34,755 kW and 104,265 kWh. The realization rate for both kW and kWh is 100.0 percent.

7.6 Summary of Low Priority Evaluation Programs

Table 7-5 provides a summary of claimed savings for Oncor's low evaluation priority programs in PY2018, including programs' overall contribution to portfolio savings. Low priority programs' claimed savings were verified against the final PY2018 tracking data provided to the EM&V team for the EM&V database.

Table 7-5. PY2018 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	1.5%	2,512	2,512	100.0%	3.8%	8,212,970	8,212,970	100.0%
Retail Platform MTP	1.4%	2,440	2,440	100.0%	5.2%	11,340,797	11,340,797	100.0%
Retail Platform MTP	4.4%	7,618	7,618	100.0%	15.0%	32,719,833	32,719,833	100.0%
Solar PV SOP	0.6%	1,113	1,113	100.0%	1.7%	3,730,231	3,730,231	100.0%
Targeted Weatherization Low-Income SOP	1.7%	2,908	2,908	100.0%	2.4%	5,291,167	5,291,167	100.0%

8.0 SWEPCO IMPACT EVALUATION RESULTS

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, we include a list of the low evaluation priority programs for which claimed savings were verified through the EM&V database.

8.1 Key Findings

8.1.1 Evaluated Savings

SWEPCO's evaluated savings for PY2018 were 13,961 in demand (kW) and 17,024,556 in energy (kWh) savings. The overall portfolio realization rates for kW and kWh are 100 percent. SWEPCO was responsive to all EM&V recommendations to adjust claimed savings based on EM&V results, which also supported healthy realization rates. (See Table 8-4.)

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

Table 8-1. SWEPCO PY2018 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%	13,960	13,961	100.0%	0.1%
Commercial	14.4%	2,008	2,009	100.1%	0.4%
Residential	28.1%	3,919	3,919	100.0%	0.1%
Load Management	57.5%	8,033	8,033	100.0%	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.

Table 8-2 shows the claimed and evaluated energy savings for SWEPCO's portfolio and broad customer sector/program categories for PY2018.

Table 8-2. SWEPCO PY2018 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%	17,017,391	17,024,556	100.0%	0.2%
Commercial	63.0%	10,712,718	10,719,932	100.1%	0.4%
Residential	36.4%	6,199,876	6,199,826	100.0%	0.2%
Load Management	0.6%	104,797	104,797	100.0%	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.

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. 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.

SWEPCO received a Good program documentation score for all its programs.

8.1.2 Cost-effectiveness Results

SWEPCO's overall portfolio had a cost-effectiveness of 2.38.

The more cost-effective programs were Commercial Solutions Market Transformation Program (MTP) and Commercial Standard Offer Program (SOP). The less cost-effective programs were Open MTP and Hard-to-Reach SOP. All of SWEPCO's programs were cost-effective in 2018. (See Table 8-3.)

The lifetime cost of evaluated savings was \$0.009 per kWh and \$18.35 per kW.

Table 8-3. SWEPCO Cost-effectiveness Results

Level of Analysis	Claimed Savings Results	Evaluated Savings Results	Net Savings Results
Total Portfolio	2.38	2.38	2.19
Commercial	2.64	2.64	2.39
Commercial Solutions MTP	3.01	3.01	2.69
Commercial SOP	2.83	2.83	2.56

Level of Analysis	Claimed Savings Results	Evaluated Savings Results	Net Savings Results
Open MTP	1.60	1.60	1.52
SCORE MTP	2.80	2.80	2.51
Residential	2.20	2.20	2.04
Residential SOP	2.40	2.40	2.12
Hard-to-Reach SOP	1.92	1.92	1.92
Load Management	2.27	2.27	2.27
Load Management SOP	2.27	2.27	2.27

8.2 Claimed Savings Adjustments

Utilities are provided the opportunity to adjust savings at the project level based on interim EM&V findings. Table 8-4 summarizes claimed savings adjustments recommended by the EM&V team. Realization rates assume the following adjustments will be included in SWEPCO's May 1 filing.

Table 8-4. EM&V Claimed Savings Adjustments by Program (Prior to EECR¹² Filing)

Program	EM&V Demand Claimed Savings Adjustments (kW)	EM&V Energy Claimed Savings Adjustments (kWh)
Commercial SOP (Com)	4.20	11,941.00
Open MTP (Com)	-1.50	4,345.80
SCORE MTP (Com)	-15.10	-84,287.00
Hard-to-Reach SOP (HTR)	0.70	815.20
Residential SOP (Res)	0.30	338.70
Total	-11.40	-66,846.30

¹² Energy Efficiency Cost Recovery

8.3 Detailed Findings—Commercial (High/Medium Evaluation Priority)

8.3.1 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
5.7%	790	790	100.0%	25.7%	4,375,933	4,376,334	100.0%	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 small sample sizes.

The PY2018 CSOP evaluation efforts focused on desk reviews and on-site M&V. The number of completed desk reviews and on-site M&V projects for this program are listed above.

The EM&V team adjusted the claimed savings for four projects. Three projects had adjustments of less than 5 percent and one project had an adjustment greater than 5 percent compared to the original claimed savings. SWEPCO accepted the evaluated results and matched the claimed savings to those of the evaluations for the one project with significant adjustment and therefore the final program realization rate is 100 percent. Further details of the EM&V findings are provided below.

Participant ID 1117881: The energy efficiency project included interior lighting retrofits with controls at a manufacturing facility. During the desk review and on-site M&V visit, the EM&V team corrected wattages for several installed fixtures using DLC qualified products list (from 139W claimed to 149W, from 83W claimed to 80W, and from 82W claimed to 74W). The deemed equivalent full load hours (EFLH) and coincidence factor (CF) were also adjusted to match the Texas TRM 5.0 values. During the site visit, the EM&V team identified fixtures in a few of the rooms in the facility that were not replaced as part of the project. In addition, additional occupancy controls were found throughout the facility, which led to a significant increase in evaluated savings. Overall, the adjustments resulted in realization rates of 107 percent kW and 103 percent kWh.

Participant ID 1117885: The energy efficiency project included interior lighting retrofits at a non-food service shop. During the desk review and on-site M&V visit, the EM&V team corrected the LED wattage for all installed fixtures using the DLC qualified products list to 141W from 140W claimed. The wattage adjustment for the project's lights resulted in a negligible decrease in energy and peak demand savings and realization rates of 100 percent kW and kWh.

Participant ID 1117887: The energy efficiency project included interior lighting retrofits at a manufacturing facility. During the desk review and on-site M&V visit, the EM&V team verified the model numbers of the new lighting installed and found one of the lighting fixtures installed at the site to have a rating of 52W compared to 53W claimed per DLC qualified products list. The wattage correction resulted in a negligible increase in energy and peak demand savings and realization rates of 100 percent kW and kWh.

Participant ID 1117901: The energy efficiency project included interior and exterior lighting retrofits at a retail building. During the desk review and on-site M&V visit, the EM&V team corrected the

LED wattage for some of the installed exterior fixtures using the DLC qualified products list to 75W from 74W claimed. The wattage adjustment resulted in a negligible decrease in energy and peak demand savings and realization rates of 100 percent kW and kWh.

Documentation Score

The EM&V team was able to verify key inputs and assumptions (e.g., equipment quantity, equipment capacity, QPL qualifications) for six of the eight projects that had desk reviews completed because sufficient documentation was provided for the sites. The project documentation included invoices, QPL qualifications, pre- and post-inspection notes, the project savings calculators, and photographic documentation of the existing and new lighting types, which are significant efforts by the utility to verify equipment conditions and quantities. However, partial documentation was provided for the other two projects. One project documentation lacked inspection notes and the other project documentation lacked pre- and post-install photographic documentation. Since invoices, QPL qualifications and specification sheets were provided for these two projects and sufficient documentation was provided for the rest of the projects, the EM&V team assigned a program documentation score of Good.

8.3.2 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 3%	465	465	100.0%	15 6%	2,648,555	2,648,655	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.

The PY2018 Commercial Solutions MTP evaluation efforts focused on desk reviews and on-site M&V. The number of completed desk reviews and on-site M&V projects for this program are listed above.

The EM&V team adjusted the claimed savings for one project. The project had an adjustment of less than 5 percent compared to the original claimed savings and therefore the final program realization rate is nearly 100 percent. Further details of the EM&V findings are provided below.

Participant ID 1133534: The energy efficiency project included interior and exterior lighting retrofits at a manufacturing facility. During the desk review, the EM&V team corrected the LED wattage for some of the installed outdoor fixtures using the DLC qualified products list to 80W from 81W claimed. The wattage adjustment for the project's lights resulted in a negligible increase in energy and peak demand savings and realization rates of 100 percent kW and kWh.

Documentation Score

The EM&V team was able to verify key inputs and assumptions (e.g., equipment quantity, equipment capacity, QPL qualifications) for two of the four projects that had desk reviews completed because sufficient documentation was provided for the sites. The project documentation included invoices, QPL qualifications, pre- and post-inspection notes, the project savings calculators, and photographic documentation of the existing and new lighting types, which are significant efforts by the utility to verify equipment conditions and quantities. However, partial documentation was provided for the other two

projects. Inspection was not conducted for these two projects and the project documentation lacked photographic documentation of new lighting types. Since invoices, QPL qualifications and specification sheets were provided for these two projects and sufficient documentation was provided for the rest of the projects, the EM&V team assigned a program documentation score of Good.

8.3.3 Open 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%	253	253	100.0%	6.2%	1,055,006	1,055,502	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 PY2018 Open MTP evaluation efforts focused on desk reviews and on-site M&V. The number of completed desk reviews and on-site M&V projects for this program are listed above.

The EM&V team adjusted the claimed savings for eight projects. Four projects had adjustments of less than 5 percent and four projects had adjustments greater than 5 percent compared to the original claimed savings. SWEPCO accepted the evaluated results and matched the claimed savings to those of the evaluations for the four projects with significant adjustments and therefore the final program realization rate is 100 percent. Further details of the EM&V findings are provided below.

Participant ID 1131641: The energy efficiency project included interior and exterior lighting retrofits at an office building. During the desk review and on-site M&V visit, the EM&V team adjusted the building type from "Retail strip/enclosed mall" to "Office" based on intended use by the customer and corrected the LED wattage for some of the installed interior and exterior fixtures using the DLC qualified products list: from 13W claimed to 12W and from 40W claimed to 38W. During the on-site visit, no air conditioning was found in the open area of the building. Overall, the corrections resulted in a decrease in energy and peak demand savings and realization rates of 85 percent kW and 94 percent kWh.

Participant ID 1131646: The energy efficiency project involved interior lighting retrofits at a non-food service shop. During the desk review and on-site M&V visit, the EM&V team adjusted the Air Conditioning Type to "None" per on-site visit findings. This adjustment decreased the energy and peak demand savings and resulted in realization rates of 91 percent kW and 95 percent kWh.

Participant IDs 1131647 and 1131991: The energy efficiency projects included interior lighting retrofits at strip mall retail stores. During the desk review and on-site M&V visit, the deemed equivalent full load hours (EFLH) and coincidence factor (CF) were adjusted to match the Texas TRM 5.0 values for the Retail-Strip Mall building type. The EM&V team also corrected the LED wattage for most installed fixtures to 17.5W from 18W claimed since version 2018.5 of the LSF calculator allows for wattages in 0.5 increments (up to 25W) that match the rated wattages. For the first project, the adjustments resulted in an increase in energy and peak demand savings and realization rates of 101 percent kW and 110 percent kWh. For the second project, the corrections

increased energy and peak demand savings and resulted in realization rates of 108 percent kW and kWh.

Participant ID 1131806: The energy efficiency project included interior lighting retrofits at a religious building. During the desk review, the EM&V team corrected the fixture quantity of the 9W lamps using the invoice and photographic documentation from five claimed to six. This quantity adjustment resulted in a negligible increase in energy and peak demand savings and realization rates of 101 percent kW and kWh.

Participant ID 1133409: The energy efficiency project included interior lighting retrofits at a non-food service shop. During the desk review, the EM&V team corrected the LED wattages for two types of installed fixture to match DLC certification, from 9W to 9.5W (screw-in bulbs) and from 15W to 14.5W and 15.5W (LED tubes) since version 2018.5 of the LSF calculator allows for wattages in 0.5 increments (up to 25W) that match the rated wattages. The wattage adjustment for the project's lights resulted in a negligible decrease in energy and peak demand savings and realization rates of 99 percent kW and kWh.

Participant ID 1133641: The energy efficiency project involved interior and exterior lighting retrofits at a manufacturing facility. During the desk review, the EM&V team adjusted the baseline wattage for non-operating fixtures by applying a 10 percent cap per TRM recommendation. The TRM states that "the number of non-operating fixtures will be limited to 10 percent of the total fixture count per facility." However, the ex-ante calculator applied the 10 percent cap per tracked line item. The EM&V team corrected the savings calculation to reflect the TRM by applying the cap on the basis of the entire facility fixture count, which reduced all interior baseline wattage. This adjustment resulted in a negligible decrease in energy and peak demand savings and realization rates of 95 percent kW and 96 percent kWh.

Participant ID 1133649: The energy efficiency project included interior lighting retrofits at a retail building. During the desk review and on-site M&V visit, the EM&V team verified the quantities and model numbers of the new lighting installed and found two lighting fixtures types at the site to have a rating of 10W compared to 18W claimed and 100W compared to 105W claimed. In addition, the on-site verification noted several quantity variations: the lamp quantity in the main sales area was short by 3 lamps (339 total), the 100W fixture quantity in the outbuildings was short by 3 (2 total), the 19W LED tubes quantity was short by 4 (10 total) in the second outbuilding, and quantity of fixtures in the office was short by 6 fixtures (34 total). Overall, the adjustments increased energy and peak demand savings and resulted in realization rates of 103 percent kW and kWh.

Documentation Score

The EM&V team was able to verify key inputs and assumptions (e.g., equipment quantity, equipment capacity, QPL qualifications) for all projects that had desk reviews completed because sufficient documentation was provided for the sites. The project documentation included invoices, QPL qualifications, pre- and post-inspection notes, the project savings calculators, and photographic documentation of the existing and new lighting types, which are significant efforts by the utility to verify equipment conditions and quantities. In some cases, however, discrepancies between the invoices and the photographic documentation (e.g., in fixture model numbers or fixtures quantities) limited the verification process. Overall, the EM&V team was satisfied with the project documentation provided and assigned a program documentation score of Good.

8.3.4 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
3.6%	500	501	100.2%	15.5%	2,633,224	2,639,442	100.2%	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 PY2018 SCORE MTP evaluation efforts focused on desk reviews and on-site M&V. The number completed desk reviews and on-site M&V projects for this program are listed above.

The EM&V team adjusted the claimed savings for three projects. Two projects had adjustments of less than 5 percent and one project had an adjustment greater than 5 percent compared to the original claimed savings. SWEPCO accepted the evaluated results and matched the claimed savings to those of the evaluations for the project with significant adjustment and therefore the final program realization rate is 100 percent. Further details of the EM&V findings are provided below.

Participant ID 1154499: The energy efficiency project included interior retrofits with some controls and exterior lighting retrofits at a school. During the desk review and on-site M&V visit, the EM&V team adjusted the LED wattage for installed fixtures using the DLC qualified products list to 15W from 15.5W claimed. The largest impact, however, was due to a correction to the Air Conditioning Type. The ex-ante calculator did not have savings associated with the retrofit in one of the line items because the air conditioning type was not selected. The EM&V team selected "Air Conditioning" and savings for these retrofits were generated and included in the project total savings. Overall, the adjustments increased energy and peak demand savings and resulted in realization rates of 105 percent kW and kWh.

Participant ID 1154508: The energy efficiency project included interior retrofits with some controls and exterior lighting retrofits at a school. During the desk review, the EM&V team found incorrect entries of installed LED tube quantities in the ex-ante calculator. The quantities were entered in the wrong column; thus, the energy savings were calculated as if the baseline linear fluorescent T8 fixtures were replaced with nothing. This is also reflected in the unusually low controls savings claimed despite having occupancy sensors installed in various locations throughout the building. Overall, the adjustments resulted in a significant decrease in energy and peak demand savings and realization rates of 74 percent kW and 75 percent kWh.

Participant ID 1154509: The energy efficiency project included interior lighting retrofits with some controls and exterior lighting retrofits at a school. During the desk review, the EM&V team corrected the LED wattage for installed fixtures using the QPL qualified products list to 10W from 9.5W claimed (ENERGY STAR certified) and to 15W from 15.5W claimed (DLC certified). The wattage adjustment for the project's lights resulted in a negligible increase in energy and peak demand savings and realization rates of 100 percent kW and kWh.

Documentation Score

The EM&V team was able to verify key inputs and assumptions (e.g., equipment quantity, equipment capacity, QPL qualifications) for all projects that had desk reviews completed because sufficient documentation was provided for the sites. The project documentation included invoices, QPL qualifications, pre- and post-inspection notes, the project savings calculators, and photographic documentation of the existing and new lighting types, which are significant efforts by the utility to verify equipment conditions and quantities. Therefore, the EM&V team assigned a program documentation score of Good.

8.4 Detailed Findings—Residential (Medium Evaluation Priority)

8.4.1 Residential 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
17.5%	2,439	2,439	100.0%	23.1%	3,928,310	3,928,310	100.0%	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 small sample sizes.

The PY2018 evaluation efforts focused on desk reviews and on-site M&V. The number of completed desk reviews and on-site M&V projects for this program are listed above.

The EM&V team made an adjustment of over 5 percent to the claimed savings for one project based on the on-site findings. Overall, the EM&V team assessed ex-ante claimed energy and demand savings across the following two activities:

- For a sample of projects, desk reviews were completed to check that measure data collected by contractors on forms aligned correctly with data in the tracking system.
- On-site M&V was completed for a sample of projects to verify that measures remained installed and matched project documentation.

Desk reviews were completed for eight projects and resulted in desk review realization rates of 103.0 percent and 102.2 percent for demand and energy savings, respectively. There were minor differences between ex-ante and ex post savings for LEDs due to rounding. All identified variations due to rounding were within 1 kWh and 0.01 kW.

On-site M&V was completed for four projects and resulted in on-site realization rates of 106.9 percent and 105.8 percent for demand and energy savings, respectively. These overall on-site realization rates for the four projects were driven by the following project:

Participant ID 1118499: The energy efficiency project included implementation of air infiltration and LED measures. The EM&V team's on-site testing resulted in a substantially higher reduction in air infiltration than what was documented by the program. Using a threshold of +/-10 percent, the EM&V

team's blower door test results were quite a bit lower than the results found in the tracking data resulting in an increase in savings. Overall, the adjustments resulted in project level realization rates of 129.2 percent and 128.6 percent for demand and energy savings, respectively.

Documentation Score

For all sampled projects, the EM&V team was able to verify key inputs and assumptions (e.g., pre- and post-condition test results) for air infiltration, duct efficiency, and ceiling insulation. There was limited documentation for direct installs such as LEDs. Because sufficient documentation was provided for most of the measures across all the reviewed projects, the EM&V team assigned a program documentation score of Good.

8.4.2 Hard-to-Reach 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
10.6%	1,480	1,480	100.0%	13.3%	2,271,566	2,271,516	100.0%	Good

Completed Desk Reviews*	On-Site M&V
7	4

*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 PY2018 evaluation efforts focused on desk reviews and on-site M&V. The number of completed desk reviews and on-site M&V projects for this program are listed above.

The EM&V team made an adjustment of more than 5 percent to the claimed savings for one project. Overall, the EM&V team assessed ex-ante claimed energy and demand savings across the following two activities:

- For a sample of projects, desk reviews were completed to check that measure data collected by contractors on forms aligned correctly with data in the tracking system.
- On-site M&V was completed for a sample of projects to verify that measures remained installed and matched project documentation.

Desk reviews were completed for seven projects and resulted in desk review realization rates of 107.4 percent and 105.5 percent for demand and energy savings, respectively. There were minor differences between ex-ante and ex post savings for LEDs due to rounding. All identified variations due to rounding were within 1 kWh and 0.01 kW.

On-site M&V was completed for four projects and resulted in on-site realization rates of 112.8 percent and 109.0 percent for demand and energy savings, respectively. These overall on-site realization rates for the four projects were driven by the following project:

Participant ID 1118746: The energy efficiency project included implementation of air infiltration and LED measures. The EM&V team's on-site testing resulted in a substantially higher reduction in air infiltration than what was documented by the program. Using a threshold of +/- 10percent, the EM&V team's blower door test results were quite a bit lower than the results found in the tracking data

resulting in an increase in savings. Overall, the adjustments resulted in project level realization rates of 132.8 percent and 131.9 percent for demand and energy savings, respectively.

Documentation Score

The EM&V team was able to verify key inputs and assumptions (e.g., pre- and post-condition test results) for air infiltration, duct efficiency, and ceiling insulation. There was limited documentation for direct installs such as LEDs. Because sufficient documentation was provided for most of the measures across all the reviewed projects, the EM&V team assigned a program documentation score of Good.

8.5 Detailed Findings—Load Management (High Evaluation Priority)

8.5.1 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
57.5%	8,033	8,033	100.0%	0.6%	104,797	104,797	100.0%	Good

Completed Desk Reviews*	On-Site M&V
N/A	N/A

* 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 SWEPCO Load Management program by applying the TRM calculation methodology to interval meter data. The meter data was supplied in 15-minute increments at the meter level. Load management events occurred on the following dates and times:

- May 18, 2018, between 2:30 p.m. and 3:30 p.m. (scheduled)
- May 23, 2018, between 1:00 p.m. and 2:00 p.m. (scheduled)
- May 29, 2018, between 1:00 p.m. and 2:00 p.m. (scheduled)
- May 30, 2018, between 1:00 p.m. and 2:00 p.m. (scheduled)
- May 30, 2018, between 1:30 p.m. and 2:30 p.m. (scheduled)
- June 6, 2018, between 2:00 p.m. and 3:00 p.m. (scheduled)
- June 27, 2018, between 2:00 p.m. and 6:00 p.m. (unscheduled)
- July 20, 2018, between 2:00 p.m. and 6:00 p.m. (unscheduled)
- July 26, 2018, between 2:00 p.m. and 6:00 p.m. (unscheduled)

The EM&V team received the interval meter data and a summary spreadsheet that detailed the SWEPCO calculated event-level savings results for each event and meter. All participants participated in the unscheduled events on June 27, July 20, and July 26, 2018, with the preceding scheduled events used as test events for individual participants. The EM&V team replicated all event-level savings for

each participant using the TRM calculation methodology, with results matching that of SWEPCO's savings calculations.

Evaluated savings for the SWEPCO Load Management program are 8,033 kW and 104,797 kWh. The realization rate for both kW and kWh is 100.0 percent.

8.6 Summary of Low Priority Evaluation Programs

All of SWEPCO's programs were categorized as either high or medium priority for PY2018 evaluation.

9.0 TNMP IMPACT EVALUATION RESULTS

This section presents the evaluated savings and cost-effectiveness results for TNMP'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, we include a list of the low evaluation priority programs for which claimed savings were verified through the EM&V database.

9.1 Key Findings

9.1.1 Evaluated Savings

TNMP's evaluated savings for PY2018 were 13,763 in demand (kW) and 17,204,465 in energy (kWh) savings. The overall kW and kWh portfolio realization rates are 100 percent. TNMP was responsive to all EM&V recommendations to adjust claimed savings based on EM&V results (see Table 9-4), which also supported healthy realization rates.

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

Table 9-1. TNMP PY2018 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%	13,763	13,763	100.0%	0.0%
Commercial	12.2%	1,681	1,681	100.0%	0.0%
Residential	31.5%	4,333	4,333	100.0%	0.0%
Low Income	3.5%	479	479	100.0%	n/a
Load Management	52.1%	7,176	7,176	100.0%	0.0%
Pilot	0.7%	94	94	100.0%	n/a

* 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 9-2 shows the claimed and evaluated energy savings for TNMP's portfolio and broad customer sector/program categories for PY2018.

Table 9-2. TNMP PY2017 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%	17,204,465	17,204,465	100.0%	0.0%
Commercial	46.8%	8,049,347	8,049,347	100.0%	0.0%
Residential	47.3%	8,133,957	8,133,957	100.0%	0.0%

Level of Analysis	Percent Portfolio Savings (kWh)	Claimed Energy Savings (kWh)	Evaluated Energy Savings (kWh)	Realization Rate (kWh)	Precision at 90% Confidence
Low Income	4.4%	757,417	757,417	100.0%	n/a
Load Management	0.0%	7,176	7,176	100.0%	0.0%
Pilot	1.5%	256,568	256,568	100.0%	n/a

* 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. 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.

TNMP received a Good program documentation score for its Residential Standard Offer and High-Performance Homes programs. It also received Good documentation scores for its Commercial SOPs and Commercial Solutions MTPs. For the Small Business, Open MTPs and SCORE/CitySmart programs, TNMP received a Fair documentation score as the EM&V team found partial documentation for some projects within each of these programs.

9.1.2 Cost-effectiveness Results

TNMP's overall portfolio had a cost-effectiveness of 1.76, or 1.90 excluding low-income programs. (See Table 9-3.)

The more cost-effective programs were Residential SOP and High-Performance Homes MTP. The less cost-effective programs were Open for Small Business MTP and REP Pilot MTP. The REP Pilot MTP was in its first year of a redesigned pilot to try to be cost-effective, but it still was not.

The lifetime cost of evaluated savings was \$0.009 per kWh and \$19.12 per kW.

Table 9-3. TNMP Cost-effectiveness Results

Level of Analysis	Claimed Savings Results	Evaluated Savings Results	Net Savings Results
Total Portfolio	1.76	1.76	1.57
Total Portfolio excluding low-income programs	1.90	1.90	1.69
Commercial	1.73	1.73	1.57
Open for Small Business MTP	1.25	1.25	1.19
SCORE/CitySmart MTP	1.91	1.91	1.72
Commercial Solutions MTP	1.95	1.95	1.75
Residential	2.14	2.14	1.85
High-Performance Homes MTP	2.22	2.22	1.55
Residential SOP	2.31	2.31	2.05
Hard-to-Reach SOP	1.47	1.47	1.47
Low Income*	2.19	2.19	2.19
Low Income Weatherization*	2.19	2.19	2.19
Load Management	1.58	1.58	1.58
Load Management SOP	1.58	1.58	1.58
Pilot	0.52	0.52	0.43
REP Pilot MTP	0.52	0.52	0.43

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

9.2 Claimed Savings Adjustments

Utilities are provided the opportunity to adjust savings at the project-level based on interim EM&V findings. Table 9-4 summarizes claimed savings adjustments recommended by the EM&V team. Realization rates assume all of the following adjustments will be included in TNMP's June 1 filing.

Table 9-4. EM&V Claimed Savings Adjustments by Program (Prior to EECR¹³ Filing)

Program	EM&V Demand Claimed Savings Adjustments (kW)	EM&V Energy Claimed Savings Adjustments (kWh)
Commercial Solutions MTP (Com)	-6.10	-28,267.00
Open for Small Business MTP (Com)	-3.40	-8,926.60
SCORE/CitySmart MTP (Com)	1.90	43,580.00
Total	-7.60	6,386.40

¹³ Energy Efficiency Cost Recovery

9.3 Detailed Findings—Commercial (Medium Evaluation Priority)

9.3.1 Commercial Solutions Market Transformation Program (MTP)

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
5.3%	724	724	100.0%	22.1%	3,806,319	3,806,319	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.

The PY2018 Commercial MTP evaluation efforts focused on desk reviews and on-site M&V. The number of completed desk reviews and on-site M&V projects for this program are listed above.

The EM&V team adjusted the claimed savings for two projects. One project had adjustments of less than 5 percent and one project had adjustments greater than 5 percent compared to the original claimed savings. TNMP accepted the evaluated results and matched the claimed savings to those of the evaluations for all projects with adjustments and therefore the final program realization rate is 100 percent. Further details of the EM&V findings are provided below.

Participant ID 1179526: The energy efficiency project included the new construction of interior lighting with controls at an office building and a non-refrigerated warehouse. During the desk review, the EM&V team adjusted the qualification of the 12-foot fixtures from “DLC” to “Non-qualified” since they were not on the DLC qualified products list. The wattage was also corrected for two types of fixtures: from 17W claimed to 18W using the ENERGY STAR® qualified products list and from 34W claimed to 47W using the DLC qualified products list. Overall, these adjustments decreased the demand and energy savings and resulted in realization rates of 93 percent kW and kWh.

Participant ID 1179530: The energy efficiency project included interior lighting retrofits with controls and an early replacement of an HVAC system at an office building. During the desk review and on-site M&V visit, a slight difference was noted as a result of a clerical switch of 6 and 9 in the kWh savings for the HVAC portion of the project (208,996 instead of the correct value 208,966). This adjustment resulted in a negligible decrease in energy savings and realization rates of 100 percent kW and kWh.

Documentation Score

The EM&V team was able to verify key inputs and assumptions (e.g., equipment quantity, equipment capacity, QPL qualifications, AHRI certifications) for all projects that had desk reviews completed because sufficient documentation was provided for the sites. Project documentation included invoices, QPL qualifications and/or AHRI certifications, pre-and post-inspection notes, the project savings calculators, and photographic documentation of existing and new equipment, which are significant efforts by the utility to verify equipment conditions and quantities. Since sufficient documentation was provided for all projects, the EM&V team assigned a program documentation score of Good.

9.3.2 Open for Small Business Market Transformation Program (MTP)

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
2.9%	405	405	100.0%	10.2%	1,751,067	1,751,067	100.0%	Fair

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 small sample sizes.

The PY2018 Open for Small Business MTP evaluation efforts focused on desk reviews and on-site M&V. The number of completed desk reviews and on-site M&V projects for this program are listed above.

The EM&V team adjusted the claimed savings for eight projects. Four projects had adjustments of less than 5 percent and four projects had adjustments greater than 5 percent compared to the original claimed savings. TNMP accepted the evaluated results and matched the claimed savings to those of the evaluations for all projects with adjustments and therefore the final program realization rate is 100 percent. Further details of the EM&V findings are provided below.

Participant ID 1131513: The energy efficiency project included interior lighting retrofits at a strip mall retail store. During the desk review and on-site M&V visit, the EM&V team adjusted the building type from "Retail Strip Mall" to "Public Assembly" since that is the primary space usage per on-site visit findings. The coincidence factor (CF) and the annual operating hours (HOU) associated with public assembly buildings are lower than retail buildings, which reduced the demand and energy savings. This correction resulted in realization rates of 71 percent kW and 83 percent kWh.

Participant ID 1132676: The energy efficiency project included interior and exterior lighting retrofits at a non-food service store. During the desk review and on-site M&V visit, the EM&V team adjusted the quantity of some interior fixtures from 15 claimed to 14 and corrected the air conditioning type to "None" for the basement and shop areas per on-site visit findings. For the exterior lighting portion of the project, the EM&V team noted that there was no photocell present, and although the LSF defaults to zero savings, the lighting wattage reduction still provides energy reduction. Therefore, the exterior fixtures were modeled with the photocell controls. Overall, these adjustments resulted in a decrease in demand and energy savings and realization rates of 95 percent kW and 98 percent kWh.

Participant ID 1132944: The energy efficiency project included interior and exterior lighting retrofits at a retail store. During the desk review, the EM&V team adjusted the wattage for several lamps from 8W claimed to 8.5W to match DLC qualified products list since version 2018.5 of the LSF calculator allows for wattages in 0.5 increments (up to 25W). In addition, the HOU and CF was corrected to match the Texas TRM 5.0 values. Overall, these adjustments slightly increased demand and energy savings and resulted in realization rates of 102 percent kW and kWh.

Participant ID 1133116: The energy efficiency project included interior lighting retrofits at a strip mall retail building. During the desk review, the EM&V team adjusted the building type from "Retail Strip Mall" to "Manufacturing 1 Shift." The CF and HOU values associated with retail buildings are

lower than 1-shift manufacturing facilities, which reduced the demand and energy savings. In addition, the EM&V team corrected the wattage of all fixtures from 166W claimed to 164W using the DLC qualified products list and adjusted the air conditioning type for the room where the fixtures were installed to "None." Overall, these corrections resulted in a significant decrease in demand and energy savings and realization rates of 80 percent kW and 67 percent kWh.

Participant ID 1133120: The energy efficiency project included interior and exterior lighting retrofits at a retail building. During the desk review and on-site M&V visit, the EM&V team corrected the building type from "Retail Strip Mall" to "Retail Other" and removed "Air Conditioning" from the space and added it to the office baths. Overall, these corrections resulted in a negligible decrease in demand and energy savings and realization rates of 100 percent kW and kWh.

Participant ID 1152763: The energy efficiency project included exterior lighting retrofits at a non-refrigerated warehouse. During the desk review and on-site M&V visit, the EM&V team adjusted the wattage for several fixtures from 22W claimed to 21W and from 166W claimed to 158W using the DLC qualified products list. In addition, the air conditioning type was corrected to "None" for the shop and storage areas per on-site visit findings. Overall, these adjustments decreased the demand and energy savings and resulted in realization rates of 96 percent kW and 99 percent kWh.

Participant ID 1180238: The energy efficiency project included interior lighting retrofits at a retail building. During the desk review, the EM&V team corrected the wattage for several fixtures from 18W claimed to 19W and from 40W claimed to 41W using the DLC qualified products list. In addition, the fixture code was adjusted for the installed 41W lamp retrofit kit from "LED041-FIXT" to "LED041-TUBE." Overall, these adjustments resulted in a slight decrease in demand and energy savings and realization rates of 99 percent kW and kWh.

Participant ID 1180266: The energy efficiency project included interior lighting retrofits at a non-food service building. During the desk review, the EM&V team adjusted the building type from "Service (Non-Food)" to "Religious." The CF and HOU values associated with religious buildings are much lower than service buildings, which significantly reduced the demand and energy savings. This adjustment resulted in realization rates of 58 percent kW and 54 percent kWh.

Documentation Score

The EM&V team was able to verify key inputs and assumptions for five of the eight projects that had desk reviews completed because sufficient documentation was provided for the sites. However, partial documentation was provided for the other three projects. The project documentation lacked spec sheets and, in some cases, photographs. In addition, post-inspection notes, invoices and QPL documentation were not provided for all projects. Complete documentation enhances the accuracy and transparency of project savings and ease of evaluation. Since sufficient documentation was provided for some of the projects, the EM&V team assigned a program documentation score of Fair.

9.3.3 SCORE/CitySmart Market Transformation Program (MTP)

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
4.0%	553	553	100.0%	14.5%	2,491,961	2,491,961	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 small sample sizes.

The PY2018 SCORE/CitySmart MTP evaluation efforts focused on desk reviews and on-site M&V. The number of completed desk reviews and on-site M&V projects for this program are listed above.

The EM&V team adjusted the claimed savings for four projects. Two projects had adjustments less than 5 percent compared to the original claimed savings percent and two projects had adjustments greater than 5 percent compared to the original claimed savings. TNMP accepted the evaluated results and matched the claimed savings to those of the evaluations for all projects with adjustments and therefore the final program realization rate is 100 percent. Further details of the EM&V findings are provided below.

Participant ID 1133381: The energy efficiency project included interior lighting retrofits at a school. During the desk review and on-site M&V visit, the EM&V team removed savings for fixtures for one of the school rooms as the room did not have LED retrofits completed per on-site visit findings. In addition, 10 additional fixtures were found in one of the school rooms. Overall, these corrections decreased demand and energy savings and resulted in realization rates of 97 percent kW and kWh.

Participant ID 1153176: The energy efficiency project included the new construction installation of HVAC equipment and interior and exterior lighting fixtures with some controls at a school. During the desk review, the EM&V team made adjustments to the HVAC portion of the project. The quantity of units with model number LGH048H4E installed was adjusted from 18 claimed to 17, per final review comments and HVAC equipment schedule. In addition, replication of the ACE inventory using the 2017.2 version (to match the lighting calculator since the project started in 2017) significantly increased the HVAC energy savings and slightly decreased the demand savings. This is due to the difference in baseline minimum efficiency required by IECC 2009 compared to 2015 requirements between the 2017 and 2018 TRM calculations. Overall, these corrections resulted in realization rates of 99 percent kW and 112 percent kWh.

Participant ID 1178724: The energy efficiency project included interior and exterior lighting retrofits with controls at a school. During the desk review, the EM&V team corrected the fixtures qualification, wattage and quantity for the main school building. Non-qualified 3-foot LED fixtures were adjusted back to DLC qualified, as the lamps were qualified less than 4 months after the completion of the project. The 3-foot LED fixtures' wattage was also adjusted from 14W claimed to 12W using the DLC qualified products list. In addition, the post-retrofit quantity of the 3-foot fixtures was increased to match the number of 3-foot T8 tubes removed since the entire project was a one-for-one tube replacement. For the multipurpose arena portion of the project, the ex-ante savings calculator inventory seemed to be entered incorrectly based upon photographic documentation and descriptions. Fixture types, wattage, and quantity were adjusted based on a one-for-one, like-for-like lamp replacement, where screw-in compact fluorescent fixtures were retrofitted with a 9W LED screw-in lamp, and linear fluorescent T8 fixtures were retrofitted with T8 LED tubes matching the number of existing T8 lamps. Overall, these adjustments resulted in a negligible decrease in demand and energy savings and realization rates of 100 percent kW and kWh.

Participant ID 1179319: The energy efficiency project included the new construction of interior and exterior lighting at a parking structure. During the desk review and on-site M&V visit, the EM&V

team adjusted the gross lighted floor area and reduced the building square footage by 37,388 square feet, as the 7th floor of the parking garage is uncovered parking. For the interior portion of the project, the pole light “cobra head” LED fixtures with the fixture code GP2 were removed, as these fixtures were only installed on the 7th floor (top) of the garage building, which is uncovered. In addition, the qualification for nine LED fixtures was adjusted from “Non-Qualified” to “Lgt Facts.” For the exterior portion of the project, the fixture quantity was adjusted from 4 claimed to 8, as onsite inspection photos showed 8 total cobra heads on 4 poles (2 each). Overall, these corrections increased demand and energy savings and resulted in realization rates of 119 percent kW and 120 percent kWh.

Documentation Score

The EM&V team was able to verify key inputs and assumptions (e.g., equipment quantity, equipment capacity, QPL qualifications, AHRI certifications) for all projects that had desk reviews completed because sufficient documentation was provided for the sites. Project documentation included invoices, QPL qualifications and/or AHRI certifications, pre- and post-inspection notes, the project savings calculators, and photographic documentation of existing and new equipment, which are significant efforts by the utility to verify equipment conditions and quantities. Since sufficient documentation was provided for all projects, the EM&V team assigned a program documentation score of Good.

9.4 Detailed Findings—Residential (High/Medium Evaluation Priority)

9.4.1 High-Performance Homes Market Transformation Program (MTP)

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
4.8%	667	667	100.0%	12.4%	2,131,048	2,131,048	100.0%	Good

Completed Desk Reviews*	On-Site M&V
9	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 PY2018 evaluation efforts focused on desk reviews. The number of completed desk reviews for this program is listed above.

The EM&V team focused on reviewing documentation for program homes. This program relies on a proprietary energy model, however that model is built on DOE-2 energy modeling software that is listed as an acceptable savings estimation method in the TRM.

We received two types of documentation from the program: REM/Rate files that provided the inputs that fed into the energy models, and detailed output files that provided the results of the energy model analysis. We reviewed the REM/Rate files to ensure that all homes met stated program requirements, and that the files contained all inputs required by the DOE-2 based model. We compared the results of the model to the claimed savings in the tracking database, and all of the model output files matched the claimed savings in the tracking data. We did not recommend any adjustments for this program.

Documentation Score

For all sampled projects, the EM&V team was able to verify key inputs and assumptions (e.g., energy model inputs and detailed model outputs). Because sufficient documentation was provided for all the reviewed projects, the EM&V team assigned a program documentation score of Good.

9.4.2 Residential Standard Offer Program (SOP)

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
22.4%	3,078	3,078	100.0%	29.7%	5,105,021	5,105,021	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 PY2018 evaluation efforts focused on desk reviews and on-site M&V. All on-site M&V projects also had desk reviews. The number of completed desk reviews and on-site M&V projects for this program are listed in the table above.

The EM&V team did not make any adjustments to this program. Overall, the EM&V team assessed ex-ante claimed energy and demand savings across the following two activities:

- For a sample of projects, desk reviews were completed to check that measure data collected by contractors on forms aligned correctly with data in the tracking system.
- On-site M&V was completed for a sample of projects to verify that measures remained installed and matched project documentation.

Desk reviews were completed for 10 projects and resulted in desk review realization rates of 100 percent and 100 percent for demand and energy savings, respectively. On-site M&V was completed for five projects and resulted in on-site realization rates of 100 percent and 100 percent for demand and energy savings, respectively.

Documentation Score

For all sampled projects, the EM&V team was able to verify key inputs and assumptions (e.g., pre- and post-condition) for ceiling insulation (the primary measure reviewed). There was limited documentation for direct installs such as low flow showerheads. Because sufficient documentation was provided for most of the measures across all the reviewed projects, the EM&V team assigned a program documentation score of Good.

9.4.3 Hard-to-Reach Standard Offer Program (SOP)

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%	588	588	100.0%	5.2%	897,887	897,887	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.

The PY2018 evaluation efforts focused on desk reviews and on-site M&V. All on-site M&V projects also had desk reviews. The number of completed desk reviews and on-site M&V projects for this program are listed in the table above.

The EM&V team did not make any adjustments to this program. Overall, the EM&V team assessed ex-ante claimed energy and demand savings across the following two activities:

- For a sample of projects, desk reviews were completed to check that measure data collected by contractors on forms aligned correctly with data in the tracking system.
- On-site M&V was completed for a sample of projects to verify that measures remained installed and matched project documentation.

Desk reviews were completed for four projects and resulted in desk review realization rates of 100 percent and 100 percent for demand and energy savings, respectively. On-site M&V was completed for two projects and resulted in on-site realization rates of 100 percent and 100 percent for demand and energy savings, respectively.

Documentation Score

For all sampled projects, the EM&V team was able to verify key inputs and assumptions (e.g., pre- and post-condition) for ceiling insulation (the primary measure reviewed). There was limited documentation for direct installs such as low flow showerheads and LEDs. Because sufficient documentation was provided for most of the measures across all the reviewed projects, the EM&V team assigned a program documentation score of Good.

9.5 Detailed Findings—Load Management (High Evaluation Priority)

9.5.1 Load Management Standard Offer Program (SOP)

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 1%	7,176	7,176	100.0%	0 0%	7,176	7,176	100.0%	Good

Completed Desk Reviews*	On-Site M&V
N/A	N/A

* 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 TNMP Commercial Load Management 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. A single load management event occurred on June 20, 2018, from 3 p.m. to 4p.m.

The EM&V team received the interval meter data and spreadsheets detailing the TNMP calculated savings results for the event and each ESI ID. The EM&V team was able to calculate savings for each of the participating ESI IDs with the results matching those of the program. As such, no adjustments were made to the program savings.

Evaluated savings for the TNMP Commercial Load Management program are 7,176 kW and 7,176 kWh. The realization rate for both kW and kWh is 100.0 percent.

9.6 Summary of Low Priority Evaluation Programs

Table 9-5 provides a summary of claimed savings for TNMP's low evaluation priority programs in PY2018, including programs' overall contribution to portfolio savings. Low priority programs' claimed savings were verified against the final PY2018 tracking data provided to the EM&V team for the EM&V database.

Table 9-5. PY2018 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)
Low Income Weatherization	3.5%	479	479	100.0%	4.4%	757,417	757,417	100.0%
REP Pilot MTP	0.7%	94	94	100.0%	1.5%	256,568	256,568	100.0%

10.0 XCEL SPS IMPACT EVALUATION RESULTS

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, we include a list of the low evaluation priority programs for which claimed savings were verified through the EM&V database.

10.1 Key Findings

10.1.1 Evaluated Savings

Xcel SPS's evaluated savings for PY2018 were 9,568 in demand (kW) and 18,877,468 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, which also supported healthy realization rates. (See Table 10-4.)

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

Table 10-1. Xcel SPS PY2018 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%	9,574	9,568	99.9%	0.2%
Commercial	21.5%	2,054	2,048	99.7%	0.9%
Residential	28.1%	2,694	2,694	100.0%	0.0%
Low Income	2.9%	282	282	100.0%	n/a
Load Management*	47.5%	4,544	4,544	100.0%	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.

Table 10-2 shows the claimed and evaluated energy savings for Xcel SPS's portfolio and broad customer sector/program categories for PY2018.

Table 10-2. Xcel SPS PY2018 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%	18,906,158	18,877,468	99.8%	0.4%
Commercial	57.5%	10,869,988	10,841,305	99.7%	0.6%
Residential	38.2%	7,217,822	7,217,816	100.0%	0.0%
Low Income	4.2%	800,172	800,172	100.0%	n/a
Load Management*	0.1%	18,176	18,176	100.0%	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.

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. 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.

Xcel SPS received a Good program documentation score for the Retro-commissioning MTP and the Residential SOP, and it received Fair documentation scores for the Commercial SOP, Small Commercial MTP, and Residential Hard-to-Reach program. While a Fair documentation score indicates a reasonable level of documentation, it also indicates some room for improvement. Details about what documentation the evaluation team found and reviewed are listed within each program-specific section.

10.1.2 Cost-effectiveness Results

Xcel SPS's overall portfolio had a cost-effectiveness of 2.31, or 2.48 excluding low-income programs. (See Table 10-3.)

The more cost-effective programs were Home Lighting MTP and Commercial SOP. The less cost-effective programs were Small Commercial MTP and Load Management SOP. The Commercial Home Lighting MTP result stands out at 26.20, but this is a result of the way this program is reported. Five percent of the program bulbs and budget are allocated to the commercial sector, but commercial applications generate disproportionate savings that distort the cost-effectiveness results.

The lifetime cost of evaluated savings was \$0.009 per kWh and \$19.51 per kW.

Table 10-3. Xcel SPS Cost-effectiveness Results

Level of Analysis	Claimed Savings Results	Evaluated Savings Results	Net Savings Results
Total Portfolio	2.32	2.31	2.13
Total Portfolio excluding low-income programs	2.48	2.48	2.28
Commercial	2.67	2.66	2.41
Commercial SOP	4.84	4.82	4.36
Retro-Commissioning MTP	2.29	2.28	2.05
Small Commercial MTP	1.18	1.18	1.12
Home Lighting MTP	26.20	26.20	23.58
Residential	2.48	2.48	2.30
Residential SOP	2.25	2.25	2.01
Home Lighting MTP	4.10	4.10	3.69
Hard-to-Reach SOP	2.03	2.03	2.03
Low Income*	2.76	2.76	2.76
Low-Income Weatherization*	2.76	2.76	2.76
Load Management	1.27	1.27	1.27
Load Management SOP	1.27	1.27	1.27

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

10.2 Claimed Savings Adjustments

Utilities are provided the opportunity to adjust savings at the project-level based on interim EM&V findings. Realization rates assume the following adjustments will be included in Xcel SPS's May 1 filing.

Table 10-4. EM&V Claimed Savings Adjustments by Program (Prior to EECR¹⁴ Filing)

Program	EM&V Demand Claimed Savings Adjustments (kW)	EM&V Energy Claimed Savings Adjustments (kWh)
Small Commercial MTP (Com)	0.40	13,140.00
Hard-to-Reach SOP (HTR)	-0.30	-1,028.10
Total	0.10	12,111.90

10.3 Detailed Findings—Commercial (High/Medium Evaluation Priority)

10.3.1 Retro-commissioning MTP

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
9.5%	907	902	99.5%	26.2%	4,950,639	4,940,604	99.8%	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 PY2018 Retro-commissioning MTP evaluation efforts focused on desk reviews and on-site M&V. The number of completed desk reviews and on-site M&V projects for this program are listed above.

The EM&V team adjusted the claimed savings for four projects. All four projects had adjustments of less than 5 percent compared to the original claimed savings and therefore the final program realization rate is nearly 100 percent. Further details of the EM&V findings are provided below.

Participant ID 1129020: The energy efficiency project involved interior lighting retrofits at a manufacturing facility. During the desk review and on-site M&V visit, the EM&V team adjusted the air-conditioning type from “Air-Conditioned” to “None” for two buildings in the facility. This correction slightly decreased energy and peak demand savings and resulted in realization rates of 99 percent kW and kWh.

Participant ID 1129021: The energy efficiency project included an early replacement of HVAC equipment and interior lighting retrofits at an office building. During the desk review, the EM&V team made adjustments to the lighting savings and did not adjust the HVAC savings. For the lighting portion of the project, the EM&V team corrected the fixture wattages from 31W claimed to 30W and from 26W claimed to 25W since wattages were rounded up instead of rounded to the nearest wattages. This adjustment resulted in a slight increase of energy and peak demand savings and realization rates of 101 percent kW and kWh.

¹⁴ Energy Efficiency Cost Recovery

Participant ID 1156861: The energy efficiency project included interior lighting retrofits at a warehouse (refrigerated and non-refrigerated) with associated offices and VFD installation for a refrigeration system. During the desk review, the EM&V team made adjustments to the lighting savings and did not adjust the refrigeration savings. For the lighting portion of the project, the EM&V team corrected the fixture wattages for the non-refrigerated warehouse from 183W claimed to 182W per DLC certification listing. This adjustment resulted in a negligible increase of energy and peak demand savings and realization rates of 100 percent kW and kWh.

Participant ID 1181195: The energy efficiency project included interior and exterior lighting retrofits at an airport. During the desk review and on-site M&V visit, the EM&V team corrected the deemed annual operating hours, fixtures quantities and wattages. The claimed interior annual hours at the airport were 24/7 although self-reported hours are from 4:00 a.m. to 11:00 p.m. from Sunday to Friday, and 4:40 a.m. to 11 p.m. on Saturday. This equates to approximately 146.3 hours weekly or 7,600 hours annually. The custom annual operating hours were therefore adjusted from 8,760 to 7,600. A slight difference in savings was attributed to adjustment in wattages for the exterior fixtures from 21W claimed to 20W per DLC certification listing. Interior fixture quantities were also corrected from 11 claimed to 10 50W-LED fixtures and from 21 claimed to 22 36W LED fixtures per on-site M&V visit findings. Overall, the adjustments slightly impacted the energy and peak demand savings and resulted in realization rates of 100 percent kW and 99 percent kWh.

Documentation Score

The EM&V team was able to verify key inputs and assumptions (e.g., equipment quantity, equipment capacity, QPL qualifications) for two of the four projects that had desk reviews completed because sufficient documentation was provided for the sites. The project documentation included post-inspection notes and the project savings calculators. However, partial documentation was provided for two lighting projects. For one project, project documentation lacked inspection notes and pre- and post-install photographic documentation, and for the other project, the provided post-retrofit photos were not sufficient to verify fixture model numbers or confirm claimed delamping. Since sufficient documentation was provided for the rest of the projects, the EM&V team assigned a program documentation score of Good.

10.3.2 Commercial SOP

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%	652	651	99.8%	19.3%	3,655,048	3,636,196	99.5%	Fair

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 small sample sizes.

The PY2018 Commercial SOP evaluation efforts focused on desk reviews and on-site M&V. The number of completed desk reviews and on-site M&V projects for this program are listed above.

The EM&V team adjusted the claimed savings for seven projects. All seven projects had adjustments of less than 5 percent compared to the original claimed savings and therefore the final program realization rate is nearly 100 percent. Further details of the EM&V findings are provided below.

Participant ID 1112688: The energy efficiency project included interior and exterior lighting retrofits at a retail strip mall building. During the desk review and on-site M&V visit, the EM&V team adjusted the fixture quantity for one of the interior rooms from 1,458 claimed to 1,362 and corrected the exterior fixture wattages from 110W claimed to 150W and from 78W claimed to 77W per DLC certification listings. Overall, the adjustments slightly increased the peak demand savings and resulted in realization rates of 102 percent kW and 100 percent kWh.

Participant ID 1112692: The energy efficiency project included interior and exterior lighting retrofits at a manufacturing facility. During the desk review, the EM&V team adjusted wattages for some of the interior fixtures from 125W claimed to 132W and from 185W claimed to 187W per DLC certification listings. This correction resulted in a slight decrease in energy and peak demand savings and realization rates of 99 percent kW and kWh.

Participant ID 1112696: The energy efficiency project included interior and exterior lighting retrofits at a non-24-hr. supermarket. During the desk review and on-site M&V visit, the EM&V team corrected the building type from “Custom” to “Supermarket Non-24 Hours” with no impact on the savings (annual operating hours and coincidence factor (CF) remained the same). Wattages were also adjusted for some interior fixtures from 16W claimed to 9W per ENERGY STAR® certification listings, and from 16W claimed to 15.5W since version 2018.5 of the LSF calculator allows for wattages in 0.5 increments (up to 25W) that match the rated wattages. Some exterior fixture wattages were also corrected from 43W claimed to 41W per DLC certification listing. During the on-site M&V visit, two fewer 9W bulbs were found in one of the interior spaces. Overall, the adjustments resulted in a slight decrease of energy and peak demand savings and realization rates of 98 percent kW and kWh.

Participant ID 1112697: The energy efficiency project included interior and exterior lighting retrofits at a non-24-hr. supermarket. During the desk review, the EM&V team corrected the building type from “Custom” to “Supermarket Non-24 Hours” with no impact on the savings (annual operating hours and coincidence factor (CF) remained the same). The EM&V team also adjusted wattages for some interior fixtures from 16W claimed to 15.5W since version 2018.5 of the LSF calculator allows for wattages in 0.5 increments (up to 25W) that match the rated wattages. A few exterior fixture wattages were also corrected from 145W claimed to 150W per DLC certification listing. Overall, the adjustments resulted in a slight decrease of energy and peak demand savings and realization rates of 98 percent kW and kWh.

Participant ID 1112700: The energy efficiency project included interior and exterior lighting retrofits at a non-24-hr. supermarket. During the desk review and on-site M&V visit, the EM&V team adjusted wattages for some of the exterior fixtures from 84W claimed to 78W per DLC certification listing. This correction resulted in a negligible increase in energy and peak demand savings and realization rates of 100 percent kW and kWh.

Participant ID 1183653: The energy efficiency project included interior and exterior lighting retrofits at a school. During the desk review, the EM&V team removed pre- and post-retrofit fixtures for one of the interior rooms based on post-inspection documentation. In addition, wattages for some exterior fixtures were adjusted from 16W claimed to 15.5W since version 2018.5 of the LSF calculator allows for wattages in 0.5 increments (up to 25W) that match the rated wattages. Overall, the corrections decreased energy and peak demand savings and resulted in realization rates of 96 percent kW and kWh.

Participant ID 1183655: The energy efficiency project included interior and exterior lighting retrofits at a custom building. During the desk review and M&V visit, the EM&V team adjusted the building type from “Custom” to “Retail/Supermarket 24-hr.” This correction decreased energy and demand savings as the deemed annual operating hours assumption was decreased from 7,280 to 6,900 hours per year. The coincidence factor (CF) slightly increased from 0.9 to 0.95. In addition, wattages for all exterior and some interior fixtures were corrected per QPL qualifications: from 150W claimed to 149W, from 43W claimed to 41W, 145W claimed to 150W, 84W claimed to 79W, and from 16W claimed to 15.5W. The latter wattage adjustment occurred because version 2018.5 of the LSF calculator allows for wattages in 0.5 increments (up to 25W) that match the rated wattages. Overall, the corrections resulted in realization rates of 103 percent kW and 97 percent kWh.

Documentation Score

Partial documentation was provided for all eight lighting projects. Pre- and post-photographic documentation was not provided for all projects and one project documentation lacked the final savings calculator. In addition, post-inspection notes, invoices, manufacturer’s specification sheets, and QPL documentation were not provided for some of the projects. Three of the eight projects with partial documentation were projects in which custom hours of operation were claimed, however, no details were provided to support the custom attribution. Complete documentation enhances the accuracy and transparency of project savings and ease of evaluation. Therefore, the EM&V team assigned a program documentation score of Fair.

10.3.3 Small Commercial MTP

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
2.8%	268	268	100.0%	6.4%	1,212,389	1,212,593	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.

The PY2018 Small Commercial MTP evaluation efforts focused on desk reviews and on-site M&V. The number of completed desk reviews and on-site M&V projects for this program are listed above.

The EM&V team adjusted the claimed savings for three projects. One project had adjustments of less than 5 percent and two projects had adjustments greater than 5 percent compared to the original claimed savings. Xcel SPS accepted the evaluated results and matched the claimed savings to those of the evaluations for the two projects with significant adjustments and therefore the final program realization rate is 100 percent. Further details of the EM&V findings are provided below.

Participant ID 1112712: The energy efficiency project included interior and exterior lighting retrofits at a religious facility. During the desk review and on-site M&V visit, the EM&V team adjusted the building type from “Religious” to “Public Assembly” since the arena where the lighting fixtures were installed is owned by a church but rented out, therefore making the building type different from religious. This correction significantly increased energy and demand savings as the deemed

annual operating hours and coincidence factor (CF) assumptions were increased from 1,824 to 2,638 hours per year and from 0.53 to 0.56 respectively. Wattages were also corrected for some fixtures from 195W claimed to 150W per DLC certification listing. Pre- and post-retrofit controls for the interior lighting was also adjusted to “None” from “Occupancy Sensor” per on-site M&V visit findings. Overall, the corrections resulted in an increase of energy and peak demand savings and realization rates of 111 percent kW and 118 percent kWh.

Participant ID 1112722: The energy efficiency project included interior and exterior lighting retrofits at a retail building. During the desk review and on-site M&V visit, the EM&V team corrected the building type selection from “Retail Other” to “Warehouse Non-Refrigerated” since that represents the majority of the building area. This correction significantly decreased energy and demand savings as the deemed annual operating hours and coincidence factor (CF) assumptions were decreased from 3,668 to 3,501 hours per year and from 0.9 to 0.77 respectively. In addition, the wattage for some interior LED lamps was adjusted from 16W claimed to 15W and from 7W claimed to 7.5W per certification listings. The latter wattage adjustment occurred because version 2018.5 of the LSF calculator allows for wattages in 0.5 increments (up to 25W) that match the rated wattages. The quantity of 4-foot linear fluorescent T8 fixtures installed in the warehouse was also adjusted from 75 to 72 per on-site M&V visit findings. Overall, the corrections decreased energy and peak demand savings and realization rates of 83 percent kW and 93 percent kWh.

Participant ID 1112731: The energy efficiency project included interior lighting retrofits at a single-shift manufacturing facility. During the desk review, the EM&V team adjusted fixture wattages from 120W claimed to 116W per DLC certification listing. This correction resulted in a slight increase in energy and peak demand savings and realization rates of 101 percent kW and kWh.

Documentation Score

The EM&V team was able to verify key inputs and assumptions for two of the four projects that had desk reviews completed because sufficient documentation was provided for the sites. However, partial documentation was provided for the other two projects. The project documentation lacked pre- and post-retrofit photographic documentation. In addition, post-inspection notes, invoices and QPL documentation were not provided for all projects. Complete documentation enhances the accuracy and transparency of project savings and ease of evaluation. Therefore, the EM&V team assigned a program documentation score of Fair.

10.4 Detailed Findings—Residential (Medium Evaluation Priority)

10.4.1 Residential SOP

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
9.9%	945	945	100.0%	11.3%	2,135,877	2,135,878	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 small sample sizes.

The PY2018 evaluation efforts focused on desk reviews and on-site M&V. The number of completed desk reviews and on-site M&V projects for this program are listed above.

The EM&V team did not make any adjustments to this program. Overall, the EM&V team assessed ex-ante claimed energy and demand savings across the following two activities:

- For a sample of projects, desk reviews were completed to check that measure data collected by contractors on forms aligned correctly with data in the tracking system.
- On-site M&V was completed for a sample of projects to verify that measures remained installed and matched project documentation.

Desk reviews were completed for six projects and resulted in desk review realization rates of 100 percent and 100 percent for demand and energy savings, respectively. On-site M&V was completed for three projects and resulted in on-site realization rates of 100 percent and 100 percent for demand and energy savings, respectively. There were minor differences between ex-ante and ex post savings for LEDs due to rounding. All identified variations due to rounding were within 1 kWh and 0.01 kW.

Documentation Score

For all sampled projects, the EM&V team was able to verify key inputs and assumptions (e.g., pre- and post-condition) for heat pumps and ceiling insulation. There was limited documentation for direct installs such as low flow showerheads and LEDs. Because sufficient documentation was provided for most of the measures across all the reviewed projects, the EM&V team assigned a program documentation score of Good.

10.4.2 Hard-to-Reach SOP

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%	681	681	100.0%	8.2%	1,550,943	1,550,935	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 small sample sizes.

The PY2018 evaluation efforts focused on desk reviews and on-site M&V. The number of completed desk reviews and on-site M&V projects for this program are listed above.

The EM&V team made an adjustment of more than 5 percent to the claimed savings for four projects. Overall, the EM&V team assessed ex-ante claimed energy and demand savings across the following two activities:

- For a sample of projects, desk reviews were completed to check that measure data collected by contractors on forms aligned correctly with data in the tracking system.
- On-site M&V was completed for a sample of projects to verify that measures remained installed and matched project documentation.

Desk reviews were completed for six projects and resulted in desk review realization rates of 97.6 percent and 97.1 percent for demand and energy savings, respectively. On-site M&V was completed for three projects and resulted in on-site realization rates of 119.1 percent and 115.2 percent for demand and energy savings, respectively. Differences between evaluated savings and claimed savings were driven by the following projects.

Participant ID 1112954: The energy efficiency project included implementation of the ceiling insulation and duct sealing measures. TRM 5.0 Volume 2 contains an eligibility requirement for the ceiling insulation measure, the application of which led to a difference in claimed and evaluated savings for this project. TRM 5.0 Volume 2 states for any reported pre-retrofit R-value that falls below R-5, all contractors are required to provide sufficient evidence including two pictures: 1) a picture showing the entire attic floor, and 2) a close-up picture of a ruler that shows the measurement of the depth of the insulation. In the absence of evidence demonstrating pre-retrofit ceiling insulation below R-5, the lowest level of pre-retrofit ceiling insulation that can be claimed is the R-5 to R-8 range. The baseline reported was less than R-5 level insulation and the EM&V team determined the documentation provided did not meet the requirement and adjusted the baseline to R-5. Overall, the adjustment resulted in project level realization rates of 37.6 percent and 59.2 percent for demand and energy savings, respectively.

Participant ID 1139114: The energy efficiency project included implementation of the ceiling insulation and duct sealing measures. TRM 5.0 Volume 2 contains an eligibility requirement for the ceiling insulation measure, the application of which led to a difference in claimed and evaluated savings for this project. TRM 5.0 Volume 2 states for any reported pre-retrofit R-value that falls below R-5, all contractors are required to provide sufficient evidence including two pictures: 1) a picture showing the entire attic floor, and 2) a close-up picture of a ruler that shows the measurement of the depth of the insulation. In the absence of evidence demonstrating pre-retrofit ceiling insulation below R-5, the lowest

level of pre-retrofit ceiling insulation that can be claimed is the R-5 to R-8 range. The baseline reported was less than R-5 level insulation and the EM&V team determined the documentation provided did not meet the requirement and adjusted the baseline to R-5. Overall, the adjustment resulted in project level realization rates of 57.0 percent and 53.7 percent for demand and energy savings, respectively.

Participant ID 1113029: The energy efficiency project included implementation of air infiltration, duct sealing, and LED measures. The EM&V team's on-site testing resulted in a substantially higher reduction in air infiltration than what was documented by the program. Using a threshold of +/-10 percent, the EM&V team's blower door test results were quite a bit lower than the results found in the tracking data resulting in an increase in savings. Overall, the adjustments resulted in project level realization rates of 136.4 percent and 130.7 percent for demand and energy savings, respectively.

Participant ID 1113032: The energy efficiency project included implementation of air infiltration, duct sealing, and LED measures. The EM&V team's on-site testing resulted in a substantially higher reduction in air infiltration and substantially lower reduction in duct sealing than what was documented by the program. Using a threshold of +/-10 percent, the EM&V team's blower door test results were quite a bit lower and the duct blaster test results were quite a bit higher than the results found in the tracking data resulting in an increase in savings. Overall, the adjustments resulted in project level realization rates of 130.3 percent and 123.4 percent for demand and energy savings, respectively. In addition, there were minor differences between ex-ante and ex post savings for LEDs due to rounding. All identified variations due to rounding were within 1 kWh and 0.01 kW.

Documentation Score

For all sampled projects, the EM&V team was able to verify key inputs and assumptions (e.g., pre- and post-condition test results) for air infiltration and duct efficiency. There was limited documentation for ceiling insulation and direct installs such as LEDs and low flow showerheads. Because sufficient documentation was provided for some, but not all, of the measures across all the reviewed projects, the EM&V team assigned a program documentation score of Fair.

10.5 Detailed Findings—Load Management (High Evaluation Priority)

10.5.1 Load Management SOP

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
47.5%	4,544	4,544	100.0%	0.1%	18,176	18,176	100.0%	Good

Completed Desk Reviews*	On-Site M&V
N/A	N/A

* 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 program by applying the TRM calculation methodology to interval meter data. The meter data was supplied in 15-minute increments at the meter level. A single scheduled load management event occurred on July 20, 2018, from 2:00 p.m. to 4:00 p.m.

The EM&V team received the interval meter data and a spreadsheet that summarized the event-level savings for each participant. The EM&V team was able to calculate savings with the data that Xcel SPS provided, with the results matching for each participant and in total.

Evaluated savings for the Xcel SPS Load Management program are 4,544 kW and 18,176 kWh. The realization rate for both kW and kWh is 100.0 percent.

10.6 Summary of Low Priority Evaluation Programs

Table 10-5 provides a summary of claimed savings for Xcel SPS' low evaluation priority programs in PY2018, including programs' overall contribution to portfolio savings. Low priority programs' claimed savings were verified against the final PY2018 tracking data provided to the EM&V team for the EM&V database.

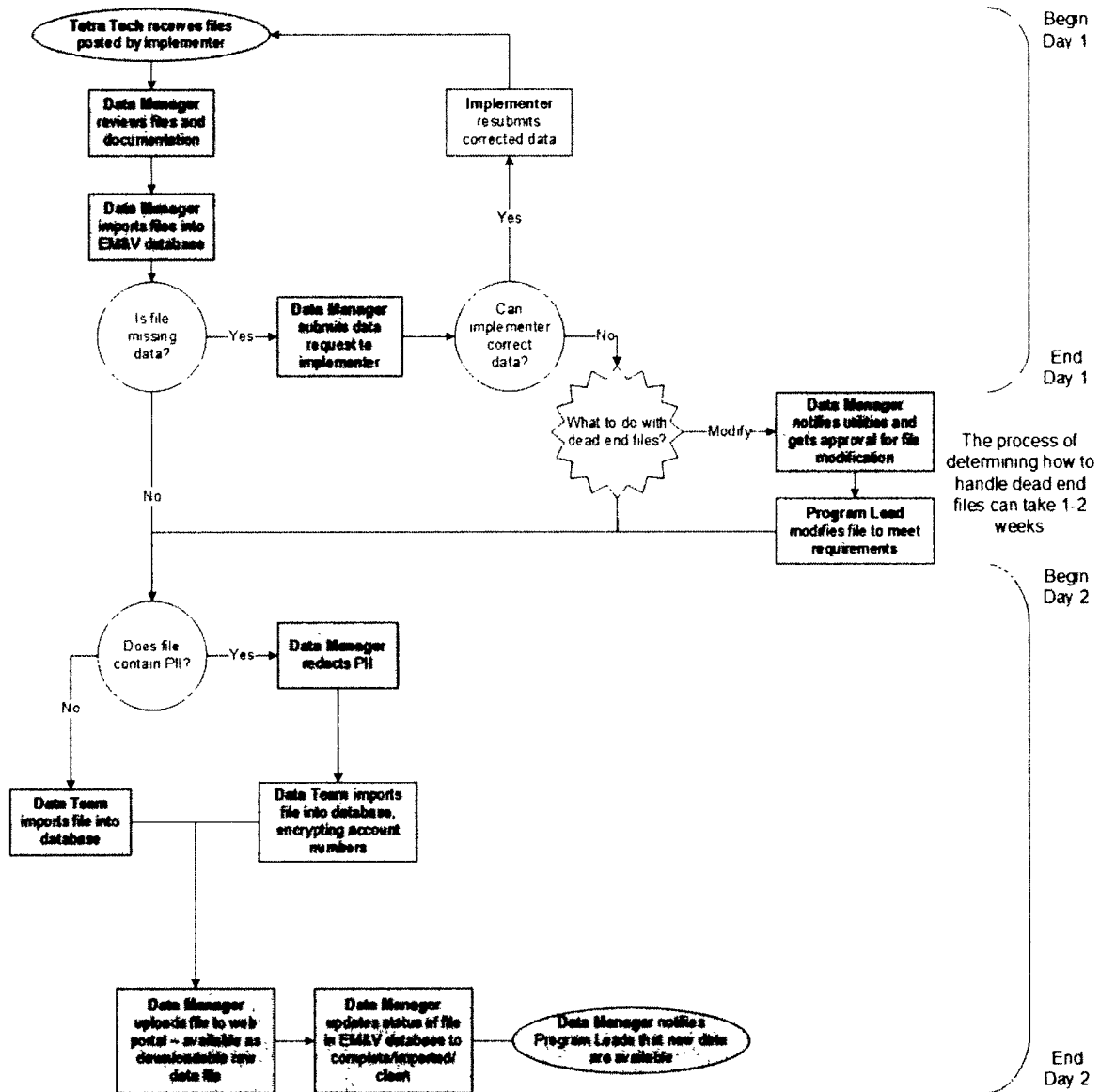
Table 10-5. PY2018 Claimed Savings Low Evaluation Priority Programs

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)
Home Lighting MTP (Com)	2.4%	227	227	100.0%	5.6%	1,051,912	1,051,912	100.0%
Home Lighting MTP (Res)	11.2%	1,068	1,068	100.0%	18.7%	3,531,002	3,531,002	100.0%
Low-Income Weatherization	2.9%	282	282	100.0%	4.2%	800,172	800,172	100.0%

APPENDIX A: DATA MANAGEMENT PROCESS

Figure A-1 details the data management process.

Figure A-1. Data Management Process



APPENDIX B: COST-EFFECTIVENESS CALCULATIONS

This appendix describes the calculations used for modeling cost-effectiveness. This approach provides the PUCT with a consistent methodology for evaluating cost-effectiveness across the utilities.

B.1 APPROACH

The approach to the EM&V team's benefit-cost testing is based on P.U.C. SUBST. R. 25.181, where costs and benefits are defined in section (d):

“The cost of a program includes the cost of incentives, measurement and verification, any shareholder bonus awarded to the utility, and actual or allocated research and development and administrative costs. The benefits of the program consist of the value of the demand reductions and energy savings, measured in accordance with the avoided costs prescribed in this subsection. The present value of the program benefits shall be calculated over the projected life of the measures installed or implemented under the program.”

This description is consistent with the PACT. Based on this definition, we collected the costs reported in the utilities' 2016 EEPRs, filed on April 1, 2017.¹⁵ The program benefits must be calculated at a measure level in order to apply individual effective useful lives. Therefore, the savings were derived from the EM&V database, which is a comprehensive, centralized source of the utilities' program tracking data.

The present value of the benefits is calculated separately for energy and demand as follows:

$$PV = \frac{AC}{WACC - E} \left[1 - \left(\frac{1 + E}{1 + WACC} \right)^n \right]$$

Where:

AC is the avoided cost of the benefit (energy or demand)

The discount rate, WACC, is the utility's weighted average cost of capital

E is the escalation rate

n is the effective useful life of the measure.

This calculation was modified from the original evaluation plan in order to allow for including an escalation rate. The EM&V team has provided results for benefit-cost calculation using an escalation rate of 2 percent and without an escalation rate.

¹⁵ PUCT filing number 44480.

The benefit-cost ratio is calculated as:

$$BC = \frac{PV_e + PV_d}{C}$$

Where:

PV_e is the present value of the avoided energy costs

PV_d is the present value of the avoided demand costs

C is the total program cost, including incentives, administrative, evaluation, measurement and verification, shareholder bonus, and research and development costs.

Some costs are reported by the utilities at the portfolio level, such as research and development and shareholder bonus costs. These costs are attributed to individual programs based on each program's incentive costs as a percentage of the portfolio. EM&V costs were previously distributed among utility programs by the EM&V team based on programs' share of energy savings and evaluation priority.

B.1.1 Savings-to-Investment Ratio

Targeted low-income energy efficiency programs are run by all unbundled transmission and distribution utilities. These programs are evaluated using the SIR rather than the PACT described above.

The SIR is significantly different in both the benefits and costs included. The benefits are comprised of the customer's avoided energy costs. This means that the retail electric rate is used rather than the utility's avoided cost, and there is no cost associated with avoided demand. Rather than the WACC, the SIR uses a societal discount rate of 3 percent. The only costs included are the incentives paid to the weatherization agencies.

Table B-1 lists the average retail rates paid by customers. These rates are based on data collected by Frontier Associates through weatherization agencies.

Table B-1. Average Energy Cost by Utility

Utility	Average kWh Rate
AEP TCC	\$0.12
AEP TNC	\$0.11
CenterPoint	\$0.12
Oncor	\$0.13
TNMP	\$0.11
Xcel Energy	\$0.12

B.1.1 Net-to-Gross Ratios

The following NTG ratios were used to calculate cost-effectiveness based on net savings. The EM&V team determined the NTG ratios through primary research in the PY2013 and PY2014 scope, and the majority of these were updated during the PY2017 scope.

Table B-2. Net-to-Gross Ratios

Program	kWh NTG	kW NTG
Commercial		
Retro-Commissioning MTP	0.90	0.90
REP (Commercial CoolSaver)	0.80	0.80
Advanced Lighting Commercial	0.90	0.90
Large Commercial SOP	0.91	0.89
Commercial MTP (SCORE, Healthcare , Data Center)	0.86	0.99
Residential		
CenterPoint Energy High Efficiency Homes MTP	0.70	0.70
REP (CoolSaver & Efficiency Connection)	0.90	0.90
Residential & SC SOP	0.92	0.86
Advanced Lighting Residential	0.90	0.90
Residential Pool Pump & A/C Distributor MTP	0.84	0.84
Multi-Family MTP	0.80	0.80
Hard-to-Reach SOP	1.00	1.00
Multi-Family MTP (HTR)	1.00	1.00
Low Income		
Targeted Low Income MTP (Agencies in Action)	1.00	1.00
Load Management		
Residential Demand Response Program	1.00	1.00
Large Commercial Load Management SOP	1.00	1.00
Pilot		
Smart Thermostat Program (Pilot)	0.84	0.84