PY2017 Annual Summary Report on Evaluation, Measurement & Verification Findings

Prepared for:

Arkansas Public Service Commission

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with

FINAL

July 6, 2018

Glossary

Below is a partial listing of some of the key terms and acronyms used in this report to aid the reader.

Acronym	Definition
ADM	ADM Associates
AEO	Arkansas Energy Office
AOH	Annual Operating Hours
APSC	Arkansas Public Service Commission
ADRC	Avoided and Deferred Equipment Replacement Costs/ Deferred Replacement Costs
B/C	Benefit/Cost
B/C ratio	Benefit/Cost Ratio
BHEA	Black Hills Energy Arkansas
BPI	Buildings Performance Institute
BTU	British Thermal Unit
BTUH	British Thermal Units Per Hour
C&EE Rules	Rules for Conservation and Energy Efficiency Programs
C&I	Commercial and Industrial
CAC	Central Air Conditioner
CDD	Cooling Degree Day
CF	Coincidence Factor
CFL	Compact Fluorescent Lamp
CIEEP	Commercial and Industrial Energy Efficiency Program
CIP	Conservation Improvement Program
CWA	Consistent Weatherization Approach
DI	Direct Install
DOE	Department of Energy
DSM	Demand Side Management
EE	Energy Efficiency
EF	Energy Factor
EFLH	Equivalent Full Load Hour
EISA	Energy Independence and Security Act of 2007
EM&V	Evaluation, Measurement, and Verification
EPA	Environmental Protection Agency
HEAL	Home Energy Affordability Loan
HES	Home Energy Savings Program
HER	Home Energy Reports
HPwES	Home Performance with ENERGY STAR
HVAC	Heating, Ventilation, and Air Conditioning
IEF	Interactive Effects Factor
IEM	Independent Evaluation Monitor
IOUs	Investor Owned Utilities
IPMVP	International Performance Measurement and Verification Protocol
kW	Kilowatt

kWh	Kilowatt-hour
LCFC	Lost Contributions to Fixed Cost
LED	Light Emitting Diode
LMSOP	Load Management Standard Offer Program
M&V	Measurement and Verification
MW	Megawatt
NEB	Non-Energy Benefit
MWh	Megawatt-hour
NTG	Net-to-Gross
NTGR	Net-to-Gross Ratio
PY	Program Year
PWC	Parties Working Collaboratively
QA	Quality Assurance
QC	Quality Control
RR	Realization Rate
RESAP	Residential ENERGY STAR Appliance Program
RSOP	Residential Standard Offer Program
SBEE	Small Business Energy Efficiency
TMY	Typical Month Year
TRC	Total Resource Cost Test
TRM	Technical Reference Manual
WX	Weatherization Program or Weatherization

Executive Summary

The Independent Evaluation Monitor (IEM) has prepared the *PY2017 Annual Summary Report of Evaluation, Measurement & Verification (EM&V) Activities* on behalf of the Arkansas Public Service Commission (APSC) and the Parties Working Collaboratively (PWC) as directed in Docket No. 10-100-R.

The *PY2017 Annual Summary Report* summarizes the key findings and recommendations from seven[1]separate EM&V Reports prepared for the following energy organizations:

- Arkansas Oklahoma Gas Corporation (AOG); AOG 2017 EM&V Report
- Black Hills Energy Arkansas (BHEA); BHEA 2017 EM&V Report
- CenterPoint Energy Arkansas (CenterPoint or CNP); CenterPoint 2017 EM&V Report
- Entergy Arkansas, Inc. (EAI); EAI 2017 EM&V Report
- Oklahoma Gas & Electric Company (OG&E); OG&E 2017 EM&V Report
- American Electric Power - Southwestern Electric Power Company (SWEPCO); SWEPCO 2017 EM&V Report

The Arkansas Energy Office (AEO) will be filing the EM&V Report by August 31, 2018. This report focuses on evaluating program activities during Program Year (PY) 2017. As requested, the IEM has continued to monitor the evaluation process to ensure it conforms to Arkansas EM&V Protocols.

While this report provides a summary of the 2017 EM&V Reports, it is not intended to replace the individual reports. Each EM&V report provides important feedback and findings that should be addressed by the program administrators and implementers to help improve program operations in Program Year (PY) 2017 and beyond.

Since the fundamental role of the IEM is advisory in nature, the goal of this report is to provide a technical review. As part of this review, the IEM determined if the PY2017 evaluations used the appropriate methodologies and approaches to provide credible estimates of program savings and followed the proper protocols for process evaluations. Where appropriate, the IEM identified ways in which the contractors could further improve and refine their evaluation activities going forward.

The key findings and recommendations from the process and impact evaluations are summarized next. The effectiveness of these evaluation activities is discussed in *Section 4: Evaluating the Evaluators*.

Key Findings and Recommendations from EM&V Contractors

Key Impact Evaluation Findings

Most energy efficiency programs met or exceeded program savings goals. Some of the most successful programs in PY2017 included AOG's C&I Solutions Program, BHEA's HESP Program, AOG-OG&E's CWA Program, SWEPCO's HPwES and Midstream Lighting Program and EAI's Manufactured Homes and Multi-family Programs (AOG 2017 EM&V Report, pp. 1-4, 5-2, 6-1; BHEA 2017 EM&V Report,

[1] Empire District Electric Company did not file a 2017 report in accordance with exemptions granted in the APSC's Ruling in Order No. 62 in APSC Docket 07-076-tf, specifically *Findings and Rulings* Item 4, which states, "*the Commission finds that it is in the public interest and good cause has been shown to grant Empire an exemption from Section 9 of the C&EE rules concerning annual reporting and it is instead required to file this information during each program design cycle, which is anticipated to be a three-year cycle.*"

pp. 1-5-1-6; EAI 2017 EM&V pp.73, 150, 303; OG&E 2017 EM&V Report, pp. 102, 158; SWEPCO 2017 EM&V Report, pp. 4-106-107, 5-143).

The CenterPoint portfolio reached 96.8 percent of its filed savings goal, compared to 93.8 percent in PY2016. There was notably strong performance relative to goals in the Food Service and Home Energy Reports programs. The C&I Solutions and Low Flow programs also performed well. The Saving Home Weatherization Program fell short of its 2017 goal (reaching 89.5% of the goal) but its savings are up by 270 percent compared to PY2016. (CenterPoint 2017 EM&V Report, p. 1-6).

However, some programs did not meet goals. After a record year in PY2016, the AOG Equipment Rebate program has fallen back to PY2014-2015 savings and participant levels. Similarly, its C&I Solutions also achieved lower custom savings than in prior years due to a lack of one single large project. AOG's Direct install savings were also lower compared to previous due to market saturation and rising costs (AOG 2017 EM&V Report, pp.1-4-1-5, 4-33, 5-39).

The following tables summarize the overall portfolio performance for PY2017 across the Arkansas energy efficiency program portfolio.

Table E- 1: Summary of Total PY2017 Gas and Electricity Primary Savings

Utility	Planned Therm Savings	Net Evaluated Therm Savings	Planned kWh Savings	Net Evaluated kWh Savings	Percent of Planned Savings Achieved
AOG	444,944	536,208	-	-	121%
BHEA	1,180,976	1,261,851	-	-	107%
CenterPoint	3,536,630	3,423,918	-	-	97%
EAI	-	-	238,130,000	264,991,920	111%
OG&E	-	-	18,062,811	21,130,663	117%
SWEPCO	-	-	32,381,870	33,689,582	104%
Total Gas	**5,162,550**	**5,221,977**	**-**	**-**	**101%**
Total Electric	**-**	**-**	**288,574,681**	**319,812,165**	**111%**

Source: PY2017 EM&V Reports and Evaluator-provided summary workbooks

Regarding demand, the gas utilities are no longer required to report on peak therm savings. However, each electric utility fell short of meetings its demand (kW) goals; EAI achieved 82 percent of its demand reduction goal, OG&E reached 76 percent of its kW goal while OG&E just fell slightly short at reaching 98 percent of its goal (EAI 2017 EM&V Report, pp. xxv-xxx; OG&E 2017 EM&V Report, p. 14; SWEPCO 2017 EM&V Report, pp. 1-15-1-16).

The Non Energy Benefits (NEBs) calculations, which were included for the first time in PY2017 reports, quantified substantial cross-fuel savings by the Arkansas utilities. Each evaluation included and quantified the three categories of NEBs (AOG 2017 EM&V Report, pp. 1-4- 1-5; BHEA 2017 EM&V Report, pp. 1-4-1-5; CenterPoint 2017 EM&V Report, pp. 1-5-1-6; EAI 2017 EM&V Report, pp. 410-426; OG&E 2017 EM&V Report, pp. 49-50; SWEPCO 2017 EM&V Report, pp. 2-40-2-42). Table E-2 summarizes these findings.

Table E- 2: PY2017 Total NEBs Annual Savings by Utility

Utility	NEB Secondary Fuel Savings (kWh or therms)	Water savings (gallons)	Propane savings (gallons)	Avoided Replacement Costs/ Direct Replacement Costs
AOG	380,095 kWh	5,547,818	-	$ 42,149
BHEA	547,225 kWh	10,421,754	-	$ 24,992
CenterPoint	333,573 kWh	88,937,269	-	$ 416,201
EAI	954,147 therms	22,965,398	(45,785)	$ 13,096,244
OG&E	56,944 therms	998,884	22,329	$ 386,026
SWEPCO	427 therms	3,187,165	-	$ 1,295,025
Total	**1,260,893 kWh 1,011,518 therms**	**132,058,288**	**(23,456)**	**$ 15,260,637**

Sources: PY2017 EM&V Reports and Utilities 2017 Annual Reports.

However, the IEM review identified a number of calculation errors. Therefore, the Attorney General's Office requests that future filings of the Utility SARP Workbooks include the cost-benefit results with and without the NEB calculations.

This was the first time in several years that some of the portfolios experienced shifting NTG results. The NTGR estimates diverged from the past several years because many programs received updated primary research. As Table E-2 shows that all three gas utilities reported a wider range of NTG values for the gas programs relative to PY2016: results ranged from a low of 71.3 percent (BHEA Heating Equipment Rebate) to a high of 100.0 percent (Home Energy Reports and Smart Thermostats (AOG 2017 EM&V Report, p. 1-2; BHEA 2017 EM&V Report, p. 1-2; CenterPoint 2017 EM&V Report, p. 1-2; EAI 2017 EM&V Report, p. xxxi; OG&E 2017 EM&V Report, p. 45; SWEPCO 2017 EM&V Report, pp. 3-60-3-61).

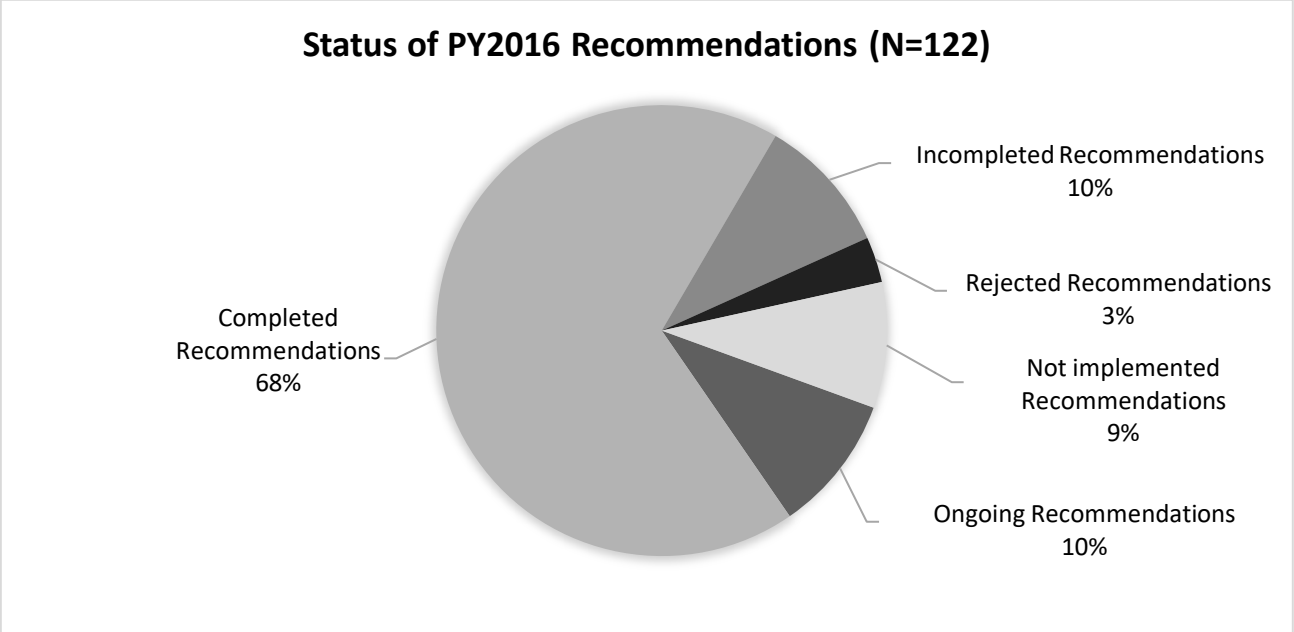
Table E- 3: Summary of Portfolio NTG Rates

Utility	Portfolio NTG
AOG	92.8%
BHEA	94.2%
CenterPoint	93.0%
EAI	89.6%
OG&E	89.1%
SWEPCO	88.6%

Source: PY2017 EM&V Reports

Status of Previous Recommendations

More than two-thirds of the previous recommendations to improve impact evaluation finding have been completed. Figure E-1 also shows that another 10 percent of these previous recommendations are in progress.



Sources: 2017 EM&V Reports

Figure E- 1: Status of PY2016 Recommendations

However, the evaluators did not provide a complete and accurate tracking of all previous recommendations by utility. Therefore, the IEM was unable to complete a full accounting of the previous recommendations by type (i.e., either a process or impact recommendation). Table E-4 summarizes the information that was provided in the PY2017 evaluation reports. These findings demonstrate that the evaluators are not carefully tracking the status of all previous recommendations provided, which contributed to these discrepancies.

Table E- 4: Disposition of PY2016 Recommendations by Energy Organization

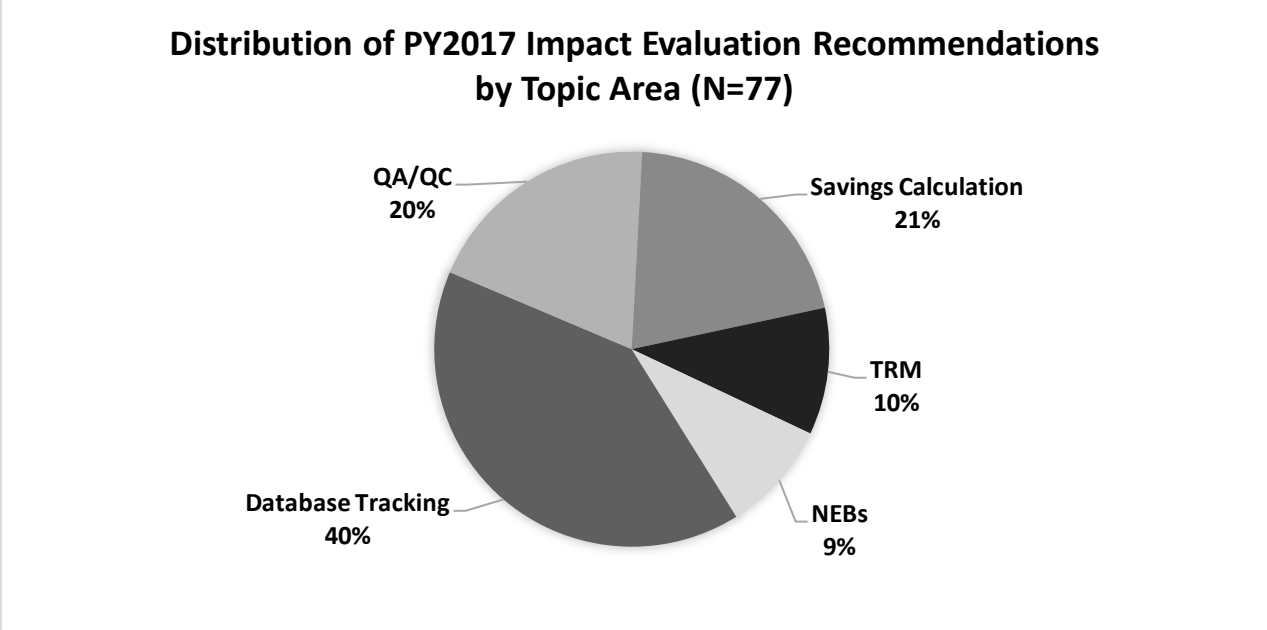
Utility	Total	Ongoing	Completed	Incomplete	Not Implemented /NA	Rejected
AOG	5	1	2		1	1
BHEA	2	1	2	1	1	1
CenterPoint	14	1	8	4	1	2
EAI	52	6	40	2	5	
OG&E	26	2	18	4	2	
SWEPCO	14	1	13	1	1	
Total	**113**	**12**	**83**	**12**	**11**	**4**

Sources: PY2017 EM&V Reports

Key Impact Evaluation Recommendations

The evaluators made a total of 77 recommendations based on the findings from the PY2017 impact evaluations. Of note, 15 percent of the recommendations were identified still in progress or ongoing from PY2016 and were repeated again in PY2017. The IEM team noted that across all evaluation reports the number of recommendations was considerably fewer than in previous years. The percent breakdown of

recommendations by category of topic remained similar to prior years. This distribution of recommendations is consistent with the changes in program delivery and design across many program areas, as well as the rigor and maturity of the Arkansas TRM update process.



Source: Analysis of PY2017 EM&V Report

Figure E- 2: Distribution of PY2017 Impact Evaluation Recommendations by Topic Area

Table E-5 summarizes the distribution of PY2017 impact evaluation recommendations across the Arkansas energy efficiency portfolio.

Table E- 5: Summary of 2017 Impact Evaluation Recommendations by Topic and Energy Organization

Utility	Database Tracking	QA/QC	Savings Calculation	TRM	NEBs	Total
AOG	1		1	1	1	4
BHEA			1	1	1	3
CenterPoint	3		1	2	1	7
EAI	13	12	12	3	1	41
OG&E	10					10
SWEPCO	4	3	1	1	3	12
Total	**31**	**15**	**16**	**8**	**7**	**77**
% of Total	**40%**	**20%**	**21%**	**10%**	**9%**	**100%**

Sources: Analysis of 2017 EM&V Reports

Key Process Evaluation Findings

The evaluators also completed process evaluations per the requirements identified in TRM Volume 1, Protocol C. The key findings are summarized next.

Several programs within the Arkansas Energy Efficiency Program Portfolio align with industry best practices. These included the C&I programs offered by the three natural gas utilities and SWEPCO's REIP Program (AOG 2017 EM&V Report, p. 5-20; BHEA 2017 EM&V Report, pp. 3-10, 5-2; CenterPoint 2017 EM&V Report, p. 7-22; SWEPCO 2017 EM&V Report, pp.8-274-8-283).

Overall participant satisfaction remains high across most of the energy efficiency programs (AOG 2017 EM&V Report, pp. 4-5, 4-13, 5-4, 5-12, 6-14; BHEA 2017 EM&V Report, pp. 4-10,4-11, 5-16, 5-20; EAI 2017 EM&V Report, pp. xlii, xliv, 86, 137; OG&E 2017 EM&V Report, pp. 150-151; SWEPCO 2017 EM&V Report, pp. 4-98, 7-195, 8-262).

Trade allies also generally reported high levels of satisfaction in working with the utilities (AOG 2017 EM&V Report, pp. 4-16, 5-18; BHEA 2017 EM&V Report, pp. 4-11; EAI 2017 EM&V Report, pp. xlv, 293; OG&E 2017 EM&V Report, pp. 200-201, 202-203; SWEPCO 2017 EM&V Report, pp. 5-135, 7-194-7-195).

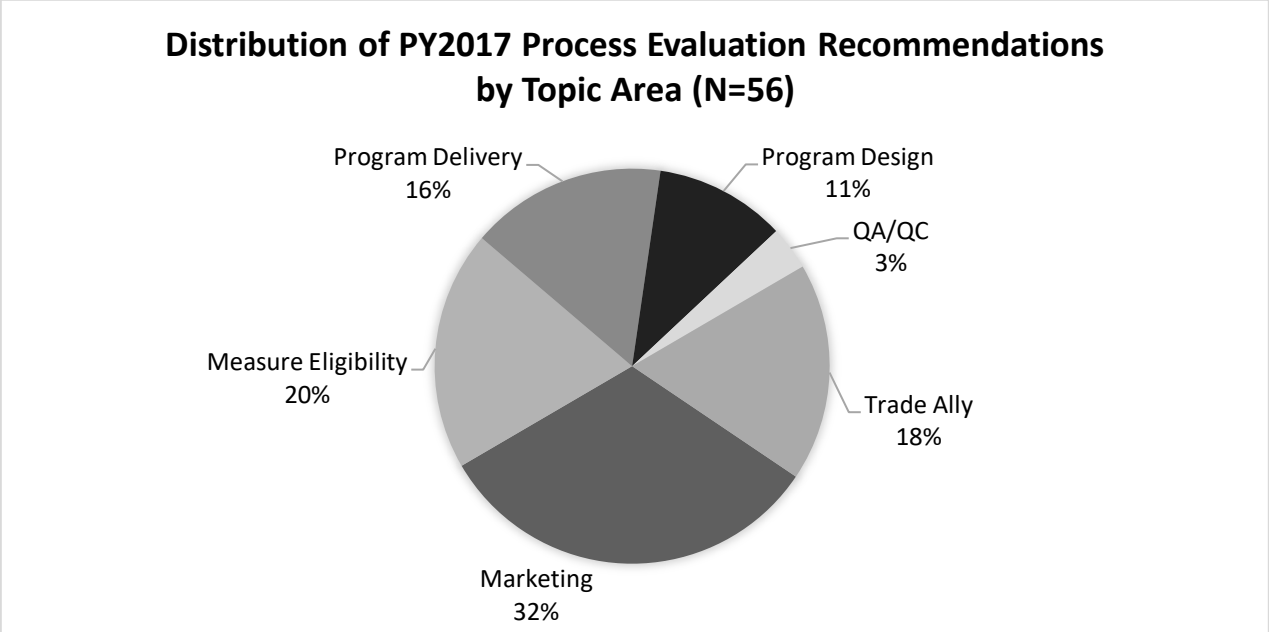
The Arkansas IOUs engaged in a variety of marketing activities to promote their energy efficiency programs. These activities included: customer-direct outreach, bill inserts, social media, program websites, radio and print advertising, and keyword searches (AOG 2017 EM&V Report, pp. 4-9, 6-4, 6-12; BHEA 2017 EM&V Report, pp. 3-2, 6-10; CenterPoint 2017 EM&V Report, p. 3-5; EAI 2017 EM&V Report, p. 213; OG&E 2017 EM&V Report, pp. 145, 190-191; SWEPCO 2017 EM&V Report, pp. 1-18, 1-23, 1-28, 4-86, 5-127).

Two utilities made substantial changes to their program portfolios during 2017. CenterPoint divided its Space Heating and Water Heating Conservation Components into separate residential and commercial program offerings (CenterPoint 2017 EM&V Report, p. 1-6). OG&E also reorganized its C&I programs into one combined offering through its Commercial Energy Efficiency Program (OG&E 2017 EM&V Report, p. 173). The other evaluations documented specific program changes made to measure eligibility, program enrollment, and incentives.

The CWA Programs have been among the most successful offerings in the overall energy efficiency program portfolio. The prog*r*am-specific summaries, which are presented in the following table, indicate that the utilities have completed more than 12,000 energy audits and installed more than 22,000 measures through the CWA offerings. The conversion rate is at 100 percent, further indicating the overall success with the CWA programs across all utilities (AOG 2017 EM&V Report, p. 6-4; BHEA 2017 EM&V Report, p. 6-5; CenterPoint 2017 EM&V Report, pp. 11-4-11-5; EAI 2017 EM&V Report, pp. 409-410; OG&E 2017 EM&V Report, p. 107; SWEPCO 2017 EM&V Report, pp. 5-154-5-155).

Key Process Evaluation Recommendations

The evaluators provided a total of 56 new process evaluations during PY2017. The majority of these recommendations focused on ways to improve overall marketing activities (32%), and suggestions for adding new measures (20%), especially guidance for Smart Thermostats. The remaining recommendations provided guidance on tactics to improve trade ally outreach efforts (18%), streamline program design (16%), and delivery (16%). A few provided some qualitative advice on improving QA/QC (3%).



Source: PY2017 EM&V Reports

Figure E- 3: Distribution of PY2017 Process Evaluation Recommendations by Topic Area

Table E-6 summarizes the process evaluation recommendations by topic area and energy organization.

Table E- 6: Distribution of PY2017 Process Evaluations by Topic and Energy Organization

Utility	Program Design	Program Delivery	Measure Eligibility	Marketing	QA/QC	Trade Ally	Total
AOG	2		1	3			6
BHEA	1		4	1			6
CenterPoint		1		3		1	5
EAI	2	5	4	5	2	5	23
OG&E	1	1		4			6
SWEPCO		2	2	2		4	10
Total	**6**	**9**	**11**	**18**	**2**	**10**	**56**
% of Total	**11%**	**16%**	**20%**	**32%**	**4%**	**18%**	**100%**

Source: Analysis of PY2017 EM&V Reports

Comparison to the Comprehensive Checklist

Each EM&V contractor also reported on the progress each energy efficiency program portfolio has made compared to the seven comprehensiveness factors identified by the APSC. Using the following legend energy organizations have fully met, partially met, or failed to meet the criteria associated with each factor set for in the Comprehensive Checklist.

Fully Met Criteria = ●	Utilities or third-party administrators are fully meeting the criteria established by the Commission Checklist.
Partially Met Criteria = ◑	Utilities or third-party administrators are partially meeting the criteria established by the Commission Checklist.
Did Not Meet Criteria = ○	Utilities or third-party administrators did not meet the criteria established by the Commission Checklist.
Not Applicable = ■	Identifies those cases where the Commission Checklist cannot be assessed.

Table E-7 summarizes these findings from the comprehensive checklist as reported in the individual EM&V report.

Table E- 7: Summary of Comprehensiveness Checklist Factor Results

Utility	Factor 1: Education / Training/ Outreach	Factor 2: Provide Adequate Resources	Factor 3: Address Major End Uses	Factor 4: Comprehensively Address Customer Needs to Avoid "Cream Skimming"	Factor 5: Target All Customer Sectors	Factor 6: Are Cost-Effective	Factor 7: Have Appropriate EM&V Procedures in Place
AOG	●	●	●	●	●	●	●
BHEA	●	●	●	●	●	●	●
CenterPoint	●	◑	●	◑	●	●	●
EAI	●	●	●	●	●	●	●
OG&E	●	●	●	◑	◑	●	●
SWEPCO	●	●	●	●	●	●	●
Fully Met = ● Partially Met = ◑ Did Not Meet = ○ Not Applicable = ■							

Source: Analysis of 2017 EM&V Reports

Assessment of the EM&V Reporting

The IEM also "evaluated the evaluator" and provided an overall assessment of how well the work conformed to EM&V Protocols and TRM Version 6.0.

Fully Met Criteria = ●	The EM&V contractors met the requirements prescribed by the IEM or provided reports that reflected industry standards and best practices.
Partially Met Criteria = ◑	The EM&V contractors met some criteria but not all of them.
Did Not Meet Criteria = ○	The EM&V reports failed to meet the IEM requirements or industry best practices.
Not Applicable = ■	Identifies those cases where these standards may not be appropriate.

Table E–8 summarizes the IEM's overall assessment of the evaluations conducted by the evaluation firms across the Arkansas energy efficiency portfolio. Section 4 provides a more detailed explanation of these findings and the IEM's specific concerns regarding the PY2017 EM&V activities. Of note, the evaluators did have some significant errors in calculating NEBs, which are reflected in the lower scores. However, we will be working proactively with the evaluators to improve the reporting process going forward.

Table E- 8: Summary of the IEM's Assessment of the 2017 EM&V Evaluation Activities

Evaluator	Utility	Impact Evaluation	Process Evaluation	NEBs
ADM	AOG	◑	◑	○
ADM	BHEA	◑	●	○
ADM	CenterPoint	●	◑	○
Tetra Tech	EAI	●	●	◑
ADM	OG&E	●	●	◑
ADM	SWEPCO	●	●	◑
Fully Met = ●	Partially Met = ◑	Did Not Meet = ○	Not Applicable = ■	

IEM Recommended Next Steps and EM&V Priorities

The PWC members remain active and engaged participants and are clearly committed to achieving the energy savings goals established by the Commission. This has been demonstrated by their willingness to work together to deliver joint programs, and to implement the recommendations from the previous program

evaluations. These reports reinforce the importance and value that annual EM&V activities offer to utilities, program implementers, and stakeholders. Ultimately, these findings benefit Arkansas ratepayers by ensuring that the energy efficiency programs are well designed, implemented, and effective.

The two evaluation teams, ADM Associates and Tetra Tech, completed six portfolio evaluations for the regulated IOUs in Arkansas. Overall, these evaluations met the requirements as defined in the EM&V Protocols in TRM Volume 1.

However, these evaluations fell short of the IEM's expectations in several areas:

- In a number of cases, the evaluators did not calculate the NEBs correctly; and
- The reports also omitted important details required to assess the accuracy and quality of the overall findings.

While, the IEM appreciates the diligence and hard work of each evaluation team, we believe some of these issues could have been avoided by reaching incorporating our suggestions into the final reports. Therefore, we have formulated several specific recommendations to ensure that each evaluation report meets the reporting requirements and reflects industry standards and best practices.

Status of Previous IEM Recommendations

The evaluators have addressed recommendations from the *IEM PY2016 Annual EM&V Report* in the following areas:

- ***Conducting Impact Evaluations:*** Each evaluation firm completed the template developed by the IEM which facilitated the analysis of savings estimates across the energy efficiency portfolio;
- ***Future evaluations should summarize the total net savings (i.e., net of lighting leakage) that should be used for the LCFC relative to the total savings that should be used for goal assessment***. This recommendation has been addressed by both EAI and SWEPCO;
- ***Seeking IEM Guidance:*** The evaluators proactively sought out the IEM's guidance on a number of technical issues throughout the year;
- ***Evaluators should inform the IEM and leverage the EM&V findings.*** The evaluators have addressed this issue satisfactorily;
- ***The evaluation and IEM teams need to review all proposed uses of prior NTG values during the evaluation planning stage and discuss whether these warrant an updated NTG ratio.*** While we have seen some improvement, the EM&V reports should still include this information which includes verifying all inputs and assumptions required to determine NTG;
- ***The evaluation reports should include site specific reports for all custom projects verified during the evaluation.*** The PY2017 EM&V reports included this information which was beneficial to our review;
- ***AEO should ensure that its next program evaluation identifies areas for program improvement and enhancement***. AEO did solicit and select a qualified evaluator to conduct its process evaluation for PY2016. The final report will be filed by August 31, 2018; and

- ***The IEM will work with the PWC members and interested parties to provide greater clarity to the myriad of issues identified in these reports***. Specifically, the IEM team provided additional guidance and enhancements to Protocol C, Protocol F, Protocol J, and Protocol L.

Repeated IEM Recommendations

None of the following recommendations has been fully implemented by all the evaluation firms, and are therefore repeated;

- ***Future evaluations should include detailed sampling strategies and statistics surrounding the findings;*** [2]
- ***Parameter assumptions should include citations and be explicitly detailed; and***
- ***Future evaluations should use secondary data sources (i.e., a literature review), rather than the prior stipulated value of 80 percent, as a source for NTG values for low priority measures.***

New IEM Recommendations

The IEM makes the following new recommendations that should be incorporated in the future EM&V Reports based on the findings from this year's evaluation reports:

- ***Utilities should try to ensure that wherever possible both gas and electric utilities try to jointly install measures that save both fuels***;
- ***The evaluators need to include the matrices for program/measure and NEB as part of the evaluation plan, provide the detailed calculations to the IEM in advance of the final report, and document more clearly the assumptions in the evaluation reports.*** Therefore, we will require evaluators to provide this information, even if in draft form, no later than March 15, 2019;
- ***Evaluation teams need to provide explicit detail when realization rates are not 100 percent.***
- ***The IEM will work with the PWC and interested parties to review, consider, and incorporate the recommended TRM updates for TRM 7.0***. The IEM will try to address these issues prior to the August 31, 2018 filing date;
- ***The process evaluations should provide an accurate and complete status report of the previous recommendations rather than an abbreviated summary in the EM&V reports; and***
- ***The IEM will continue to provide the PWC with updates on advances in new technologies and evaluation methodologies to ensure that its EM&V Protocols are aligned with national best practices.*** To the extent possible, the IEM will incorporate the findings and recommendations from the two PWC Working Groups:
    - *National Standard Practice Manual:* We will incorporate any recommended changes in future evaluation protocols, as approved by the Commission; and
    - *Act 1102:* We will document the ways in which the current Arkansas Energy Efficiency Program Portfolio is addressing the two target groups identified in Act 1102:
        - LIHEAP eligible utility customers and utility customers aged 65 or older.

[2] Of note, Tetra Tech did provide detailed sampling information in an appendix as part of its 2017 EM&V Report.

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Introduction

The Independent Evaluation Monitor (IEM) has prepared this *PY2017 Annual Summary Report of Evaluation, Measurement & Verification (EM&V) Activities* on behalf of the Arkansas Public Service Commission (APSC) in support of Docket 10–100–R and the Parties Working Collaboratively (PWC).

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- Oklahoma Gas & Electric Company (OG&E); OG&E 2017 EM&V Report
- American Electric Power-Southwestern Electric Power Company (SWEPCO); SWEPCO 2017 EM&V Report

This report is organized into the following sections to help guide the reader through this summary of the key results:

- Section 1: Summary of Impact Evaluation Findings and Recommendations
- Section 2: Summary of Process Evaluation Findings and Recommendations
- Section 3: Comparison to Comprehensive Checklist
- Section 4: Evaluating the Evaluators
- Section 5: IEM Recommendations and EM&V Priorities

The portfolio evaluations addressed impact and process evaluation activities separately, so these activities are summarized in separate sections. While this report provides a summary of the PY2017 EM&V Reports, it is not intended to replace the value of the individual reports. Indeed, each EM&V report provides valuable feedback and findings that should be addressed by the program administrators and implementers to help improve program operations in PY2018 and beyond.

Section 1: Summary of Impact Evaluation Findings and Recommendations

1.1 Overview of Impact Evaluation

Given that the fundamental role of the IEM is advisory in nature, our task was to determine if the PY2017 evaluations used the appropriate methodologies and to determine if those approaches could lead to credible and reliable savings estimates.

Impact evaluations measure the change in energy usage and demand (i.e., kWh, kW, and therms, water gallons, propane gallons, deferred equipment costs) attributable to a program[3].

Impact evaluations rely on a variety of approaches to calculate energy savings such as statistical comparisons, engineering estimation and modeling, metering, and billing analysis. Using generally accepted evaluation methods, the evaluators conducted evaluations of the Arkansas utilities.

The key findings and recommendations from these impact evaluations conducted for the Arkansas energy efficiency portfolio are summarized next. The effectiveness of these impact evaluation activities is discussed in *Section 4: Evaluating the Evaluators.*

The evaluators completed the following impact evaluation activities to determine the net and gross savings:

- Verify Program Savings Estimates;
    - For prescriptive measures, verify correct use of the Arkansas TRM values; and
    - For custom measures, calculate savings according to accepted protocols (such as IPMVP).
- Review Program Databases;
- Conduct QA/QC and On–Site Verification as appropriate; and
- Estimate the Net to Gross (NTG) impacts.

Table 1 summarizes the types of impact evaluations conducted across the Arkansas energy efficiency program portfolio for PY2017.

[3] All energy savings goals and impacts are assumed to be reported at the meter in EM&V reports. For EAI's PY2016 EM&V report plan savings were reported at the generator, integrating line losses. The IEM found no indication that this practice continued for 2017's EM&V report.

Table 1: Summary of Impact Evaluation Methodologies Used in PY2017 Evaluations

Utility/ Program Administrator	Measure Verification		Review Program Databases	Verify Correct Use of TRM Values	Estimate Net Impacts
	Prescriptive Measure Verification (On–Site/Surveys)	Custom Measure Verification			
AOG	✓	✓	✓	✓	✓
BHEA	✓	✓	✓	✓	✓
CenterPoint	✓	✓	✓	✓	✓
CWA	✓	✓	✓	✓	✓
EAI	✓	✓	✓	✓	✓
OG&E	✓	✓	✓	✓	✓
SWEPCO	✓	✓	✓	✓	✓

This section begins with a summary of the overall energy savings, followed by a review of the key findings and recommendations from each impact evaluation activity that led to key conclusions and recommendations.

1.2 Key Impact Findings

Portfolio Level Findings

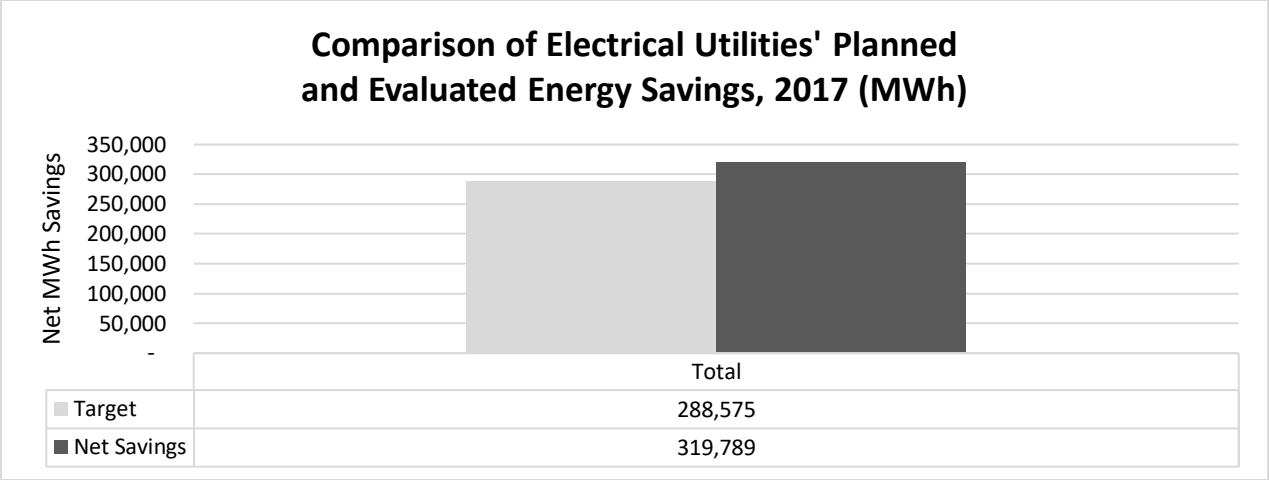
One important purpose of EM&V is to determine the progress that the portfolio as a whole, is making towards reaching the energy savings targets and objectives. The Arkansas portfolio of programs has a long history of providing cost effective savings at or near goal level.

Summed together, the electric utilities significantly exceeded their energy savings goals.[4] The electric utilities achieved an overall 111 percent of their goals, while the gas utilities met their energy savings goals summing to 101 percent of their goal (AOG 2017 EM&V Report, pp. 1-4, 5-2, 6-1; BHEA 2017 EM&V Report, pp. 1-5-1-6; EAI 2017 EM&V pp.73, 150, 303; OG&E 2017 EM&V Report, pp. 102, 158; SWEPCO 2017 EM&V Report, pp. 4-106-107, 5-143).

The CenterPoint portfolio reached 96.8 percent of its filed savings goal, compared to 93.8 percent in 2016. There was notably strong performance relative to goals in the Food Service and Home Energy Reports programs. The C&I Solutions and Low Flow programs also performed well. The Saving Home Weatherization Program fell short of its 2017 goal (reaching 89.5% of the goal) but its savings are up by 270 percent compared to PY2016. (CenterPoint 2017 EM&V Report, p. 1-6).

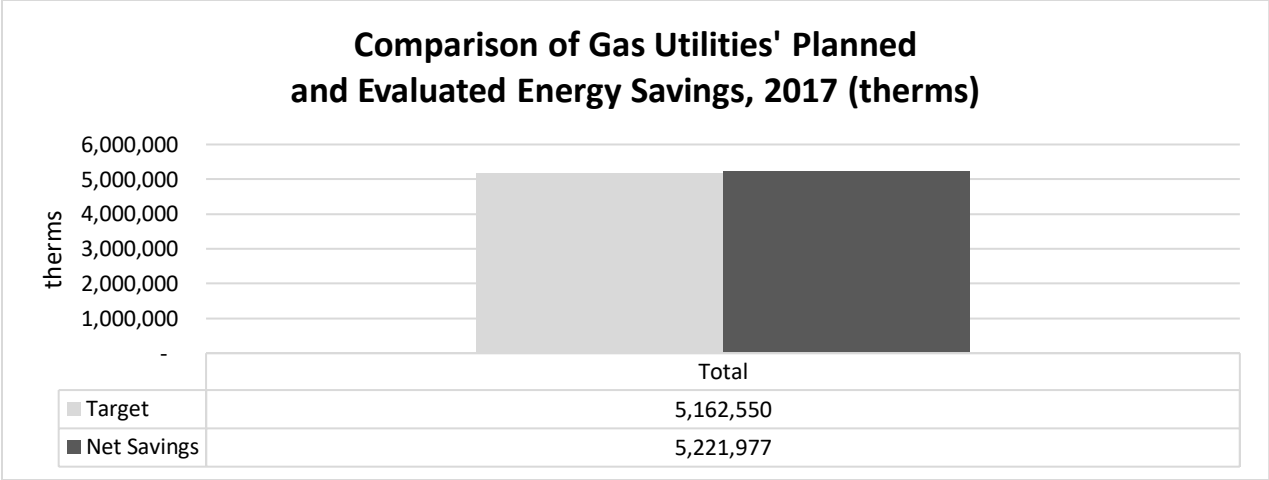
Figure 1 and Figure 2 summarize the PY2017 energy savings goals and achievements by energy source for electricity and natural gas.

[4] This report uses goals, targets, and planned savings as synonyms.



Source: PY2017 EM&V Reports and Evaluator-provided summary workbooks

Figure 1: Comparison of Electric Utilities' Planned and Evaluated Energy Savings, 2017 (MWh)



Source: PY2017 EM&V Reports and Evaluator-provided summary workbooks

Figure 2: Comparison of Gas Utilities' Planned and Evaluated Energy Savings, 2017 (therms)

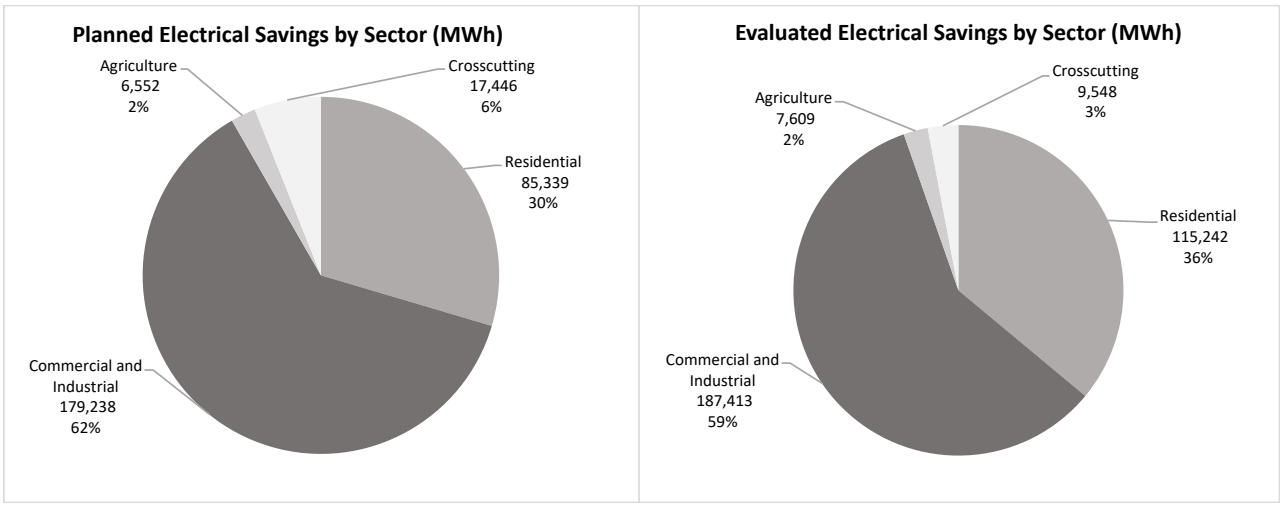
To assess the sectors in which savings and expenditures are occurring, the programs are categorized into commercial and industrial (C&I), residential, agricultural, and cross-cutting categories. C&I target non-residential customers only, while residential programs include both single family and multifamily residences. Programs in the agricultural category focus exclusively on that sector while cross-cutting refers to programs that are available to all customers. EAI is the only utility that offers programs specifically directed to the agricultural sector (AOG 2017 EM&V Report, pp. 1-2-1-3; BHEA 2017 EM&V Report, pp. 1-2-1-3; CenterPoint 2017 EM&V Report, pp. 1-2-1-3; EAI 2017 EM&V Report, pp. xxxi; OG&E 2017 EM&V Report, p. 14; SWEPCO 2017 EM&V Report, pp.1-12-1-14). Table 2 shows the classification of each program within each utility.

Table 2: Utility Programs by Class

Utility	Residential	C&I	Cross-cutting
AOG	• AOG Weatherization	• C&I Solutions	• Energy Efficiency Arkansas • Equipment Rebates
BHEA	• Home Energy Savings	• C&I Solutions	• Energy Efficiency Arkansas • Equipment Rebates
CenterPoint	• Home Energy Reports • Low Flow CIP • Savings Homes WX Program	• Commercial Boiler CIP • C&I Solutions • Commercial Food Service CIP	• Energy Efficiency Arkansas • Equipment Rebates
EAI	• Lighting & Appliances • Home Energy Solutions • Multifamily Homes • Manufactured Homes • Residential Benchmarking Pilot • Residential Direct Load Control • Bring Your Own Thermostat • Energy Efficiency Arkansas	• C&I Midstream Lighting • C&I Solutions • Small Business • City Smart	**Cross-cutting** • CoolSaver **Agricultural** • Agricultural Energy Solutions • Irrigation Pump Load Control
OG&E	• Consistent Weatherization Approach • Home Energy Efficiency Program	• Commercial Energy Efficiency Program	
SWEPCO	• Home Performance with ENERGY STAR® • Residential Energy Improvement • Residential Lighting and Appliance	• Commercial and Industrial Energy Efficiency Program • Small Business Direct Install • Load Management Standard Offer	

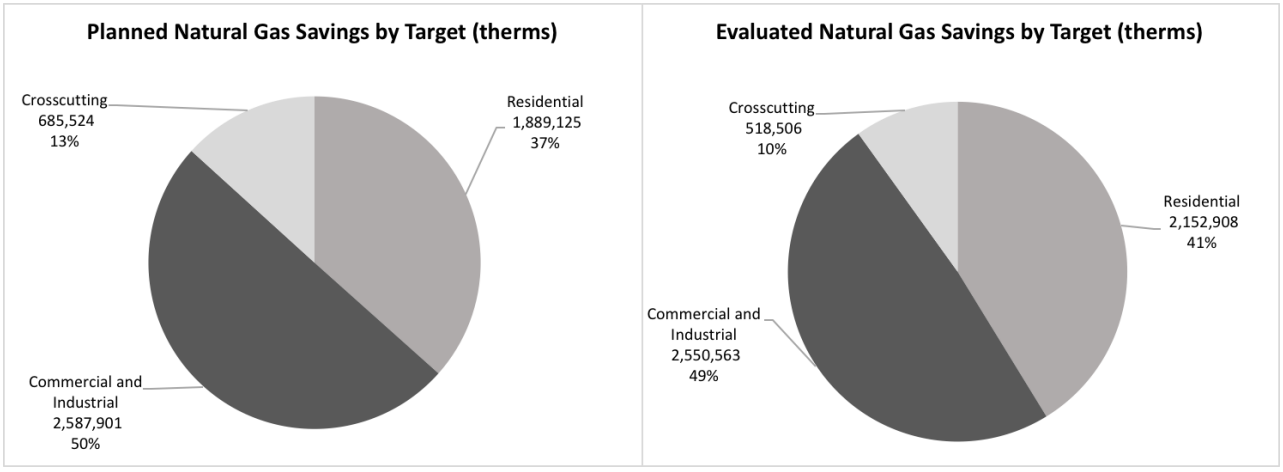
Sources: PY2017 EM&V Reports

Figure 3 and Figure 4 show that the C&I sector delivers approximately 60 percent of the savings for the electric utilities and 50 percent for the gas utilities. Cross-cutting and agricultural programs together only account for five percent of the total savings for electric utilities compared to a target of eight percent, missing the cross-cutting target by approximately 6,000 MWh. Cross-cutting programs for gas utilities are more significant, accounting for 10 percent of their total savings. Residential programs account for the balance, about 36 percent of total primary savings for electric utilities and 41 percent for gas utilities. As expected, there are variations between the planned and evaluated net saving results, but these differences are within a reasonable range.



Sources: PY2017 EM&V Reports and Evaluator-provided summary workbooks

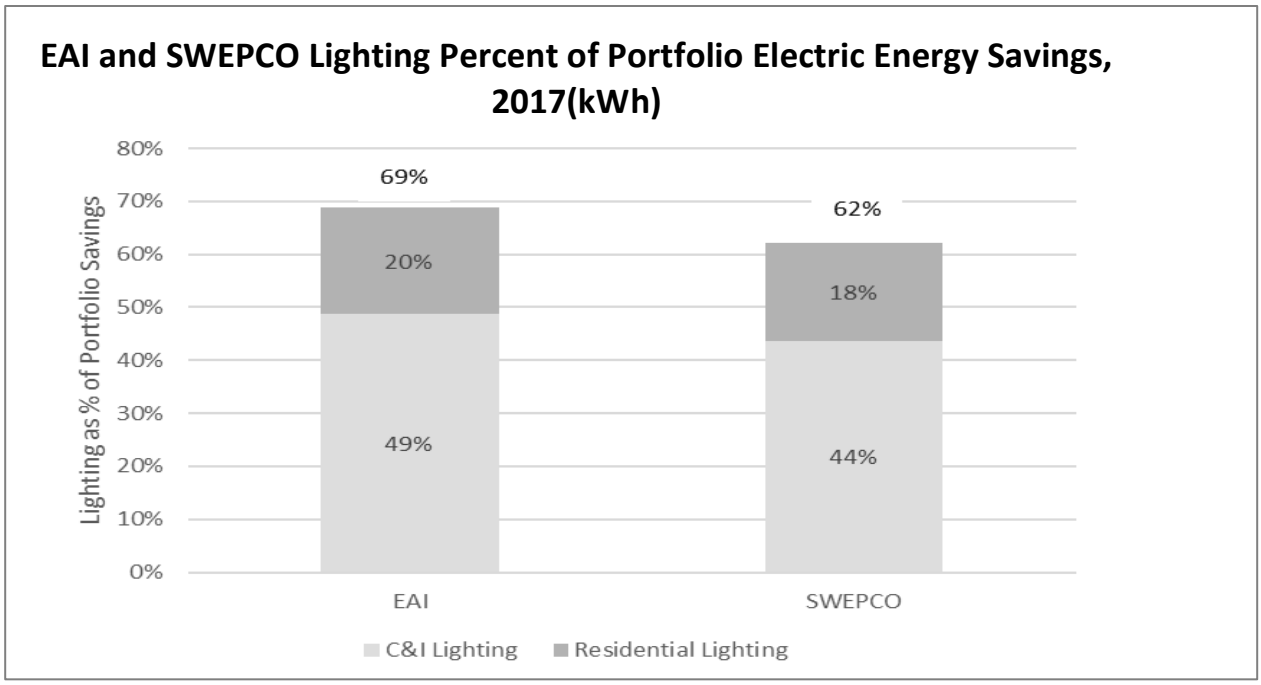
Figure 3: Planned and Evaluated Electrical Energy Savings by Sector (MWh)



Sources: PY2017 EM&V Reports and Evaluator-provided summary workbooks

Figure 4: Planned and Evaluated Natural Gas Energy Savings by Target (therms)

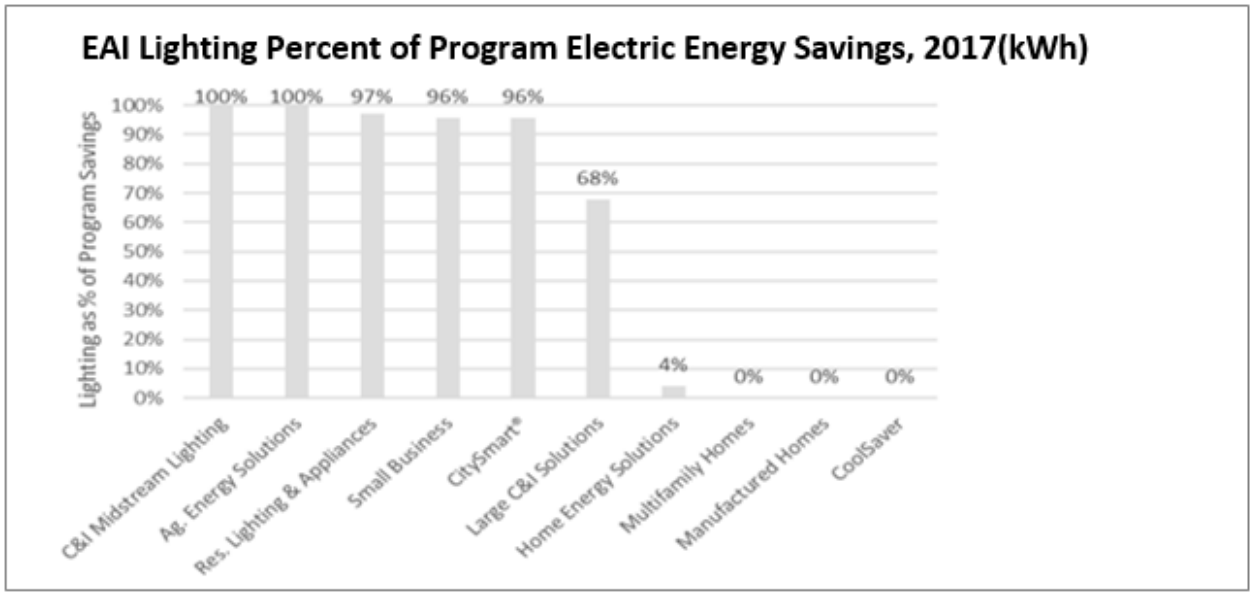
Given the current discussion regarding goal setting for the next three-year program cycle and the coinciding decreasing lighting savings potential, the following three figures shows how prevalent lighting components to the EAI and SWEPCO portfolios currently are (as of 2017). Approximately two-thirds of 2017 *ex ante* gross portfolio savings are from lighting, for both EAI and SWEPCO (see Figure 5).



Sources: PY2017 EM&V Reports and Evaluator-provided summary workbooks

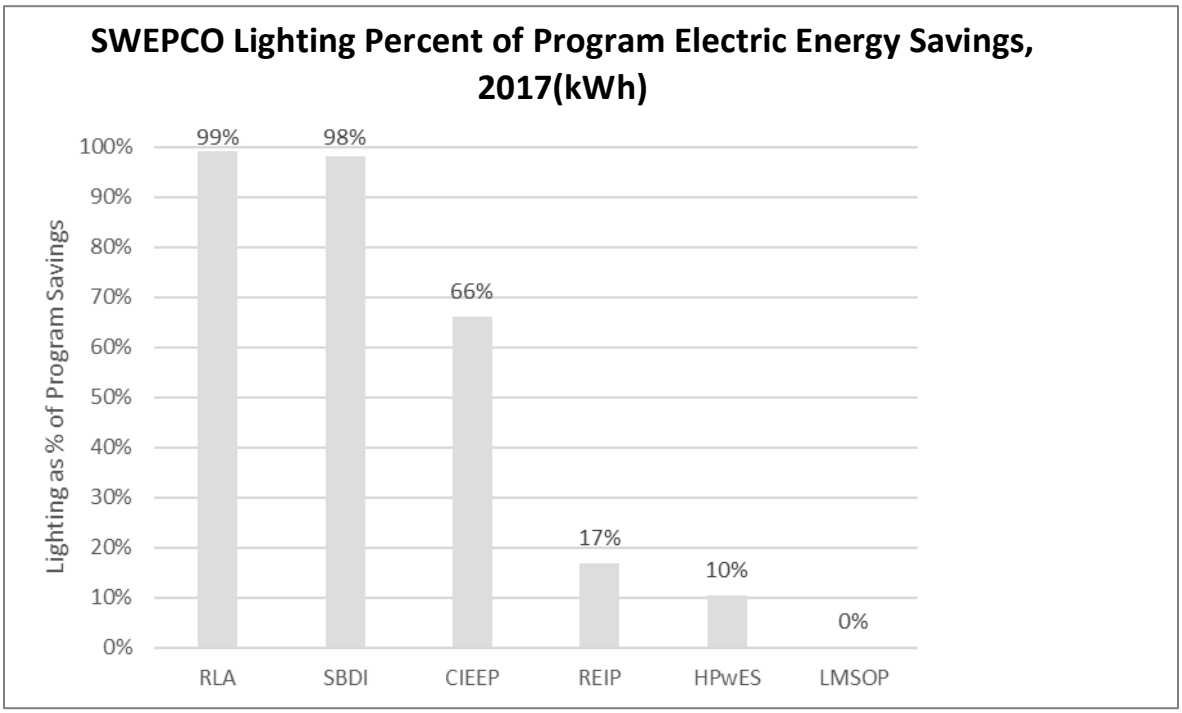
Figure 5: EAI and SWEPCO Lighting Percent of Portfolio Electric Energy Savings, 2017 (kWh)

More than two-thirds of the electric savings are from C&I programs, and some may be exempt from the upcoming 2020 EISA lighting standards. But it is still likely some linear and screw-based lighting will be offered in the C&I programs. Lighting measures also represent almost 100 percent of the largest program savings within the EAI and SWEPCO portfolios (see Figure 6).



Sources: 2017 EM&V Reports and Evaluator-provided summary workbooks

Figure 6: EAI Lighting Percent of Program Electric Energy Savings, 2017 (kWh)



Sources: PY2017 EM&V Reports and Evaluator-provided summary workbooks

Figure 7: SWEPCO Lighting Percent of Program Electric Energy Savings 2017 (kWh)

Overall Program Performance

Portfolio Energy Savings

Arkansas' energy efficiency programs offered by the six evaluated IOUs continue to have significant success in achieving their goals. Combined, the program savings exceeded targets for both the gas and electric utilities.

Table 3 provides a tabulation of goals and savings including both primary savings and Non-Energy Benefits (NEBs) as reported in the utilities' PY2017 Evaluation Reports. The remaining figures in this section show results for primary fuel only and do not account for NEBs, which are discussed in the next section.

As shown in Table 3, the three gas utilities together achieved a net evaluated primary savings of 5,221,977 therms, 101 percent of their goals, and the three electric utilities achieved a net evaluated savings of 319,789 MWh which is 111 percent of their 2017 goals. (AOG 2017 EM&V Report, pp. 1-4, 5-2, 6-1; BHEA 2017 EM&V Report, pp. 1-5-1-6; CenterPoint 2017 EM&V Report, p. 1-6).

Overall performance is similar to the prior three years. The electric programs achieved 111 percent this year, 101 percent in PY2016, 108 percent in PY2015, and 103 percent in PY2014. The gas programs achieved 101 percent of their goals this year, 104 percent in PY2016, 102 percent in PY2015, and 89 percent of their goals in PY2014. (EAI 2017 EM&V pp.73, 150, 303; OG&E 2017 EM&V Report, pp. 102, 158; SWEPCO 2017 EM&V Report, pp. 4-106-107, 5-143).

NEBs primarily impacted natural gas results. Including the impacts of NEBs increases the achieved natural gas savings to 6,233,495 therms, increasing the percentage attainment by 20 percent. Electric NEBs increased the overall kWh savings by only 0.5 percent to 321,050 MWh. (AOG 2017 EM&V Report, pp. 1-4- 1-5; BHEA 2017 EM&V Report, pp. 1-4-1-5; CenterPoint 2017 EM&V Report, pp. 1-5-1-6; EAI 2017 EM&V Report, pp. 410-426; OG&E 2017 EM&V Report, pp. 49-50; SWEPCO 2017 EM&V Report, pp. 2-40-2-42).

Table 3: Summary of 2017 Gas and Electricity Savings

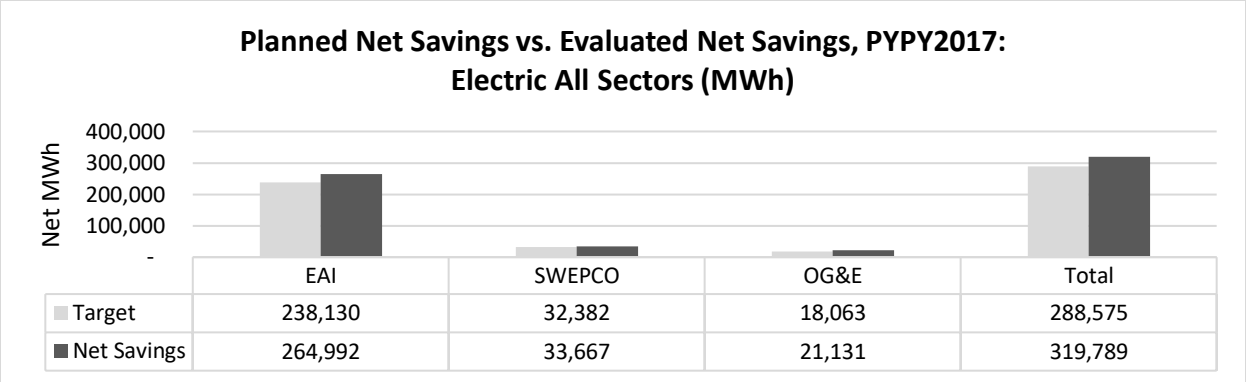
Utility	Planned Therm Savings	Net Evaluated Primary Therm Savings	Net Evaluated Therm Savings including NEBs	Planned MWh Savings	Net Evaluated Primary MWh Savings	Net Evaluated MWh Savings including NEBs	Percent of Savings Achieved (Primary)	Percent of Savings Achieved Including NEBs
AOG	444,944	536,208	536,208	-	-	380	120.5%	
BHEA	1,180,976	1,261,851	1,261,851	-	-	547	106.8%	
CenterPoint	3,536,630	3,423,918	3,423,918	-	-	334	96.8%	
EAI	-	-	954,147	238,130	264,992	264,992	111.3%	
OG&E	-	-	56,944	18,063	21,131	21,131	117.0%	
SWEPCO	-	-	427	32,382	33,667	33,667	104.0%	
Total Natural Gas	**5,162,550**	**5,221,977**	**6,233,495**	-	-	-	**101.2%**	**120.7%**
Total Electric	-	-	-	**288,575**	**319,789**	**321,050**	**110.8%**	**111.3%**

Sources: 2017 EM&V Reports and Evaluator-provided summary workbooks

Evaluated net primary savings values were provided for each utility in spreadsheet form using an IEM-provided template. One value differed between the SWEPCO EM&V report and the provided spreadsheet summary. Specifically, the template included 5,930,285 kWh evaluated net savings from the Home Performance with Energy Star (HPwES) Program, whereas the EM&V report stated 5,907,529 kWh. This difference should be corrected.

Electric Portfolio Energy Savings

Altogether, the electric utilities exceeded their combined goal of 288,575 MWh savings for PY2017 as Figure 8 shows. Each of the electric utilities exceeded its target savings for a total of 111 percent primary savings above the total goal (EAI 2017 EM&V pp.73, 150, 303; OG&E 2017 EM&V Report, pp. 102, 158; SWEPCO 2017 EM&V Report, pp. 4-106-107, 5-143).



Sources: PY2017 EM&V Reports and Evaluator-provided summary workbooks – Electric Utilities

Figure 8: Planned Savings vs. Evaluated Net Savings (MWh): Electric All Sectors PY2017

While the electric utilities each exceeded their goals for energy savings, none reached its demand reduction goal. As shown in Table 4, the utilities achieved between 76 and 98 percent of planned demand reduction (EAI 2017 EM&V Report, pp. xxv-xxx; OG&E 2017 EM&V Report, p. 14; SWEPCO 2017 EM&V Report, pp. 1-15-1-16).

Table 4: Summary of 2017 Electric Demand Reduction

Utility	Planned Demand Reduction, MW	Net Evaluated Demand Reduction, MW	Percent Reduction Achieved
EAI	127.9	104.9	82%
OG&E	3.5	3.4	98%
SWEPCO	16.7	12.7	76%
Total	**148.0**	**121.0**	**82%**

Sources: 2017 EM&V Reports and Evaluator-provided summary workbooks – Electric Utilities

Table 5 shows a comparison of load factors as calculated from planned electric energy and demand savings and net evaluated energy and demand savings. Load factor is calculated using the following formula:

$$Load\ Factor = \frac{kWh}{kW * 8{,}760\ hours}$$

Table 5: Plan vs. Evaluated Load Factors

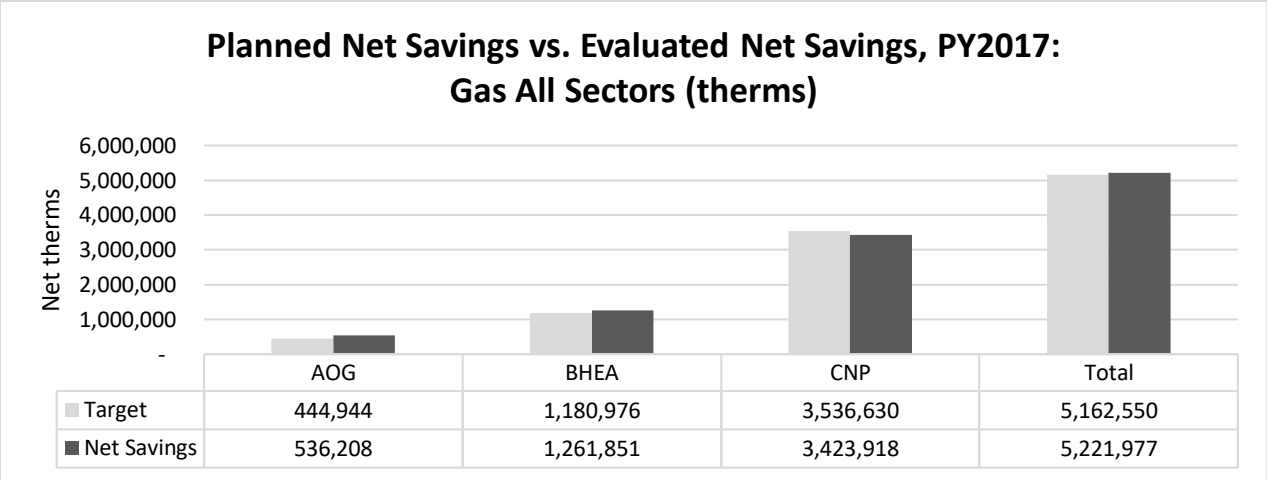
Utility	Planned MW Reduction	Planned MWh Savings	Expected Load Factor	Net Evaluated MW Reduction	Net Evaluated MWh Savings	Evaluated Load Factor
EAI	127.9	238130	21%	104.9	264992	29%
OG&E	3.5	18063	60%	3.4	21131	71%
SWEPCO	16.7	32382	22%	12.7	33667	30%
Total	**148.0**	**288575**	**22%**	**121.0**	**319789**	**30%**

Sources: 2017 EM&V Reports and Evaluator-provided summary workbooks – Electric Utilities

Both EAI and SWEPCO had expected load factors, based on planned savings, of just greater than 20 percent, while OG&E planned for a load factor of 60 percent. Load management programs were part of EAI's and SWEPCO's portfolios. The demand-only goals for those programs contribute to lower load factors (EAI 2017 EM&V Report, pp. 420, 468, 520-521; OG&E 2017 EM&V Report, p. 16; SWEPCO 2017 EM&V Report, p. 5-146).

Gas Portfolio Energy Savings

AOG and BHEA exceeded their net savings goals, achieving 121 percent and 107 percent, respectively. CenterPoint achieved 97 percent of its goals, but as a combined group, the gas utilities achieved a total of 101 percent of the summed goals ((AOG 2017 EM&V Report, pp. 1-4, 5-2, 6-1; BHEA 2017 EM&V Report, pp. 1-5-1-6; CenterPoint 2017 EM&V Report, p. 1-6). These findings are illustrated in Figure 9.



Sources: PY 2017 EM&V Reports and Evaluator-provided summary workbooks – Gas Utilities

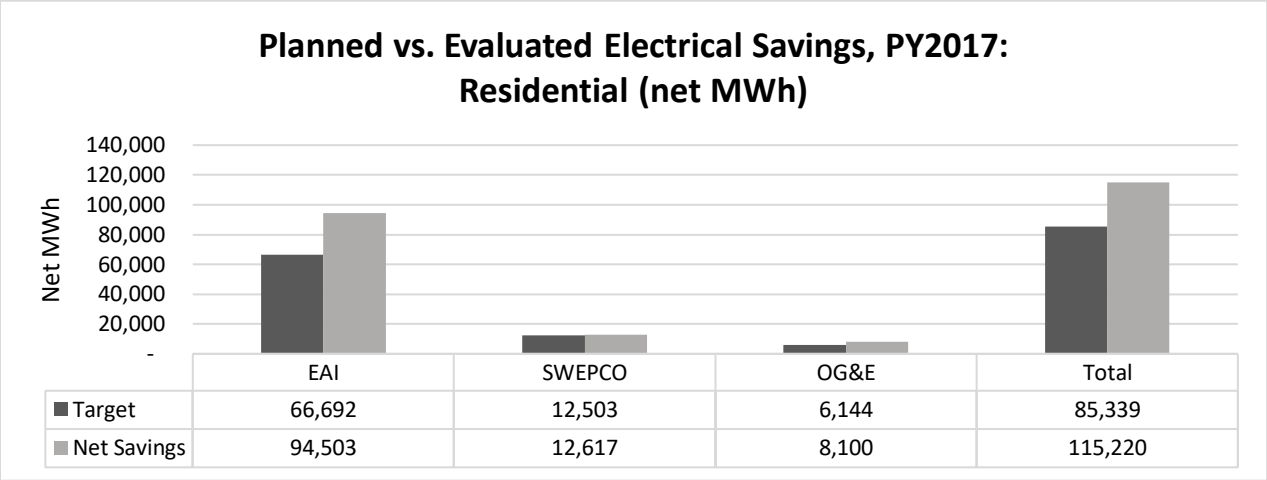
Figure 9: Planned Net Savings vs. Evaluated Net Savings, PY2017: Gas All Sectors (therms)

Savings by Sector

The next set of figures summarizes the planned savings achieved across specific sectors.

Electric Program Performance by Sector

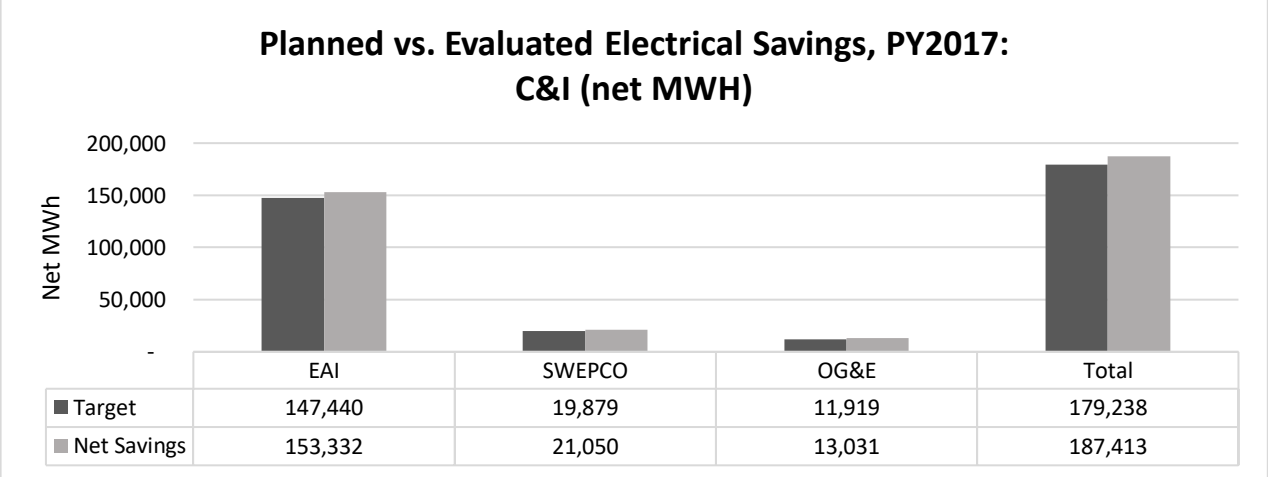
Figure 10 summarizes the PY2017 EM&V goals and results for the electric residential programs. The residential program portfolio for each electric utility exceeded its savings goal.



Sources: PY2017 EM&V Reports and Evaluator-provided summary workbooks – Electric Utilities

Figure 10: Planned vs. Evaluated Electrical Savings, PY2017: Residential (net MWh)

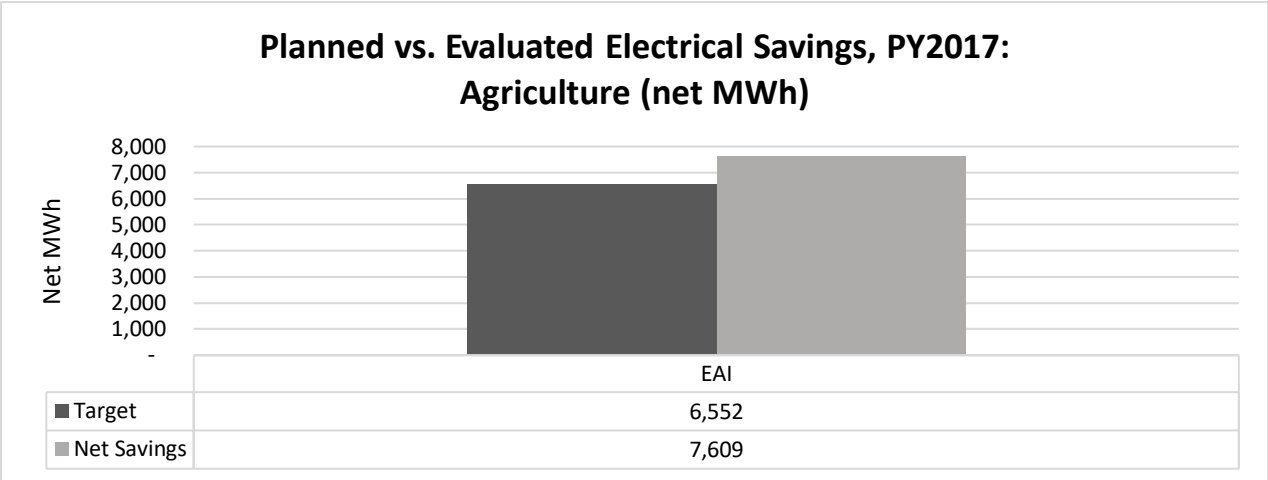
Figure 11 summarizes the PY2017 EM&V goals and results for the electric C&I programs. As the figure shows, each electric utility met or exceeded its goals.



Sources: PY2017 EM&V Reports and Evaluator-provided summary workbooks – Electric Utilities

Figure 11: Planned vs. Evaluated Electrical Savings, PY2017: C&I (net MWH)

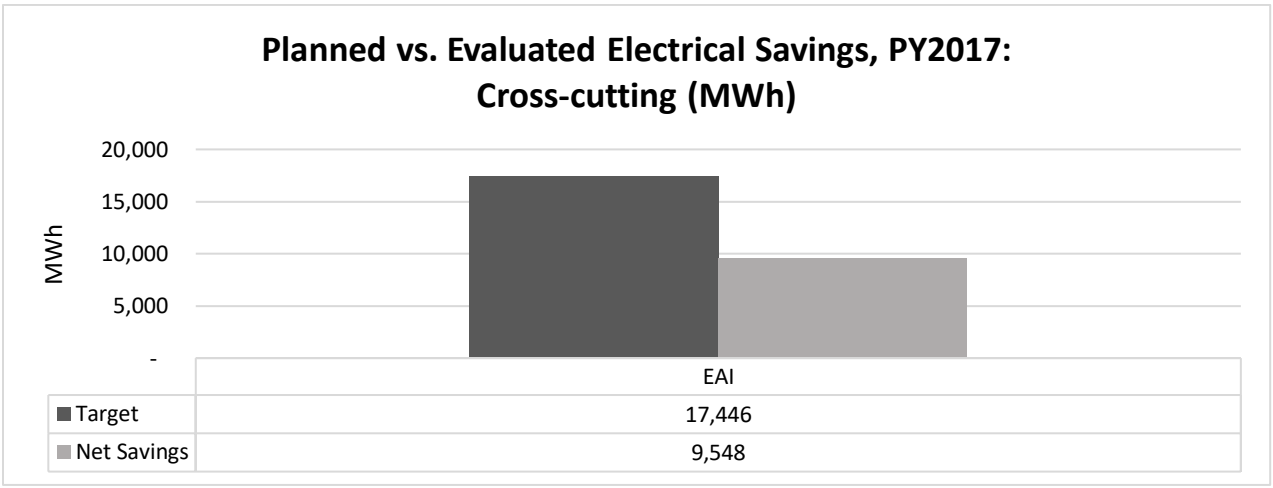
EAI is the only utility that has agricultural programs. Figure 12 shows the goals and savings for EAI's agricultural programs.



Sources: PY2017 EM&V Reports and Evaluator-provided summary workbooks – Electric Utilities

Figure 12: Planned vs. Evaluated Electrical Savings, PY2017: Agricultural (net MWh)

Figure 13 presents the savings achieved by EAI's CoolSaver program, which is the only explicitly defined cross-cutting program among electric utilities. This program achieved only approximately 55 percent of its goal (EAI 2017 EM&V Report, p. xxxi).

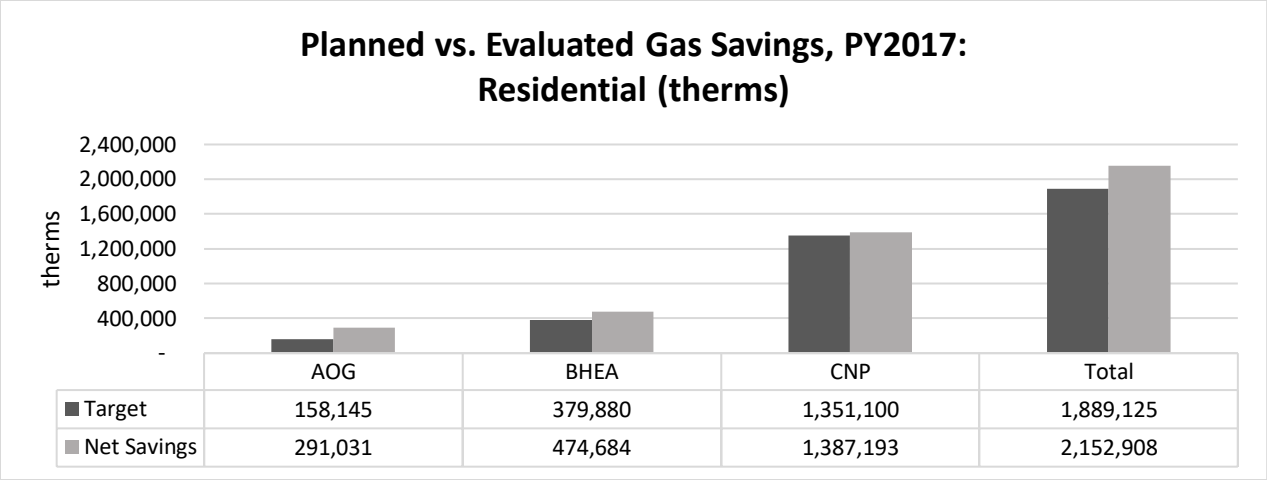


Sources: PY2017 EM&V Reports and Evaluator-provided summary workbooks – Electric Utilities

Figure 13: Planned vs. Evaluated Electrical Savings, PY2017: Cross-cutting (MWh)

Gas Program Performance by Sector

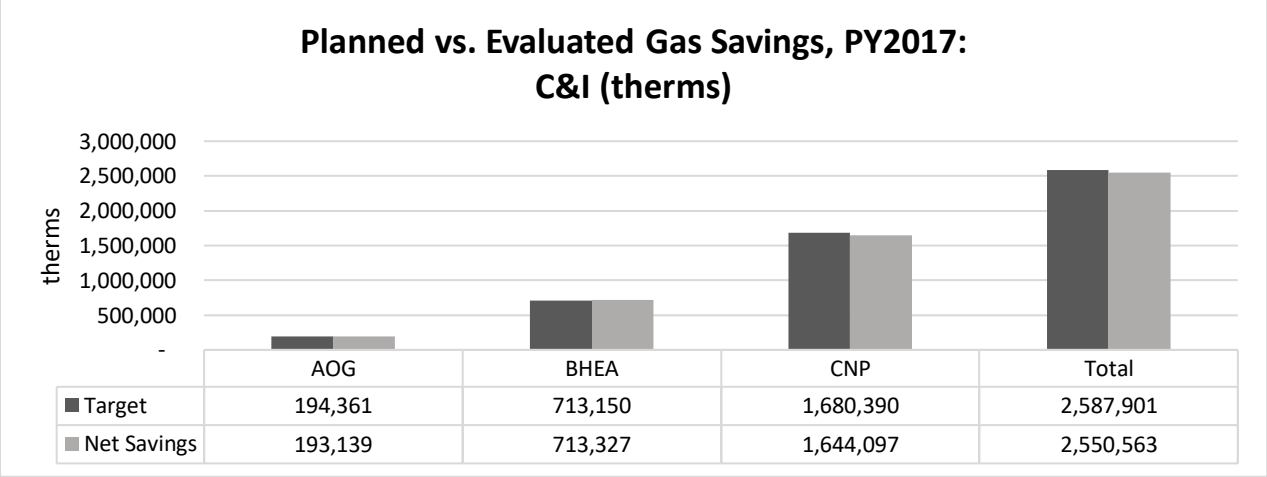
Figure 14 summarizes the PY2017 EM&V goals and results for the gas residential programs. The residential program portfolio for each gas utility exceeded its savings goal.



Sources: PY2017 EM&V Reports and Evaluator-provided summary workbooks – Gas Utilities

Figure 14: Planned vs. Evaluated Gas Savings, PY2017: Residential (therms)

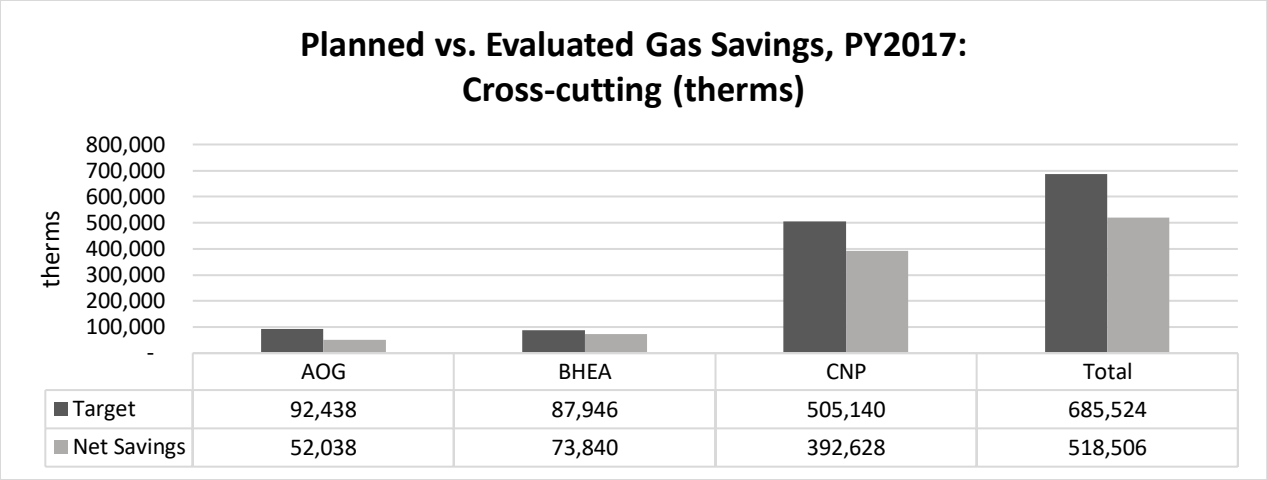
Figure 15 summarizes the PY2017 EM&V goals and results for the gas C&I programs. As the figure shows, each gas utility fell modestly short of its goals.



Sources: PY2017 EM&V Reports and Evaluator-provided summary workbooks – Gas Utilities

Figure 15: Planned vs. Evaluated Gas Savings, PY2017: C&I (therms)

Figure 16 presents the savings achieved by cross-cutting programs among gas utilities. These programs fell short of the goals for each utility with achieved savings representing 56 percent, 84 percent, and 78 percent of goals for AOG, BHEA, and CenterPoint, respectively.



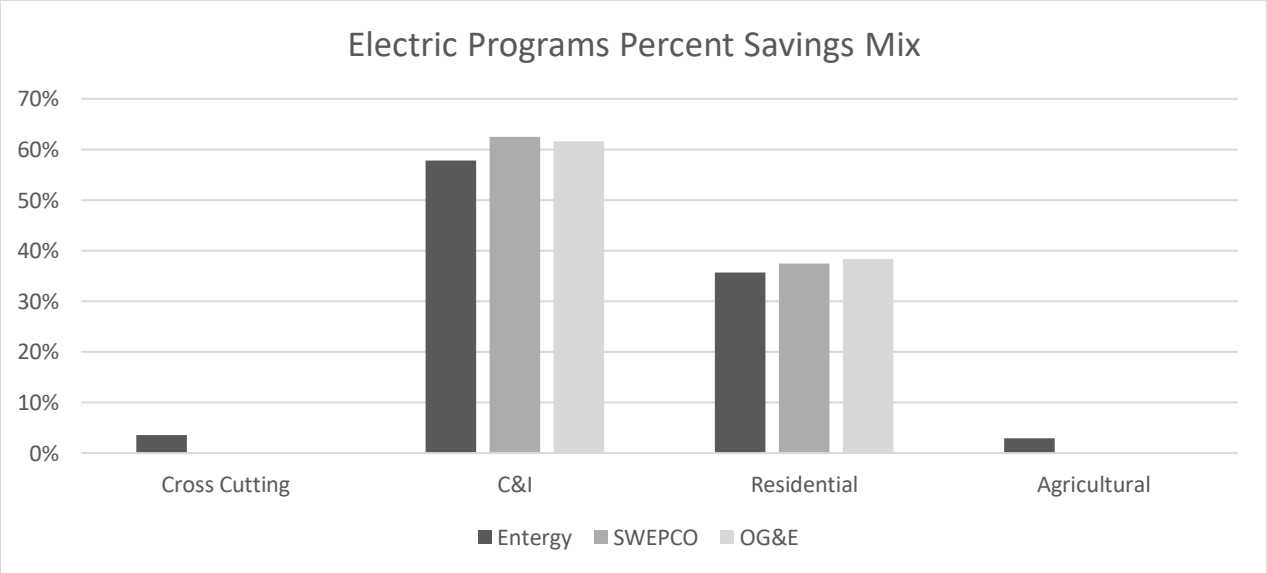
Sources: PY2017 EM&V Reports and Evaluator-provided summary workbooks – Gas Utilities

Figure 16: Planned vs. Evaluated Gas Savings, PY2017: Cross-cutting (therms)

Sector Mix Within Portfolios

A comparison of portfolio mixes across the utilities is useful to understand and compare the program sectors served for each utility in the state. Figure 17 and Figure 18 provide a sector-level breakdown of evaluated net energy savings for PY2017 for each evaluated utility.

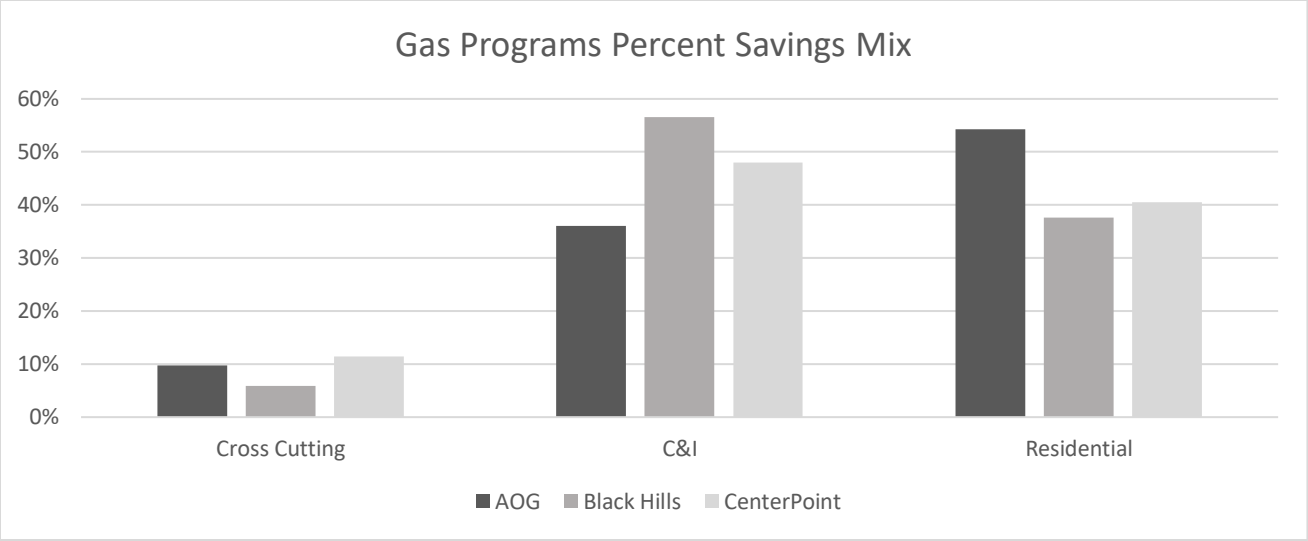
Comparing the electric utilities, the primary savings by sector is quite uniform, which indicates there are similarities in program targets, and likely in some territory characteristics. This uniformity may also show that utilities are experiencing similar measure costs and characteristics.



Sources: PY2017 EM&V Reports and Evaluator-provided summary workbooks – Electric Utilities

Figure 17: Electric Programs Percent Savings Mix

Similar to the electric programs, the gas utilities' programs exhibit somewhat uniform breakdown of served sectors. A difference not illustrated in Figure 18 is that CenterPoint includes a behavioral program that provides 24 percent of their portfolio savings. Consequently, the other CenterPoint program mix has smaller residential program impacts relative to C&I (CenterPoint 2017 EM&V Report, pp. 1-2-1-3).



Sources: PY2017 EM&V Reports and Evaluator-provided summary workbooks – Gas Utilities

Figure 18: Gas Programs Percent Savings Mix

Non-Energy Benefits Analysis

The Arkansas Public Service Commission (Commission) issued Order No. 30 on December 10, 2015, which provides further direction and guidance regarding the inclusion of Non-Energy Benefits (NEBs) in the Technical Reference Forum (p. 21 of 21). The Commission ordered that three categories of NEBs be consistently and transparently accounted for in all applications of the TRC test, as it is applied to measures, programs, and portfolios:

- Benefits of electricity, natural gas, and liquid propane energy savings (i.e., other fuels);
- Benefits of public water and wastewater savings; and
- Benefits of avoided and deferred equipment replacement costs (ADRCs).

Overall Impact of NEBs

This was the first year that NEBs were included in the TRC tests; each evaluation included and quantified the three categories of NEBs (AOG 2017 EM&V Report, pp. 1-4- 1-5; BHEA 2017 EM&V Report, pp. 1-4-1-5; CenterPoint 2017 EM&V Report, pp. 1-5-1-6; EAI 2017 EM&V Report, pp. 410-426; OG&E 2017 EM&V Report, pp. 49-50; SWEPCO 2017 EM&V Report, pp. 2-40-2-42). In the section, the IEM summarizes the NEB findings from these program evaluations.

Table 6: PY2017 Total NEBs Savings by Utility

Utility	NEB Secondary Fuel Savings (kWh or therms)	Water savings (gallons)	Propane savings (gallons)	ARC/DRC
AOG	380,095 kWh	5,547,818	-	$ 42,149
BHEA	547,225 kWh	10,421,754	-	$ 24,992
CenterPoint	333,573 kWh	88,937,269	-	$ 416,201
EAI	954,147 therms	22,965,398	(45,785)	$ 13,096,244
OG&E	56,944 therms	998,884	22,329	$ 386,026
SWEPCO	427 therms	3,187,165	-	$ 1,295,025
Total	**1,260,893 kWh 1,011,518 therms**	**132,058,288**	**(23,456)**	**$ 15,260,637**

Sources: PY2017 EM&V Reports and Utilities 2017 Annual Reports.

There were substantial gas savings (positive and negative) claimed by the electric utilities, and electric savings claimed by the gas utilities. Examples of these findings are summarized next:

- The EAI HES program reported gas savings of 1.5 million annual therms, and 25 million in lifetime therms (EAI 2017 EM&V Report, p. 417). The annual savings are as large as CenterPoint's largest program, C&I Solutions (1.5 million therms, CenterPoint 2017 EM&V Report, p. 44), and the lifetime savings equal approximately 75 percent of the entire CenterPoint portfolio (30 million therms, CenterPoint 2017 EM&V Report, p. 44);
- Approximately 60 percent of the SWEPCO HPwES program participants did not receive an incentive from a gas utility for the installation of energy efficiency measures, leading to reported gas (other fuel) annual savings of approximately 450,000 therms and lifetime savings of nearly 7.5 million therms (SWEPCO 2017 EM&V Report, p. 177); and
- EAI accounted for the C&I commercial lighting gas interactive effects as a NEB, rather than a gross savings adjustment, leading to approximately 1.4 million in *negative* therm NEBs (i.e., in increase in gas usage of 1.4 million therms, EAI 2017 EM&V Report, p. 421). As noted above, this is approximately equal to the total claimed savings from the CenterPoint C&I Solutions Program, the largest CenterPoint program.

Table 7: Electric and Gas Savings Including NEBs

Resource	Primary Savings	NEB Secondary Fuel Savings	% Additional savings due to NEBs
Gas (therms)	5,221,977	1,011,518	19.4%
Electric (kWh)	319,789,409	1,260,893	0.4%

Sources: PY2017 EM&V Reports and Utilities 2016 Annual Report.

1.3 Summary of Findings from Specific Impact Evaluation Activities

The evaluation contractors conducted a variety of impact evaluation activities to accurately estimate the savings achieved from each program. This section summarizes the key impact findings from each specific impact evaluation activity:

- Review of Program Database Tracking;
- Determine Savings from M&V/Custom Projects;
- Quality Assurance/Quality Control (QA/QC);
- Review of TRM Savings Estimates; and
- Net-to-Gross (NTG) Verification.

Review of Program Database Tracking

Evaluation teams reported the findings from their review of program tracking databases associated with each utility program. All evaluators referenced the guidelines defined in "*Protocol A – Program Tracking and Database Development"* in Volume 1 of TRM Version 6.1. These protocols provide recommendations on the type of information to collect regarding customer, project and measure level details.

The evaluation reports included several recommendations related to improvements in data collection and program tracking. Many recommendations were resolved from PY2016 with just a few carrying into 2017 (i.e. missing primary contact information, not collecting home vintage and square footage).

***Issues with multiple database tracking systems/calculators*:** Efficiency programs that tracked project information in multiple databases were found to have a few inconsistencies on data reporting and mapping as well as in defining project types between Commercial and Residential (EAI 2017 EM&V Report, p. 276, 445; OG&E 2017 EM&V Report, p. 102). Supplemental calculators used for specific programs were also found to apply parameters inconsistently (EAI 2017 EM&V Report, p. 519).

Persistence of verification challenges: While many of the issues noted in PY2016 were resolved, there were a few remaining items such as the data collection of key parameters for residential and commercial measures such as equipment characteristics, vintage, and weather zones (AOG 2017 EM&V Report, p. 6-10; CenterPoint 2017 EM&V Report, pp. 4-5, 5-7, 5-21, 11-3; EAI 2017 EM&V Report, p. 190, 256; OG&E 2017 EM&V Report, pp. 158, 188; SWEPCO 2017 EM&V Report, pp. 3-54, 8-220, 8-286).

Verification efforts for on-site visits and telephone surveys continued to be a challenge with missing primary contact information and phone numbers for key contacts especially regarding multifamily participants (CenterPoint 2017 EM&V Report, p. 5-21; OG&E 2017 EM&V Report, pp. 48, 102; SWEPCO 2017 EM&V Report, p. 8-287).

Data collection needs based on expanded program requirements: Evaluators identified areas for data collection needs to address savings verification based on changes in program delivery channels and target markets. Recommendations for collection needs were noted for new construction installations as well as tracking equipment age and condition for early replacement impacts (CenterPoint 2017 EM&V Report, pp. 4-5, 5-7; EAI 2017 EM&V Report, pp. 372, 519).

Additional database challenges were noted for lighting measures as program needs have evolved to LED technologies and use of the ENERGY STAR qualifying light bulbs product listing (EAI 2017 EM&V Report, p. 445, 462, 502; OG&E 2017 EM&V Report, p. 206; SWEPCO 2017 EM&V Report, p. 4-109).

The IEM team also noted a concerted effort by evaluators to identify additional data collection needs to refine the determination of NEBs (AOG 2017 EM&V Report, p. 4-34; EAI 2017 EM&V Report, pp. 462, 464; OG&E 2017 EM&V Report, p. 188; SWEPCO 2017 EM&V Report, pp. 4-109, 4-87) while increasing the percentage of projects requiring pre- and post-verification efforts based on program complexity (EAI 2017 EM&V Report, p. 261).

***Proactive approaches in increasing the quality of performance by contractors and trade allies*:** The implementation contractor, CLEAResult, documents the performance of trade allies through a rating of major and minor violations for 10 percent of the projects completed by each one (CenterPoint 2017 EM&V Report, pp. 11-10; BHEA 2017 EM&V Report, p. 6-7).

In some cases, a contractor score card is used and provided on a bi-monthly basis to develop contractor monthly allotments (SWEPCO 2017 EM&V Report, p. 7-185). SWEPCO does a more stringent number of pre- and post-inspection for projects by a new contractor while also expressing an interest in the coming year to "tag-along" during post-inspection visits (SWEPCO 2017 EM&V Report, pp. 4-142, 7-185, 7-212).

Review of TRM Savings Estimates

This section summarizes the findings reported by evaluation teams regarding the application and usage of the Arkansas TRM Version 6.1, Volume 2. Our review of the recommendations and findings from the evaluation teams noted a significant drop in the number of issues related to the use of the TRM. Evaluation findings are summarized below.

Missing Data for TRM Version 6.1 Algorithms

- Early replacement algorithms require specific information that was missing for many projects (CenterPoint 2017 EM&V Report, pp. 4-5, 5-7);
- Measure specific data was missing such as equipment capacity, efficiency, installation location, and base line condition (CenterPoint 2017 EM&V Report, pp. 4-5, 5-7; OG&E 2017 EM&V Report, p. 158); and
- Information was missing for new construction lighting projects which apply lighting power density for deriving savings (EAI 2017 EM&V Report, pp. 372, 519).

Savings Databases Not Updated to reflect TRM Version 6.1

- The Midstream Lighting Program was not updated across all databases to the latest TRM for subcategories of lighting products as well as facility types (EAI 2017 EM&V Report, p. 173; OG&E 2017 EM&V Report, p. 23).

Incorrect Application or Interpretation of Algorithms

- The evaluator noted that flow rate instead of gallons per year saved was being used to derive savings for Low Flow Showerheads, this was corrected for 2017 data (EAI 2017 EM&V Report, p. 158);

- It was unclear on how to select weather stations for measures where those data are critical for look-up tables; evaluators assisted in that guidance (AOG 2017 EM&V Report, p. 6-10; EAI 2017 EM&V Report, pp. 163, 165; OG&E 2017 EM&V Report, p. 158);
- For lighting projects where the Annual Operating Hours (AOH) are 8,760 then the corresponding Coincidence Factor should be 1.0 (EAI 2017 EM&V Report, p. 171, 174, 175);
- There is an ongoing need to identify when algorithms apply site specific values or deemed defaults (EAI 2017 EM&V Report, p. 372); and
- There was some confusion on determining appropriate EFLH (Equivalent Full Load Hours) and CF (Coincidence Factor) values for lighting projects in mixed use buildings (EAI 2017 EM&V Report, p. 171).

Determine Savings from Custom Projects

Per the guidance and direction from TRM Version 6.1, it was more appropriate for some programs to rely on custom savings calculations using Measurement and Verification (M&V) protocols rather than relying on the TRM values or algorithms. Specific programs that included custom M&V elements are:

- ***Commercial & Industrial Solutions***: a combination of direct installation and custom measures program for larger commercial and industrial participants. This program is operated for three gas utilities: AOG, BHEA, and CenterPoint;
- ***Commercial & Industrial Solutions Program***: a combination of prescriptive measures, custom measures, technical assistance, and auditing offered by EAI;
- ***High Efficiency Tune-Up (Cooling Solutions℠)***: marketed as the CoolSaver℠ program through EAI;
- ***CITYSMART® (Solutions for Publicly Funded Institutions):*** a program that offers energy assessments, direct install measures, and capital measures for facilities of public entities;
- ***Agricultural Energy Solutions***: a program that offers farm audits, custom and prescriptive incentives, and education of supplies to help overcome barriers to energy efficiency;
- ***Commercial & Industrial Energy Efficiency Program***: a program that offers walk-through assessments, project financial analysis, technical assistance, and incentives to customers for completing prescriptive or custom measures offered by SWEPCO; and
- ***Commercial Energy Efficiency Program:*** a program that provides incentives to C&I customers to install energy efficiency measures that reduce energy costs, save energy consumption, and reduce peak demand offered by OG&E.

The programs with custom calculations were similar to those that employed custom M&V during PY2017.

Custom projects provided less of a contribution to the portfolio for gas utilities. Statewide custom projects accounted for 30 percent of gas (therms) savings. This is less than PY2017 when custom projects accounted for 38 percent of gas (therms) savings. Custom projects represented a notable portion of the savings for the Commercial & Industrial Solutions programs offered by gas utilities; 24 percent for AOG (AOG 2017 EM&V Report, p. 6-27), 31 percent for CenterPoint (CenterPoint 2017 EM&V Report, p. 7-29), and 24

percent for BHEA (BHEA 2017 EM&V Report, p. 5-30). Custom savings calculations for the Home Energy Reports program for CenterPoint were a significant portion of the residential portfolio at 50 percent (CenterPoint 2017 EM&V Report, p. 1-4).

Custom projects also continued to be less significant for electric utilities. Statewide custom projects accounted for 14 percent of electric (kWh) savings. This is less than 2016 where they accounted for 18 percent of electric (kWh) savings. EAI's Commercial & Industrial Solutions program savings were 24 percent custom projects (EAI 2017 EM&V Report, p. 232) compared to 34 percent custom projects in PY2016. The CITYSMART® program had only one custom project resulting in less than one percent of the programs savings (EAI 2017 EM&V Report, p. 363). EAI's Agricultural Energy Solutions had a much higher percentage of savings provided by custom projects, at 90 percent (EAI 2017 EM&V Report, p. 393). SWEPCO's Commercial & Industrial Energy Efficiency program was 30 percent custom projects (SWEPCO 2017 PYEM&V Report, p. 4-72), compared to 21 percent custom projects in PY2016.

Programs that include custom projects had mixed results. The electric utilities exceeded their goals for several of their programs with custom M&V. EAI's Cooling Solutions program fell short of goals, achieving 55 percent of the kWh goal (EAI 2017 EM&V Report, p. 44). Similarly, EAI's C&I Solutions program achieved 83 percent of goals (EAI 2017 EM&V Report, p. 36). However, EAI's CITYSMART® and Agricultural Energy Solutions programs achieved 156 and 116 percent of their kWh goals, respectively (EAI 2017 EM&V Report, p. 44). SWEPCO was able to achieve its energy savings goals for the CIEEP, achieving 106 percent of its kWh goal (SWEPCO 2017 EM&V Report, p. 4-63). Finally, the C&I CEEP program offered by OG&E exceeded goals achieving 109 percent of its kWh savings goal (OG&E 2017 EM&V Report, p. 7).

BHEA was able to meet 100 percent of its therm savings target for the Commercial & Industrial Solutions programs (BHEA 2017 EM&V Report, p. 19). AOG and CenterPoint fell just short of targets achieving 99 and 98 percent of therm savings goals, respectively (2017 EM&V report, p. 12; CenterPoint 2017 EM&V Report, p. 25).

Net-to-Gross (NTG) Verification

The IEM team reviewed in detail the methods and the findings for the PY2017 NTG ratios, which is presented next. A discussion of the strengths and limitations of the NTG research is presented in Section 4.

This program year was the first time in several years that some of the portfolios experienced shifting NTG results. The NTGR estimates diverged from the past several years because many of the programs received updated primary research. Regardless of the updated research, the natural gas programs continued to show higher savings weighted average NTG (93.3%) relative to the electric NTG results (89.5%).

Table 8 shows that all three gas utilities reported a wider range of NTG values for the gas programs relative to PY2016: results ranged from a low of 71.3 percent (BHEA Heating Equipment Rebate) to a high of 100 percent (Home Energy Reports and Smart Thermostats). Even with some program-level differences, there was minimal NTGR variability across the overall gas portfolios: the savings weighted average NTG estimates were all within 1.4 percentage points of each other (this is exactly the same difference as found from the PY2016 evaluations). (AOG 2017 EM&V Report, p. 1-2; BHEA 2017 EM&V Report, p. 1-2; CenterPoint 2017 EM&V Report, p. 1-2).

Table 8: Summary of NTG Values for Gas Utilities

Program	AOG NTG	CenterPoint NTG	BHEA NTG
Heating Equipment Rebates	75.1%	74.9%	71.3%
Water Heating Equipment Rebates	73.3%	73.2%	76.1%
Smart Thermostats			100.0%
Water Conservation Kits		96.0%	
Commercial Boiler CIP		80.3%	
C&I Solutions	95.1%	97.5%	99.4%
Commercial Food Service		77.2%	
Home Energy Reports*		100.0%	
Home Energy Savings (HESP)		90.9%	91.2%
Consistent Weatherization Approach	95.7%		
Total	**92.8%**	**93.0%**	**94.2%**

*The Home Energy Reports relied on a billing analysis and thus did not calculate an NTG ratio.

For the electric portfolios, there was an increase in the level of consistency across the overall savings-weighted portfolio NTGR: all three electric utilities NTGR were within one-percentage point of each other. OG&E's portfolio experienced the largest decline, going from 97.5 percent in PY2016 to 89.1 percent in 2017. (EAI 2017 EM&V Report, p. xxxi; OG&E 2017 EM&V Report, p. 45; SWEPCO 2017 EM&V Report, pp. 3-60-3-61).

Taking a look at the specific program results, the NTG estimates ranged from a low of 57.7 percent (SWEPCO Lighting and Appliance Program) to a high of 105 percent (EAI Small Business Program).[5] The savings weighted average portfolio NTG ratios for EAI and SWEPCO showed slight declines, from 91.0 percent and 91.9 percent in PY2016, to 89.6 and 88.6 percent in 2017, respectively. EAI's NTGR decline was largely due to the six-point decline in Residential Lighting and Appliance NTGR while SWEPCO's decline was attributed to the seven-point decline in CIEEP results (see Table 9).

The OG&E portfolio-wide NTGR saw a decrease over the PY2016 results, driven by a combination of the introduction of new programs, all of which received new NTGR research, and a 25-percentage point decline in C&I lighting NTGR.

[5] The NTG estimates for the PY2017 Arkansas evaluations were based on two components: free ridership and spillover. The NTG can exceed 1.0 for programs where spillover is greater than free ridership.

Table 9: Summary of NTG Values for the Electric Utilities

Program	EAI NTG	OG&E NTG	SWEPCO NTG
Res. Lighting & Appliances	73.5%	89.2%	57.7%
Home Energy Solutions	94.0%	94.4%	97.5%
Multifamily Homes	95.0%		
Manufactured Homes	92.0%		
CoolSaver℠	91.7%	83.0%	
Res. Benchmarking**	100.0%		
Res. Direct Load Control**	100.0%		100.0%
Bring Your Own Thermostat Pilot (BYOT)	N/A		
C&I Midstream Lighting	90.0%	75.5%	
Large C&I Solutions	92.4%	85.7%	93.0%
Small Business	105.0%	100.0%	100.0%
CitySmart®	98.5%		
Ag. Energy Solutions	89.0%		
Ag. Irrigation Load Control	100.0%		
HPwES			90.8%
Consistent Weatherization Approach (CWA)		95.0%	
HEEP - Schools		100.0%	
CEEP - SAGE		81.1%	
Total	**89.6%**	**89.1%**	**88.6%**

*The Residential Solutions Reward relied on a billing analysis and thus did not calculate an NTG ratio.
** Load control programs, where the assumption is that customers would not be voluntarily reducing their demand in absence of the program received an NTG of 100 percent.

NTG Methods

As the next three tables show, the majority of the PY2017 evaluations relied on new research and primary data collection years, though some of the programs continued to use the previous research based on NTG collected from PY2013 or PY2014 participants. The evaluation plans documented a staggered approach to conducting NTGR research during the three-year evaluation cycle (as an example, please see EAI EM&V Plan, Program Year 2017-2019, Table 3-1. Summary of Activities, p. 9) and provided the planned year for each programs NTGR research. The IEM team confirms that the evaluators stayed true to the evaluation plans and were able to conduct primary research for those programs designated to receive the research in PY2017.

A minority of programs NTGR relied on and billing/statistical analysis or stipulated values. The primary data collection generally fell into one of two categories:

- **PY2017 Participant Surveys Based on Primary Data Collection.** This includes interviews and some combination of surveys and/or interviews with 2017 participating customers, non participating customers, and trade allies; and

- **Use of Prior Primary Data Collection.** For stable programs (i.e., similar program offerings and incentive levels) that were targeted for new NTGR research in PY2018 or PY2019 and that underwent primary data collection for NTG in 2012/2013/2014 or in 2015, the evaluators may have decided to use these prior values (including blended 2012 and 2013 NTG ratios where available).

Table 10 summarizes the NTG methods used for the PY2017 gas utility evaluation research. All three gas utilities relied primarily on participant surveys; no trade ally surveys were used. None of the gas utilities relied on previous years' primary research or literature reviews, but rather still used stipulated NTGR values for at least one of their 2017 programs. The IEM team recommended previously that the evaluators should use literature reviews or previous NTGR values rather than stipulated defaults.

Table 10: Summary of NTG Methods for Gas Utilities

Program	Survey Research in 2017			Use of Prior Year Findings*	Billing Analysis/ Statistical Modeling	Literature Review	Stipulated Values
	Participant Customer Surveys	Non part Customer Surveys	Trade Ally Surveys				
AOG							
Heating Equipment	✓*						
Water Heat Equipment	✓*						
Water Conserve							
C&I Solutions	✓						✓
Consistent Weatherization Approach	✓						
BHEA							
Heating Equipment	✓*						
Water Heat Equipment	✓*						
C&I Solutions	✓						✓
Smart Thermostats							✓**
HES Program	✓***						
CenterPoint							
Space Heat	✓						
Water Heat	✓						
Water Conserve							✓
C&I Boiler							✓
C&I Solutions	✓						
C&I Cooking	✓		✓				
HER							
HES Program	✓***						

* Relied on participant surveys and findings from CenterPoint participants due to low participation counts.
**Relied on 100% stipulated NTG for Smart Thermostats.
***Relied on results of normal weatherization measures for DI component as well

As Table 11 shows, the EAI evaluation conducted primary data collection for approximately half of the PY2017 programs, and leveraged previous PY2013, PY2014, and PY2015 research for the other half of their PY2017 programs. The reliance on both primary and previous research for EAI was due to the planned staggering of NTGR research over the three-year evaluation cycle. The use of previous NTG values were for those programs that did not experience any change to delivery, structure, or incentives during the past several years. As noted above, the evaluator, Tetra Tech, indicated it will be conducting NTG research in PY2018 and PY2019 for the remainder of the EAI programs (EAI 2017 EM&V Report, pp. xxxii, xxxvi, xxxvii, xlv, xlvi).

All of the PY2017 SWEPCO programs received up-to-date survey research, relying on participant surveys for most of the programs, a billing analysis for the residential lighting program, and stipulating an 80 percent NTG for advanced power strips (SWEPCO 2017 EM&V Report, pp. 3-60; 4-74, 9-290, 9-310).

Table 11: Summary of NTG Methods for EAI and SWEPCO

Program	Survey Research in 2017			Use of Prior Year Findings*	Billing Analysis/ Statistical Modeling	Literature Review	Stipulated Values
	Participant Customer Surveys	Non part Customer Surveys	Trade Ally Surveys				
EAI							
Lighting and Appliances	✓		✓		✓		
HES				✓			
CoolSaver	✓		✓				
Multifamily				✓			
Mfg. Homes				✓			
Large C&I Solutions	✓		✓				
C&I Midstream Lighting	✓						
Small Business				✓			
CitySmart				✓			
AES				✓			
SWEPCO							
C&I EEP	✓						
SBDI	✓						
RLA Program	✓				✓		✓
REIP	✓						
HPwES	✓						

*EAI's Residential Benchmarking, Residential DLC, and Agriculture ILC Programs and SWEPCO LMSOP Program evaluation did not include net-to-gross research due to the nature of the program. EAI's BYOT Program did not have participation and therefore did not include net-to-gross research.

The OG&E evaluation conducted primary data collection for most of its PY2017 programs, consistent with its EM&V plans as noted in the PY2016 IEM report (PY2016 Final IEM Annual Report, p. 15). A literature review was conducted for its Residential Solutions Program due to limitations with participant contact information and unwillingness of property managers/owners to participate in a survey (OG&E 2017 EM&V Report, pp. 79-80). Table 12 shows the OG&E summary of NTG methods used for the 2017 evaluation.

Table 12: Summary of NTG Methods for OG&E

Program	Survey Research in 2017			Use of Prior Year Findings*	Billing Analysis/ Statistical Modeling	Literature Review	Stipulated Values
	Participant Customer Surveys	Non part Customer Surveys	Trade Ally Surveys				
OG&E							
HEEP – RSOL						✓	
HEEP - Kits							✓*
HEEP – HVAC	✓						
HEEP - CPS					✓		
CWA	✓						
CEEP – Large C&I	✓						
CEEP – SAGE	✓						
CEEP – SBDI	✓						
CEEP – HVAC	✓						
CEEP – Mid-Lighting	✓						

*Schools kits program received a stipulated 100% NTG due to them identified as hard-to-reach participants.

As noted previously, there were some exceptions to conducting primary research to estimate NTG, relying on prior-year's research or using statistical modeling techniques (i.e., billing analysis). Alternative approaches used billing or statistical analysis for behavioral programs (i.e., HER and Residential Benchmarking) and the EAI, SWEPCO, and OG&E residential lighting programs. Furthermore, as outlined in Protocol F of TRM Version 6.1, programs that are not sufficient in size to devote the evaluation resources necessary to estimate an NTG ratio can use literature reviews to establish an NTG value. Specific examples of these alternative methods include:

- The staggered evaluation approach for the PY2017-2019 EAI's program evaluations prompted its evaluator to leverage previous evaluated values for half of their programs, relying mostly on PY2014 evaluation results for the HES, Multifamily, Manufactured Home, Small Business, City Smart, and the AES Programs (EAI 2017 EM&V Report Table 1-1, p. xxiv);
- Load control programs, where the assumption is that customers would not be voluntarily reducing their demand in absence of the program, received a stipulated NTG of 100 percent (EAI 2017 EM&V Report Table 1-1, p. xxiv; SWEPCO 2017 EM&V Report, p. 6-153); and
- The HER Program (CenterPoint 2017 EM&V Report, p. 187) and the Residential Benchmarking Program (EAI 2017 EM&V Report, p. 192) relied on billing analysis, which estimates net savings

by using a control group.

Spillover

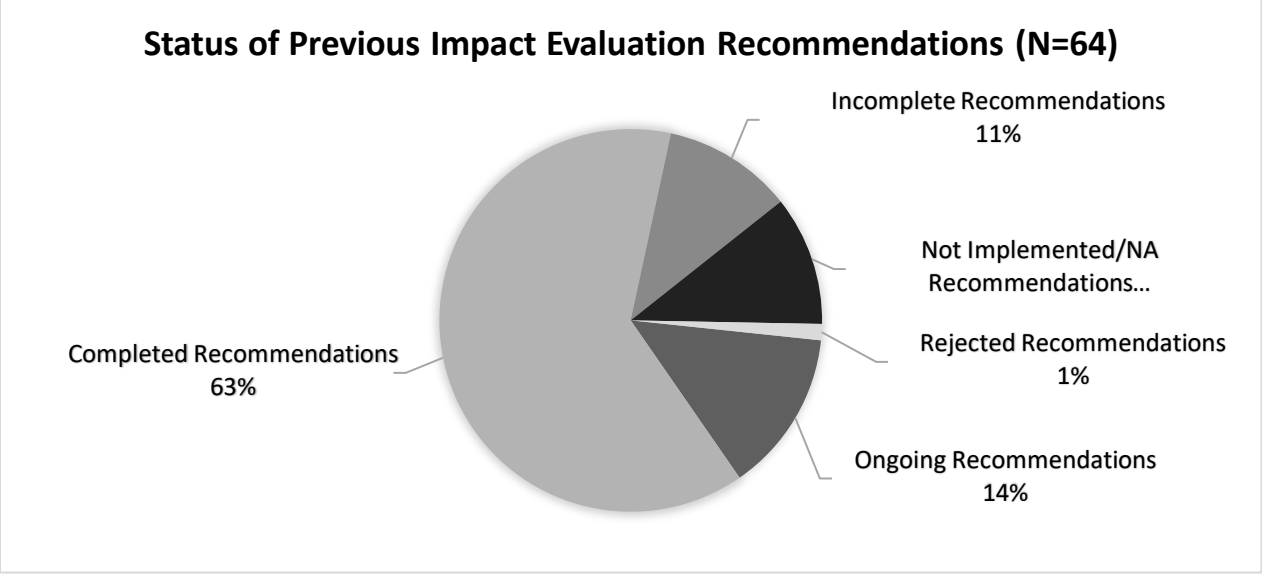
A limited number of PY2017 program evaluations identified that program participation has led to participants installing additional non-incentivized measures on their own. Spillover was identified in the AOG/OG&E Consistent Weatherization Approach programs, SWEPCO's HPwES and OG&E's Large C&I Programs (OG&E 2017 EM&V Report, pp. 129-130, 182; SWEPCO 2017 EM&V Report, p. 7-175).

The PY2017 EAI evaluation showed some evidence of spillover as well, with the residential Lighting and Appliance, CoolSaver, and Large C&I Solutions Programs each reporting some degree of spillover (EAI 2017 EM&V Report, pp. 97,103, 170, 301). The relative spillover values reported across these reports was minimal, with most spillover representing less than one-percent of the overall NTG value, with only EAI clothes washers and residential lighting showing eight percent spillover (the clothes washer estimate was based on participant surveys while the residential lighting was based on benchmarking other evaluation estimates) (EAI 2017 EM&V Report, pp. 97,103).

1.4 Impact Recommendations

Status of Previous Impact Evaluations

The evaluators provided updates for a total of 64 recommendations from previous impact evaluations. These findings are summarized in Figure 19. However, as noted in the Executive Summary, 18 previous recommendations did not include sufficient detail in the report to be classified as impact or process recommendations.



Sources: PY2017 EM&V Reports

Figure 19: Status of Previous Impact Recommendations

The following table summarizes the status of the previous recommendations by utility. As Table 13 shows, EAI has made substantial progress in implementing 29 of the 38 (76%) previous impact recommendations during PY2017. Other utilities have also made good progress on implementing or completing previous recommendations as only one has been rejected and eight are no longer applicable.

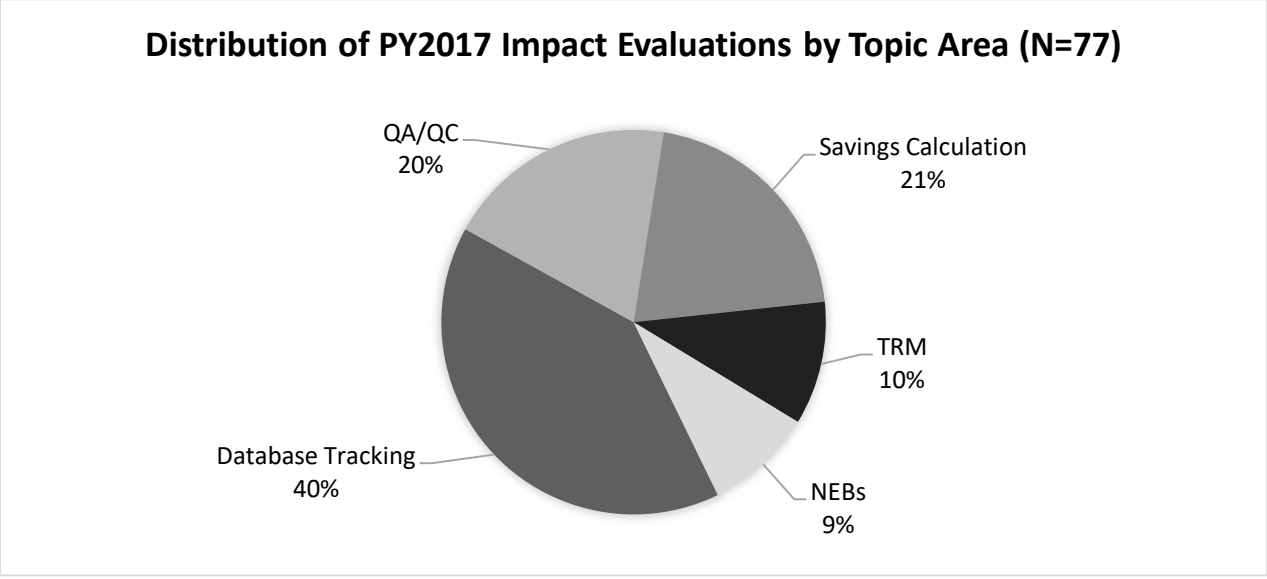
Table 13: Disposition of Previous Impact Recommendations by Energy Organization

Utility	Total	Ongoing	Completed	Incomplete	Not Implemented/NA	Rejected
AOG	1		1			
BHEA	1	1	1	1	1	1
CenterPoint	1	1	1	1	1	
EAI	38	5	29	1	3	
OG&E	16	2	8	4	2	
SWEPCO	7	1	6	1	1	
Total	**64**	**10**	**46**	**8**	**8**	**1**

Sources: 2017 EM&V Reports

PY2017 Impact Evaluation Recommendations

Evaluation teams provided a total of 77 new recommendations from their efforts in conducting their impact estimations. A significant decrease in recommendations on TRM updates were noted in PY2017. The majority of issues were related to database tracking and savings calculations. With the additional reporting of NEBs PY2017.



Source: Analysis of PY2017 EM&V Reports

Figure 20: Distribution of PY2017 Impact Evaluation Recommendations by Topic Area

The disposition by topic area is summarized in Table 14.

Table 14: Summary of PY2017 Impact Evaluation Recommendations by Topic and Energy Organization

Utility	NEBs	Database Tracking	QA/QC	Savings Calculation	TRM	Total
AOG	1	1		1	1	4
BHEA	1			1	1	3
CenterPoint	1	3		1	2	7
EAI	1	13	12	12	3	41
OG&E		10				10
SWEPCO	3	4	3	1	1	12
Total	**7**	**31**	**15**	**16**	**8**	**77**
% of Total	**9%**	**40%**	**20%**	**21%**	**10%**	**100%**

Source: Analysis of PY2017 EM&V Reports

Recommendations to Improve NEBs

The evaluators provided seven recommendations on ways to improve the determination of NEBs. One recommendation was unresolved from PY2016, noted below with PY (Previous Year). These recommendations focused on the following activities:

- Recommendation to include NEBs at the measure level including lighting hours of use (SWEPCO 2017 EM&V Report, p. 127); (PY);
- Update program application forms to include a checkbox if an ECM blower motor fan was included for cross-fuel savings (AOG 2017 EM&V Report, p. 4-34);
- Suggestion to apply water savings from steam trap replacement as noted in Chapter 12 (BHEA 2017 EM&V Report, p. 12-2, CenterPoint 2017 EM&V Report, p. 12-2);
- Convene a NEBs working group during PY2018 to establish consensus definitions, methodologies, and protocols for the identification and calculation of avoided and deferred replacement costs (EAI 2017 EM&V Report, p. 412);
- Include baseline fixture type and count as well as age to assist in deriving Avoided Replacement Costs for NEBs (SWEPCO 2017 EM&V Report, p. 4-109); and
- Program tracking data can include information tracking gas savings if available so that NEBs can be more easily determined during the evaluation (SWEPCO 2017 EM&V Report, p. 4-110).

Recommendations to Improve Database Tracking

The evaluators provided 31 recommendations on ways to improve data tracking procedures that will improve the overall quality of the savings estimates as well as verification efforts. Six recommendations were noted as unresolved in PY2016. These were recommended again for PY2017 and noted with PY (Previous Year). These recommendations provided the following improvement guidance:

- Update application forms to collect vintage, square footage, equipment age and replacement type (CenterPoint 2017 EM&V Report, pp. 4-5, 5-7); (PY);
- Resolve issues regarding inconsistency within and between tracking databases to avoid confusion during verification efforts (EAI 2017 EM&V Report, pp. 268, 444, 505, 519; OG&E 2017 EM&V Report, p. 102, SWEPCO 2017 EM&V Report, p. 4-109); (PY);
- Improve tracking post inspection activities and documentation to facilitate verification efforts such as indicating if a post inspection has been conducted as well as details on improvements or equipment installed (EAI 2017 EM&V Report, pp. 268, 476; OG&E 2017 EM&V Report, pp. 102, 188, 206, 294); (PY);
- For multifamily participants, primary contact name and phone number continue to be a challenge in reporting documentation (SWEPCO 2017 EM&V Report, p. 8-287);
- Include missing fields in database that are essential for determining savings such as weather zones, lighting sub-categories, coincidence factors *(*AOG 2017 EM&V Report, pp. 6-10; EAI 2017 EM&V Report, pp. 268, 445; OG&E 2017 EM&V Report, pp. 158, 206, SWEPCO 2017 EM&V Report, p. 8-286);
- Update data fields for new programs such as New Construction projects (EAI 2017 EM&V Report, pp. 372, 462, 505, 519); and
- Update database tools to reflect current TRM practices and parameters such as interactive effects, lighting AOH values and power adjustment factors (OG&E 2017 EM&V Report, p. 206; EAI 2017 EM&V Report, pp. 464, 519; SWEPCO 2017 EM&V Report, p. 4-109).

Recommendations to Improve QA/QC

The evaluators made 15 recommendations related to improving the quality of information required for EM&V, which have been summarized by topic area. Many recommendations centered around program offerings that addressed unique markets or complex program models. One recommendation was also made for PY2016 and was made again to continue in PY2017. This is noted below with PY (Previous Year). These recommendations include the following:

- Continue to conduct QA/QC on the first five projects with each new distributor as suggested in previous years (EAI 2017 EM&V Report, p. 458); (PY);
- Program staff would benefit from a "tag-along" during verification on-site visits to benefit from observing the work performed (SWEPCO 2017 EM&V Report, p. 1-27);
- Reduce verification for smaller projects that have the potential for less savings and incentive (SWEPCO 2017 EM&V Report, p. 4-110);
- Audit form should be improved to aid contractors in review and processing of information (SWEPCO 2017 EM&V Report, p. 8-287);
- Maintain a copy of the documented lighting product qualification, including input wattages within project files to support post-installation verification efforts (EAI 2017 EM&V Report, p. 502);

- Improve documentation of methodology for selecting cohorts and control groups for behavioral programs that ensures the similarity between groups (EAI 2017 EM&V Report, p. 324);
- Seek guidance from the EM&V team for large custom projects to better estimate savings (EAI 2017 EM&V Report, p. 171);
- Continue contractor checks and training efforts (EAI 2017 EM&V Report, p. 262);
- Increase QA/QC reviews of the program's tracking data to reduce errors across program measures (EAI 2017 EM&V Report, pp. 173, 249, 276, 462);
- Implementer should confirm qualifying bulbs in the most recent version of the ENERGY STAR Qualified Products List (EAI 2017 EM&V Report, p. 202);
- Implement and follow up with trade allies on training and installation for building envelope measures for projects where evaluated blower door test results differed from reported by more than 10 percent (EAI 2017 EM&V Report, p. 255); and
- Train staff and trade allies to better determine how to differentiate between different types of lighting such as omni directional and directional (EAI 2017 EM&V Report, p. 462).

Recommendations to Improve Savings Calculations

The evaluators provided a total of 16 unique recommendations related to savings calculations Two of the recommendations were unresolved from PY2016, noted below with PY (Previous Year). The PY2017 recommendations were noted as follows:

- For lighting projects that have operating hours of 8760, the CF value should be adjusted to 1.0 (EAI 2017 EM&V Report, pp. 473, 510); (PY);
- Work on developing an efficient and transparent method of determining weather stations (EAI 2017 EM&V Report, p. 306); (PY);
- Adjust gross kWh and kW to reflect the effects of leakage from the upstream program based on the territory size (SWEPCO 2017 EM&V Report, p. 9-336);
- Provide custom calculators that detail the complexities of poultry lighting (EAI 2017 EM&V Report, p. 525);
- Work collaboratively with the EM&V team in updating the assumed lighting power density baseline for new construction lighting projects in poultry housing (EAI 2017 EM&V Report, p. 520);
- Use consistent sources for savings across all lighting measures in multiple databases to better estimate annual claimed savings (EAI 2017 EM&V Report, p. 304);
- Create an efficient and transparent method for selecting weather stations for weatherization programs (EAI 2017 EM&V Report, p. 306);
- Refine the regression equation used for MISO weather adjusted baseline calculations for the Direct Load Control program (EAI 2017 EM&V Report, p. 334);

- MISO based savings calculations using the weather adjustment baseline methodology should take care to align NOAA temperature records with the appropriate load intervals (EAI 2017 EM&V Report, p. 333);
- Use a consistent method of analyzing peak demand impacts across all custom projects (EAI 2017 EM&V Report, p. 383);
- Work with the IEM team to determine a partially deemed mechanism for determining savings from steam leak repair and steam line insulation. (AOG 2017 EM&V Report, p. 12-2; BHEA 2017 EM&V Report, p. 5-42, CenterPoint 2017 EM&V Report, p. 7-22);
- For Bring Your Own Thermostat (BYOT) Program, the calculation methods should be explored and refines with all interested parties (EAI 2017 EM&V Report, p. 347);
- Continue to use a rolling average of the latest M&V data to update the efficiency loss factors for better accuracy with HVAC Tune Ups (EAI 2017 EM&V Report, p. 234); and
- Implementation contractor worked with the evaluator to determine the annual water savings from a low flow showerhead that had a flow rate of 1.6 GPM (EAI 2017 EM&V Report, p. 238).

Recommendations to Improve TRM Version 7.0

The evaluators provided seven recommendations on ways to improve the TRM. Two recommendations were unresolved in PY2016, noted below with PY (Previous Year). Some of these recommendations were repeated across evaluation reports and tally to a total of six unique recommendations. These recommendations focused on making the following adjustments and/or corrections to the TRM:

- TRM default values for Food Service Equipment consistently underestimate equipment in the market (CenterPoint 2017 EM&V Report, p. 8-13); (PY);
- Consider target metering to update the HOU parameter in the AR TRM (SWEPCO 2017 EM&V Report, p. 1-27); (PY);
- Update the TRM to include "Other Building Types" for deemed building types when there is a limited option to choose from (i.e. refrigeration and domestic hot water measures) (EAI 2017 EM&V Report, p. 443);
- Consider applying field collected values for DHW Temperature Setpoint for average, single family and multifamily applications (BHEA 2017 EM&V Report, p. 12-1; CenterPoint 2017 EM&V Report, p. 12-1);
- Add new TRM measure for Steam Leak Repair (AOG 2017 EM&V Report, p. 7-2; BHEA 2017 EM&V Report, p. 7-2; CenterPoint 2017 EM&V Report, p. 12-2);
- In TRM, rename Table 358 for Commercial Low Flow Showerhead to Annual Hot Water Usage, not daily hot water usage since values in table are annual usage (EAI 2017 EM&V Report, pp. 476, 504); and
- Update the TRM with a new code fixture for LED exit lamps below 3W (EAI 2017 EM&V Report, p. 171).

Section 2: Summary of Process Evaluation Findings and Recommendations

2.1 Overview of Process Evaluation

Process evaluations focus on determining the overall effectiveness of program delivery, identifying opportunities for program improvements and assessing key program metrics, including participation rates, market barriers{ XE "barriers" }, and overall program operations{ XE "operations" }. Process evaluations also provide context for the impact evaluations, by identifying areas of success and areas for improvement relative to overall program goas.

2.2 Summary of Process Evaluation Findings

The process evaluations conducted by the EM&V evaluators identified a number of key strengths with the programs currently offered across the state. Although these findings are identified in each program evaluation, the IEM compared these findings across all of the evaluation reports to identify emerging statewide trends. These portfolio–level findings are summarized by topic next.

Program Performance

Most energy efficiency programs met or exceeded program savings goals. Some of the most successful programs in PY2017 included AOG's C&I Solutions Program, BHEA's HESP Program, AOG-OG&E's CWA Program, SWEPCO's HPwES and Midstream Lighting Program and EAI's Manufactured Homes and Multi-family Programs (AOG 2017 EM&V Report, pp. 1-4, 5-2, 6-1; BHEA 2017 EM&V Report, pp. 1-5-1-6; EAI 2017 EM&V pp.73, 150, 303; OG&E 2017 EM&V Report, pp. 102, 158; SWEPCO 2017 EM&V Report, pp. 4-106-107, 5-143).

The CenterPoint portfolio reached 96.8 percent of its filed savings goal, compared to 93.8 percent in PY2016. There was notably strong performance relative to goals in the Food Service and Home Energy Reports programs. The C&I Solutions and Low Flow programs also performed well. The Saving Home Weatherization Program fell short of its 2017 goal (reaching 89.5% of the goal) but its savings are up by 270% compared to PY2016. (CenterPoint 2017 EM&V Report, p. 1-6).

Of note, the three gas utilities saw increased participation among small business customers due to the successful outreach for the stream trap replacement program (AOG 2017 EM&V Report, p. 5-39; BHEA 2017 EM&V Report, p. 1-5; CenterPoint 2017 EM&V Report, p. 1-6).

SWEPCO has successfully engaged lighting distributors to promote commercial energy efficient lighting which has contributed to overall program success (EAI 2017 EM&V Report, p. xlvii).

However, some programs did not meet goals. After a record year in PY2016, the AOG Equipment Rebate program has fallen back to PY2014-2015 savings and participant levels. Similarly, its C&I Solutions also achieved lower custom savings than in prior years due to a lack of one single large project. AOG's Direct install savings were also lower compared to previous due to market saturation and rising costs (AOG 2017 EM&V Report, pp.1-4-1-5, 4-33, 5-39).

Several programs within the Arkansas Energy Efficiency Program Portfolio align with industry best practices. For example, the evaluators determined current rebate levels for residential and small business custom incentives for AOG, BHEA and CenterPoint align with similar programs offered by utilities in other territories (AOG 2017 EM&V Report, p. 5-20; BHEA 2017 EM&V Report, pp. 3-10, 5-2; CenterPoint 2017 EM&V Report, p. 7-22).

In addition, the evaluators confirmed that SWEPCO's REIP aligned with industry best practices for delivering effective residential energy efficiency programs (SWEPCO 2017 EM&V Report, pp. 8-274-8-283).

Program Participation

Most residential participants enrolled in programs as a way to save money on their monthly utility bill (AOG 2017 EM&V Report, p. 6-13; EAI 2017 EM&V Report, p. 214; OG&E 2017 EM&V Report, p. 145; SWEPCO 2017 EM&V Report, p. 7-186). Other reasons motivating participation included the low cost to participate through direct install programs (BHEA 2017 EM&V Report, p. 5-13); or receive free or low-cost equipment such as Smart Thermostats (EAI 2017 EM&V Report, p. 214).

Of note, the evaluators reported that participants receiving CenterPoint's Home Energy Reports were significantly more likely to participate in CenterPoint's weatherization program, suggesting their previous program participation led to additional program participation (CenterPoint 2017 EM&V Report, p. 1-9).

C&I customers participated based on the contractor or utility staff recommendation This trend was especially evident by the participation rates in CenterPoint's Commercial Food Service CIP and CenterPoint's Commercial Equipment Rebate (CenterPoint 2017 EM&V Report, pp. 5-9 8-1). In addition, most participants in CenterPoint's boiler rebate program was driven by past participation in previous projects in the public sector, such as schools and municipal buildings (CenterPoint 2017 EM&V Report, p. 6-7).

EAI reported a similar finding for its C&I program, where nearly one-third of participants learned about the program directly from a vendor and more than one-half participated due to the contractor recommendation (EAI 2017 EM&V Report, p. xlv).

AOG's C&I Solutions had mixed results with lower custom savings in previous years (AOG 2017 EM&V Report, p. 1-5.) However, there has been a substantial increase in trade ally activity due to using the same program implementer, CLEAResult, that is currently working on similar programs for the other two gas utilities (AOG 2017 EM&V Report, pp. 3-15).

EAI's Summer Advantage Load Program also did not meet its participation goals, despite specific outreach to residential customers in PY2017, which may be due to low incentive levels (EAI 2017 EM&V Report, p. 221).

CenterPoint's REIP also reported lower participation and savings in PY2017 compared to PY2016. (CenterPoint 2017 EM&V Report, p. 1-7)

Reasons for Non Participation

The evaluation reports, as a whole, did not discuss reasons for non participation or barriers to non participation in the process evaluation findings. Of note, only EAI's report included findings regarding

customer disenrollment from its Summer Load Program, due primarily to increasing home discomfort, inability to participate in other EAI programs, or missed enrollment period deadlines (EAI 2017 EM&V Report, p. 219).

Customer Satisfaction

Overall participant satisfaction remains high across most of the energy efficiency programs (AOG 2017 EM&V Report, pp. 4-5, 4-13, 5-4, 5-12, 6-14; BHEA 2017 EM&V Report, pp. 4-10,4-11, 5-16, 5-20; EAI 2017 EM&V Report, pp. xlii, xliv, 86, 137; OG&E 2017 EM&V Report, pp. 150-151; SWEPCO 2017 EM&V Report, pp. 4-98, 7-195, 8-262).

Program participants reported being more satisfied with their utility overall, as a result of their involvement in the energy efficiency programs (AOG 2017 EM&V Report, pp. 4-13, 4-17; BHEA 2017 EM&V Report, p. 4-10; CenterPoint 2017 EM&V Report, pp. 5-11, 7-16, 11- 19-11-20).

Trade allies also generally reported high levels of satisfaction in working with the utilities (AOG 2017 EM&V Report, pp. 4-16, 5-18; BHEA 2017 EM&V Report, pp. 4-11; EAI 2017 EM&V Report, pp. xlv, 293; OG&E 2017 EM&V Report, pp. 200-201, 202-203; SWEPCO 2017 EM&V Report, pp. 5-135, 7-194-7-195).

Reasons for Dissatisfaction

A few program participants were not satisfied with certain elements of the program, such as contractor performance, not seeing the expected energy savings, or not receiving all of the installation measures (AOG 2017 EM&V Report, p. 6-18; BHEA 2017 EM&V Report, pp. 4-10, 4-13; CenterPoint 2017 EM&V Report, p. 11-20; OG&E 2017 EM&V Report, pp. 150-151: SWEPCO 2017 EM&V Report, pp. 1-20, 1-21, 5-142).

Marketing and Outreach

The Arkansas IOUs engaged in a variety of marketing activities to promote their energy efficiency programs. These activities included: customer-direct outreach, bill inserts, social media, program websites, radio and print advertising, and keyword searches (AOG 2017 EM&V Report, p. 4-9, 6-4, 6-12; BHEA 2017 EM&V Report, pp. 3-2, 6-10; CenterPoint 2017 EM&V Report, p. 3-5; EAI 2017 EM&V Report, p. 213; OG&E 2017 EM&V Report, pp. 145, 190-191; SWEPCO 2017 EM&V Report, pp. 1-18, 1-23, 1-28, 4-86, 5-127).

Several utilities relied on in-store promotions and events for midstream programs including lighting and appliance programs. These activities included educational displays, signs, and stickers highlighting the program rebates (EAI 2017 EM&V Report, p. 91; SWEPCO 2017 EM&V Report, pp. 1-28, 9-289, 9-322).

SWEPCO also engaged in some non-traditional marketing and outreach activities to promote its energy efficiency programs. To promote lighting rebates, program outreach focused on education events at senior centers, two home shows, and three teacher fair events. (SWEPCO 2017 EM&V Report, pp. 9-322-9-323). Other marketing activities included developing relationships with property owners to promote installations in multifamily units (SWEPCO 2017 EM&V Report, pp. 1-26, 8-62). CenterPoint hired industry-experts to promote its food service program as well (CenterPoint 2017 EM&V Report, p. 1-7).

However, some marketing activities were less successful in engaging customers. EAI's direct marketing strategy to enroll customers with Smart Thermostats into its load control program did not generate the expected participation rates (EAI 2017 EM&V Report, pp. 221-222). SWEPCO also moved away from in-store promotions as these were less successful compared to previous years (SWEPCO 2017 EM&V Report, pp. 9-322-9-323).

***Several IOUs joined forces to market programs directly to trade allies*.** The gas and electric utilities in the same service territories worked together to promote a variety of energy efficiency programs, including the Consistent Weatherization Approach (AOG 2017 EM&V Report, p. 6-8; BHEA 2017 EM&V Report, p. 6-8; CenterPoint 2017 EM&V Report, pp. 3-10, 4-6, 5-1,11-8; SWEPCO 2017 EM&V Report, pp. 1-20, 1-26).

The IOUs developed specialized marketing and outreach activities to recruit and engage contractors who deliver these programs. All three gas utilities focused their marketing efforts on reaching out to plumbing and HVAC contractors to promote energy efficient space and water heaters (AOG 2017 EM&V Report, p. 4-9; BHEA 2017 EM&V Report, p. 6-1; CenterPoint 2017 EM&V Report, p. 5-1).

SWEPCO partnered with trade allies and provide co-operative advertising support and collateral material to promote its HPwES Program. Two trade allies reported using program developed marketing materials because the SWEPCO brand added credibility to their marketing efforts (SWEPCO 2017 EM&V Report, pp. 1-20, 1-23. 1-26).

SWEPCO also offered technology educational workshops described as "lunch-and-learn" events to target customers and contractors throughout its service territory (SWEPCO 2017 EM&V Report, p. 4-86).

But some trade allies did not use the marketing materials developed by the utilities, primarily because they were not aware it was available (BHEA 2017 EM&V Report, p. 4-11; CenterPoint 2017 EM&V Report, p. 4-14).

Trade allies also conducted their own marketing and outreach to reach potential customers. Trade allies used program through social media, working with local government entities to promote the program, direct mail and, emails, and text messages (SWEPCO 2017 EM&V Report, p. 1-26). Several trade allies also relied on direct mail or word-of-mouth to engage customers (AOG 2017 EM&V Report, p. 4-15; BHEA 2017 EM&V Report, p. 5-20).

Program Awareness

Most *customers learned about these programs from participating retailers or contractors*. (AOG 2017 EM&V Report, pp. 4-9, 5-11; BHEA 2017 EM&V Report, p. 5-18; CenterPoint 2017 EM&V Report, pp. 4-7, 4-12. 5-9, 7-19; EAI 2017 EM&V Report, pp. 85, 153-154, 291-292, 283-284; OG&E 2017 EM&V Report, p. 191; SWEPCO 2017 EM&V Report, pp.1-18, 1-20, 1-26, 4-90, 4-107, 5-30, 8-258).

Participants also reported learning about these energy efficiency programs from family, friends, and colleagues (AOG 2017 EM&V Report, pp. 4-9, 5-11, 6-4; BHEA 2017 EM&V Report, pp. 4-11, 5-13, 6-11; CenterPoint 2017 EM&V Report, p. 11-14; OG&E 2017 EM&V Report, p. 145: SWEPCO 2017 EM&V Report, pp. 5-186, 5-212, 8-258).

However, 40 percent of SWEPCO program participants in Small Business Direct Install Program reported learning about the program directly from a customer service representative, which is notably different from

the findings from previous evaluations in which contractors were the primary source of program awareness (SWEPCO 2017 EM&V Program p. 5-130).

Trade Ally Engagement

Trade ally participation and recruitment remains strong across the Arkansas energy efficiency program portfolio. For example, trade ally participation has increased in CenterPoint, which has led to increased overall program savings while trade allies are critical to encouraging customers to complete custom projects (AOG 2017 EM&V Report, pp. 1-5, 3-11; BHEA 2017 EM&V Report, p. 3-5; CenterPoint 2017 EM&V Report, pp. 11-1, 11-27; EAI 2017 EM&V Report, pp. 65, 69; OG&E 2017 EM&V Report, p. 164; SWEPCO 2017 EM&V Report, p. 5-127).

However, trade ally participation in BHEA's HESP program did decline from six to four trade allies in PY2017 (BHEA 2017 EM&V Report, p. 6-11).

Retention of trade allies remains strong for two of the utilities (OG&E 2017 EM&V Report, p. 5-128; SWEPCO 2017 EM&V Report, p. 5-127).

Trade allies typically for the gas utilities did not use marketing material developed by their corresponding utility company to promote the program (AOG 2017 EM&V Report, p. 4-14, BHEA 2017 EM&V Report, p. 4-12; CenterPoint 2017 EM&V Report, p. 4-12).

The gas utilities do not require trade ally registration to participate for most programs. Rather, they allow all licensed dealers or contractors to apply for the appropriate equipment rebates (AOG 2017 EM&V Report, pp. 3-10; BHEA 2017 EM&V Report, p. 3-4; CenterPoint 2017 EM&V Report, p. 3-4).

Trade ally training activities were mixed across the Arkansas portfolio. Most of the participating trade allies for the gas utility programs have not received any specialized training (AOG 2017 EM&V Report, p. 4-16; BHEA 2017 EM&V Report, pp. 4-11; CenterPoint 2017 EM&V Report, p. 4-15).

The electric utilities provided trade ally education and training for several of their programs. EAI also held Trade Ally Summits for educational purposes and to recognize high performing trade allies with awards to foster continued program participation (EAI 2017 EM&V Report, p. 64).

EAI's multifamily and manufactured homes program implementer expanded program offerings specifically using iManifold among trade allies and provided AC tune-ups to more than 1,400 multifamily units and more than 200 manufactured homes (EAI 2017 EM&V Report, p. 67).

SWEPCO held numerous training events throughout 2017 ranging from in-store trainings to full certification courses (SWEPCO 2017 EM&V Report, p. 3-52). SWEPCO has also developed a ranking system to highlight top trade ally performers and is looking for additional ways to enhance trade ally program delivery (SWEPCO 2017 EM&V Report, pp, 3-52, 5-127, 5-128, pp. 128, 3-52). OG&E offers contractor training for its CWA and REEP programs (OG&E 2017 EM&V Report, pp. 39, 194).

Program Changes

The process evaluations also identified a number changes that had been made in PY2017 to both program design and delivery. These modifications are summarized next.

Two utilities made substantial changes to their program portfolios during PY2017. CenterPoint divided its Space Heating and Water Heating Conservation Components into separate residential and commercial program offerings (CenterPoint 2017 EM&V Report, p. 1-6). OG&E also reorganized its C&I programs into one combined offering through its Commercial Energy Efficiency Program (OG&E 2017 EM&V Report, p. 173).

Other program modifications made in PY2017 are summarized next.

Changes in Incentives:

- AOG's program portfolio shifted from offering tiered incentives for premium efficiency products to a single incentive for the highest premium efficiency product in each category (AOG 2017 EM&V Report, p. 3-13).
- BHEA's C&I Solutions Program adjusted the incentive payments for boiler and food service equipment, while SWEPCO changed the incentive requirements for its lighting measures (BHEA 2017 EM&V Report, p. 5-9; SWEPCO 2017 EM&V Report, p. 1-18).
- Two changes in CenterPoint's program led to increased savings for steam cookers through new tiered incentives in its Commercial Food Service CIP and adding door infiltration had also increased overall program savings for its C&I Solutions Program (CenterPoint 2017 EM&V Report, p. 1-8)
- SWEPCO modified its contractor reimbursement rates for the CWA program to better reflect market conditions (SWEPCO 2017 EM&V Report, p. 5-183).

Changes in Measures:

- OG&E added several new measures to meet the CWA requirements including faucet aerators, low-flow showerheads, and smart power strips (OG&E 2017 EM&V Report, pp. 21-22). AOG added smart thermostats to its Equipment Rebate Program and door infiltration for its C&I Solutions Program (AOG 2017 EM&V Report, p. 4-33). EAI's also made changes to its Midstream Lighting Program in June and October 2017 included splitting lighting measures into separate categories or adding new lighting types (EAI 2017 EM&V Report, p. 311).

Changes in Customer Eligibility:

- Both BHEA and SWEPCO changed the customer eligibility requirements for their Small Business Programs. SWEPCO increased the eligibility threshold for small business customers from 50 kW to 100 kW while BHEA offered an additional incentive from small business customers with substantial gas loads (BHEA 2017 EM&V Report, p. 5-9; SWEPCO 2017 EM&V Report, p. 1-20).
- AOG extended program eligibility to municipal customers who were AOG gas customers. This change allowed these customers to also receive program-funded LEDs, since AOG could not capture those energy savings through NEBs (AOG 2017 EM&V Report, p. 6-6).

New Program Implementers: Both BHEA and CenterPoint brought on the same third-party implementer to run their C&I Solutions Program, which led to consistent program delivery across both utility service territories. The two gas utilities are coordinating dual-fuel projects with SWEPCO and EAI (BHEA 2017 EM&V Report, p. 3-8; CenterPoint 2017 EM&V Report, p. 3-10).

Program Enrollment: AOG-OG&E's CWA program enrollment was streamlined by using in-house staff rather than have a third-party handle customer inquiries and leads. This change led to improved and reduction of customer wait times (AOG 2017 EM&V Report, p. 6-6).

Future Program Enhancements:

- SWEPCO's process evaluation identified upcoming changes for the next program cycle. These changes included:
  - Adding a midstream lighting channel that will primarily focus on the replacement of fluorescent T8s with LED tube lights;
  - A RCx-lite measure offering that would use deemed estimates of savings rather requiring full M&V to estimate savings;
  - Introduction of a trade ally ranking system that would designate trade allies as "preferred" for CIEEP (SWEPCO 2017 EM&V Report, pp. 1-19, 4-108, 5-128); and
  - Staff attending some verification visits for its HPwES Program in the next program cycle (SWEPCO 2017 EM&V Report, p. 5-214)

2.3 Consistent Weatherization Approach (CWA)

Order No.7 in Docket No.13-002-U of the Arkansas PSC requires all investor-owned utilities (IOUs) to implement a consistent approach to providing weatherization services to eligible Arkansas residents. The Consistent Weatherization Approach (CWA) was adopted by the Arkansas utilities under APSC guidance. Each utility offered its version of the CWA, either by modifying an existing program or developing a new one. The program trains contractors and home energy consultants to analyze the energy use for single and multifamily homes and identify specific energy efficiency improvements which are then provided at no-cost to the customer.

The IOUs are responsible for delivering the Program, and each IOU has a separate program budget and may use its own Building Performance Institute (BPI) or Residential Energy Services Network (RESNET) certified contractors or trained private contractors. Each IOU must follow the guidelines of the statewide approach when delivering weatherization services but is able to supplement the program with complementary elements such as additional measure offerings. While all IOUs are required to offer weatherization services under the CWA Program framework, each IOU offers its own iteration of the framework and may or may not deliver weatherization through a joint utility offering. The CWA program is an example of a joint utility version, where OG&E and AOG are the joint sponsors and share the costs of weatherizing participant homes (OG&E 2017 EM&V Report, p. 109)

The program provides energy assessments, along with direct installation of low-cost measures and pre-qualification for building envelope improvements.

Direct install measures include:

- Faucet aerators;
- Low flow showerheads;
- Water heater pipe insulation;

- Water heater wrap; and
- LEDs.

Weatherization measures include:

- Air sealing;
- Duct sealing; and
- Ceiling insulation.

The CWA Programs have been among the most successful offerings in the overall energy efficiency program portfolio. The program-specific summaries indicate that the utilities have completed more than 12,000 energy audits and installed more than 22,000 measures through the CWA offerings. The conversion rate is at 100 percent, further indicating the overall success with the CWA programs across all utilities ***(***AOG 2017 EM&V Report, p. 6-4; BHEA 2017 EM&V Report, p. 6-5; CenterPoint 2017 EM&V Report, pp. 11-4-11-5; EAI 2017 EM&V Report, pp. 409-410; OG&E 2017 EM&V Report, p. 107; SWEPCO 2017 EM&V Report, pp. 5-154-5-155). These program offerings are summarized in the following table.

Table 15: Summary of CWA Metrics Across the Arkansas IOUs

Metric	AOG	BHEA	CenterPoint	EAI			OG&E	SWEPCO
Program Name	AOG Weatherization Program	Home Energy Savings Program	Saving Homes Weatherization Program	Home Energy Solutions	Energy Solutions for Manufactured Homes	Energy Solutions for Multifamily Homes	Consistent Weatherization Approach	Home Performance with ENERGY STAR
CWA Implementation	The CWA is implemented directly by AOG with the use of a closed network of pre-approved trade allies. Program coordinates heavily with OG&E. Note, AOG has opted to fund installation of LEDs in customers' homes that are served by municipal or co-op utilities.	The CWA is implemented using a third-party contractor (CLEAResult) with a network of pre-approved trade allies that market the program. Program coordinates with SWEPCO and EAI.	The CWA is implemented using a third-party contractor (CLEAResult) with a network of pre-approved trade allies that market the program. Program coordinates with SWEPCO and EAI.	EAI uses local home energy consultants who help single family residential customers analyze their energy use and identify opportunities to improve the energy efficiency of their homes.	This program targets residents living in manufactured housing units.	This program targets multifamily residences with five or more units.	The (CWA) program operated by OG&E and AOG is a joint utility offering that provides residential energy audits and energy efficiency installations to customers within the Arkansas territories of OG&E and (AOG).	The CWA is implemented directly by SWEPCO with the use of a closed network of pre-approved trade allies. Program coordinates heavily with BHEA and CenterPoint.
Total Audits Completed	874	810	1,134	4,876	499	430	1,662	1,825
Total Submitted Projects	979	817	1,235	8,424 (includes all measures installed)	754	945	7,048 (includes all measures installed)	1,845
Conversion Rate	100%	99% (802 of 810 assessments yielded projects)	78% (886 of 1,134 assessments yielded projects)	100% (Contractors installed at least one measure)	100% (Contractors installed at least one measure)	100% (Contractors installed at least one measure)	100%	100.00%
Measures installed per-project	3.15	2.5	1.99	4.0	1.8	1.6	4.2	3.6
Cost per participant	$0 cost to participants. AOG paid $1,389/home	No customer co-pay. BHE paid $894/home	No customer co-pay. CenterPoint paid $723/home	$1400.00 and average provided at $0 cost to the participant	$1034 and $0 cost to customer	$241 and $0 cost to customer	$0 cost to the participants: OG&E paid $744/home – this was calculated based on totals for both AOG and OG&E	$0 cost to participants. SWEPCO paid $793/home
Percent of contractors promoting program	100%	100%	100%	100%	100%	100%	100%	100.00%

Sources: AOG 2017 EM&V Report, p. 6-4; BHEA 2017 EM&V Report, p. 6-5; CenterPoint 2017 EM&V Report, pp. 11-4-11-5; EAI 2017 EM&V Report, pp. 409-410; OG&E 2017 EM&V Report, p. 107; SWEPCO 2017 EM&V Report, pp. 5-154-5-155

Some utilities also made modifications to reach out to other markets. For example, AOG expanded program eligibility for the direct installation of LEDs to customers in municipal/co-op-served homes that are otherwise eligible for weatherization measures. AOG opted to offer this to ensure a consistent offering for their customers. This benefit is possible due to the APSC guidance on NEBs allowing for the claiming of cross-fuel savings. (AOG 2017 EM&V Report, p. 6-1).

Age and Income Levels for CWA Program Participants

For EAI, 20 percent of HESP Program participants were aged 65 or older and 17 percent earned less than $50,000 with two percent earning less than $24,000 annually (EAI 2017 EM&V Report, p. 88).

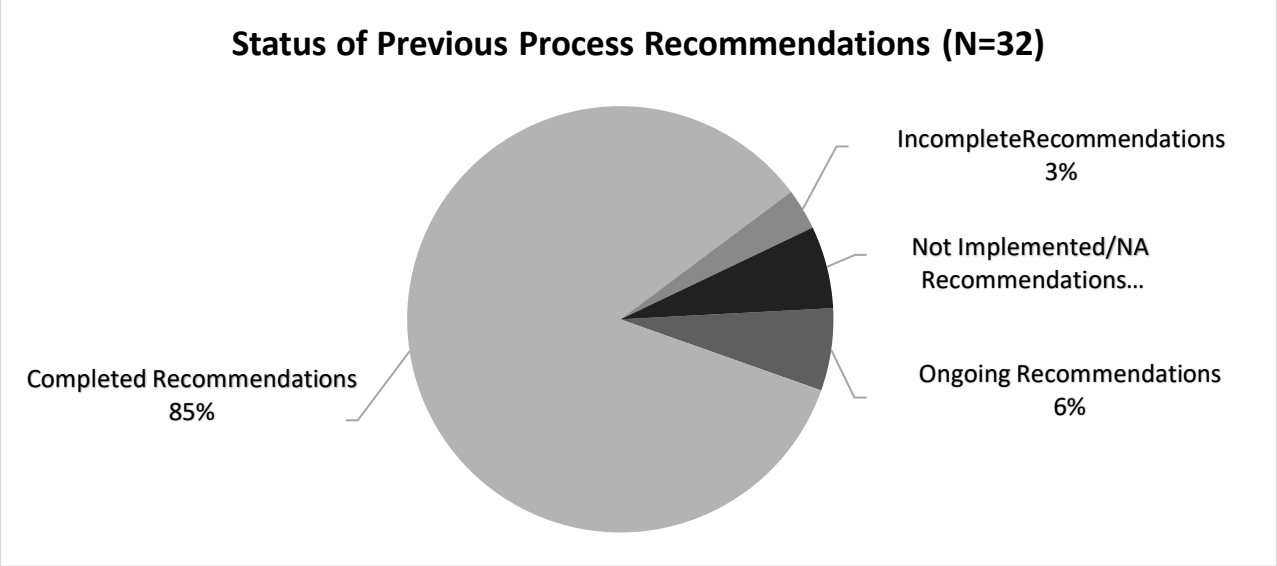
Twenty-seven percent of HPwES program participants earned less than $50,000 annually and 19 percent had annual incomes of less than $30,000 (SWEPCO PY2018 EM&V Report, pp. 5-190-5-191).

Note, however, that while the CWA was implemented by all the utilities in PY2017, as evidenced by the significant gas fuel NEBs from the electric utilities there may be additional opportunities for joint incentives. This is discussed in Section 4 in more detail.

2.5 Process Recommendations

Status of Previous Process Evaluation Recommendations

Consistent with Protocol C requirements, all of the evaluators provided an update regarding the status of the recommendations made during prior process evaluations.



Source: PY2017 EM&V Reports

Figure 21: Status of Previous Process Evaluation Recommendations

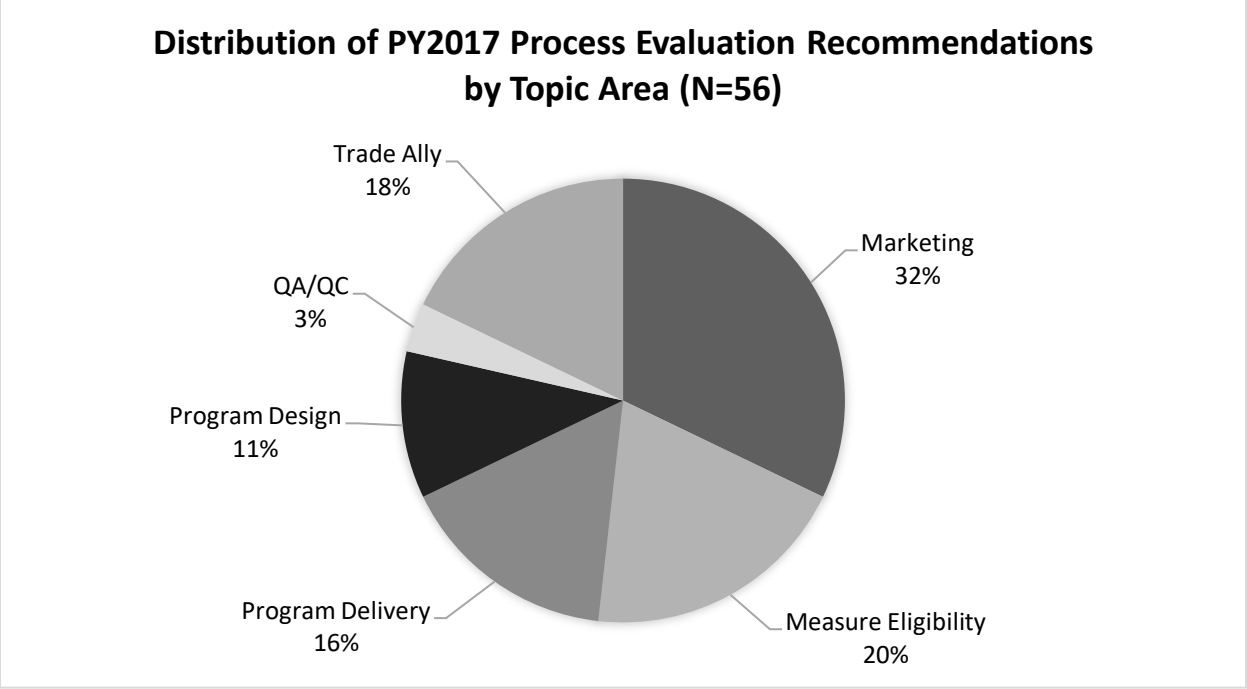
Table 16: Disposition of Previous Process Recommendations by Utility

Utility	Total	Ongoing	Complete	Incomplete	Not Implemented/NA
AOG	2	1	1		
BHEA	1		1		
CenterPoint	1		1		
EAI	15	1	11	1	2
OG&E	10		10		
SWEPCO	3		3		
Total	**32**	**2**	**27**	**1**	**2**

Source: PY2017 EM&V Reports

PY2017 Process Evaluation Recommendations

The evaluators also made a total of 56 recommendations to improve overall program operations.



Source: Analysis of PY2017 EM&V Reports

Figure 22: Distribution of PY2017 Process Evaluation Recommendations by Topic Area

Table 17 summarizes the process evaluation recommendations by topic area and energy organization.

Table 17: Distribution of PY2017 Process Evaluations by Topic and Energy Organization

Utility	Program Design	Program Delivery	Measure Eligibility	Marketing	QA/QC	Trade Ally	Total
AOG	2		1	3			6
BHEA	2		3	1			6
CenterPoint	1			3		1	5
EAI	2	5	4	5	2	5	23
OG&E	1	1		4			6
SWEPCO	1	2	1	2		4	10
Total	9	8	9	18	2	10	56
% of Total	**16%**	**14%**	**16%**	**32%**	**4%**	**18%**	**100%**

Source: Analysis of PY2017 EM&V Reports

Recommendations to Improve Program Design

The evaluators made six recommendations to improve overall program design including adding two for new equipment:

- Expand the steam trap initiative to include "comprehensive maintenance/optimization" to steam trap replacement, insulation, leak repair, and boiler tune-up (AOG 2017 EM&V Report, p. 5-40; BHEA 2017 EM&V Report p. 5-42); and
- Contractor/Midstream incentives for pool pumps (SWEPCO 2017 EM&V Report, p. 8-287).

The evaluators recommended making the following changes in overall program design including:

- Developing strategies to address the wide variation in acquisition costs for domestic hot water participants (AOG 2017 EM&V Report, p. 4-34);
- Continue to review ways to streamline contractor participation (EAI 2017 EM&V Report, p. 227); and
- Increase marketing budgets for the CWA program (OG&E 2017 EM&V Report, p. 159).

Recommendations to Improve Program Delivery

The evaluators made nine recommendations to improve program delivery which included:

- Investigating and follow-up with trade ally training and installation for envelope measures when blower door results differ by more than 10 percent (EAI 2017 EM&V Report, p. 109);
- Adopt a methodology to review HVAC Tune-Up projects (EAI 2017 EM&V Report, pp. 135-136);
- Initiate a pre-construction review process (OG&E 2017 EM&V Report, p. 207);
- Continue to work collaboratively regularly with implementer and evaluator teams (EAI 2017 EM&V Report, pp. 338-341, 366-368);

- Consider developing an electronic portal to monitor program application status (SWEPCO 2017 EM&V Report, p. 4-110); and
- Recruit new facilities into the Load Management Program (SWEPCO 2017 EM&V Report, p. 5-153).

Recommendations to Improve Marketing

The evaluators made a total of 18 recommendations to improve marketing and outreach activities which included:

- Expand program outreach to public housing authorities for participants in the CWA (AOG 2017 EM&V Report, p. 6-29; BHEA 2017 EM&V Report, p. 6-26);
- Develop additional marketing collateral for the CWA Program (CenterPoint 2017 EM&V Report, p. 11-28);
- Increase direct marketing through email, websites, and direct mail for its residential and C&I programs (EAI 2017 EM&V Report, pp. 74, 135-136);
- Consider developing proactive outreach to engage participants in Summer Advantage Direct Load Program (EAI 2017 EM&V Report, p. 203);
- Develop a business case study (AOG 2017 EM&V Report, p. 5-40);
- Consider testing alternative marketing and delivery strategies, such as point-of-sale promotions, and key word searchers (EAI 2017 EM&V Report, p. 222; OG&E 2017 EM&V Report, p. 208; SWEPCO 2017 EM&V Report, pp. 9-337);
- Focus on new construction outreach to production models rather than custom builders (BHEA 2017 EM&V Report, p. 4-29; CenterPoint 2017 EM&V Report, p. 4-28);
- Identify cross-promotional opportunities with EAI's City Smart Program to help increase participation in the Commercial Boiler CIP (CenterPoint 2017 EM&V Report, p. 6-7);
- Provide trade allies with information and marketing materials to promote the programs (EAI 2017 EM&V Report, p. 227; OG&E 2017 EM&V Report, p. 159); and
- Market the programs to past participants and ask customers to promote the programs to others (OG&E 2017 EM&V Report, p. 207).

Recommendations Regarding Measure Eligibility

The evaluators made 11 recommendations regarding measures to add to or remove from the Arkansas energy efficiency programs. Of note, smart thermostats were recommended to be offered through both electric and natural gas programs.

- Smart thermostats as a standalone measure (BHEA 2017 EM&V Report, pp. 4-28-4-29; CenterPoint 2017 EM&V Report, p. 4-28; EAI 2017 EM&V Report, p. 74); In addition, the evaluators recommended clarifying the thermostat eligibility criteria for smart thermostats in program materials (AOG 2017 EM&V Report p. 4-34);

- Consider offering more residential appliance categories and increasing program eligibility for ENERGY STAR Most Efficient Washers (EAI 2017 EM&V Report, p. 74; SWEPCO 2017 EM&V Report, pp. 9-333-9-337);
- Assess the potential and cost-effectiveness of adding new measures including advanced power strips, LED fixtures, dehumidifiers and air purifiers (EAI 2017 EM&V Report, p 75); and
- Remove linear fluorescent T5 HO lamps from the program (EAI 2017 EM&V Report, pp. 304-306).

Recommendations Regarding Quality Assurance/Quality Control

The evaluators recommended that EAI should continue its efforts to optimize the functionality and reliability of the online QA/QC tool to minimize contractor burden and project delays as well as continue to improve internal quality control and quality assurance processes (EAI 2017 EM&V Report, pp. 135-136, 182).

Recommendations Regarding Trade Ally Support

The evaluators recommended continuing to provide trade ally support in the following ways:

- Provide contractor training, and perform QA/QC checks to maintain customer satisfaction (EAI 2017 EM&V Report, pp. 135-136, 227, 338-341, SWEPCO 2017 EM&V Report, p. 5-215);
- Assess trade ally performance based on conversion rates (CenterPoint 2017 EM&V Report, p. 11-28);
- Provide guidance to trade allies about selecting weather stations (EAI 2017 EM&V Report, p. 172);
- Increase training to staff and trade allies regarding advances in lighting technologies (EAI 2017 EM&V Report, pp. 338-341);
- Add contractor newsletter to the program website (SWEPCO 2017 EM&V Report, p. 4-109);
- Engage non-lighting trade allies (SWEPCO 2017 EM&V Report, p. 5-143); and
- Review potential enhancements to the OPEN tool (SWEPCO EM&V Report, PY p. 5-143).

Section 3: Comparison to the Comprehensive Checklist

Each EM&V contractor also reported on the progress each energy efficiency program portfolio has made compared to the seven comprehensiveness factors identified by the APSC. Table 18 summarizes these findings from the comprehensive checklist as reported in the individual EM&V reports. Using the following legend, energy organizations have been evaluated as either fully met, partially met, or failed to meet the criteria associated with each factor as set forth in the Commission's Comprehensive Checklist.

Fully Met Criteria = ●	Utilities or third-party administrators are fully meeting the criteria established by the Commission Checklist.
Partially Met Criteria = ◑	Utilities or third-party administrators are partially meeting the criteria established by the Commission Checklist.
Did Not Meet Criteria = ○	Utilities or third-party administrators did not meet the criteria established by the Commission Checklist.
Not Applicable = ■	Identifies those cases where the Commission Checklist cannot be assessed.

Table 18: Summary of the Comprehensiveness Checklist Factor Results

Utility	Factor 1: Education / Training/ Outreach	Factor 2: Provide Adequate Resources	Factor 3: Address Major End Uses	Factor 4: Comprehensively Address Customer Needs to Avoid "Cream Skimming"	Factor 5: Target All Customer Sectors	Factor 6: Are Cost-Effective	Factor 7: Have Appropriate EM&V Procedures in Place
AOG	●	●	●	●	●	●	●
BHEA	●	●	●	●	●	●	●
CenterPoint	●	◑	●	◑	●	●	●
EAI	●	●	●	●	●	●	●
OG&E	●	●	●	◑	◑	●	●
SWEPCO	●	●	●	●	●	●	●
Fully Met = ● Partially Met = ◑ Did Not Meet = ○ Not Applicable = ■							

Factor One: Adequate Education, Training and Marketing

Whether the programs or portfolio provide, directly or through identification and coordination, the education, training, marketing, or outreach needed to address market barriers to the adoption of cost-effective energy-efficiency measures.

Consistent with the prior program evaluations, overall most utilities and implementers engaged in sufficient amount of educational, training, and marketing activities in PY2017. The evaluators cited the following examples to demonstrate that these utilities are successfully addressing Factor One:

- The three natural gas utilities have developed specialized marketing materials to address program barriers within targeted segments or for specific technologies. For example, CenterPoint developed fact sheets targeting restaurants and food processing plants (AOG 2017 EM&V Report, p. 3-11; BHEA 2017 EM&V Report, p. 3-4; CenterPoint 2017 EM&V Report, p. 3-5). EAI developed case studies targeting specific C&I target markets (EAI 2017 EM&V Report, p. 64);
- The utilities are also looking for ways to engage trade allies which has led to increased program participation. More than half of BHEA's custom projects were from trade ally referrals (AOG 2017 EM&V Report, p. 3-11; BHEA 2017 EM&V Report, p. 3-4);
- Both BHEA and CenterPoint work with local technical colleges to help provide training opportunities to trade allies and students interested in careers related to energy efficiency (BHEA 2017 EM&V Report, p. 3-9; CenterPoint 2017 EM&V Report, p. 3-10);
- For EAI's Commercial Programs, a trade ally specialist position focused on recruiting and training trade allies on all program aspects. The utility also held Trade Ally Summits to both teach and reward participating contractors. EAI's implementation contractors also were trained to perform air and duct sealing measures and AC tune-ups (EAI 2017 EM&V Report, p. 65);
- OG&E's program staff conducted outreach and education through a wide range of potential program partners (OG&E 2017 EM&V Report, p. 38); and
- In PY2017 SWEPCO held training and educational events for its C&I and Residential customers, ranging from in-store trainings to full certification courses. The HPwES and SBDI programs all held multiple contractor training courses and gave out appreciation gifts to the top performers in 2017 (SWEPCO 2017 EM&V Report, p. 3-52).

The EM&V reports also point to some challenges that exist and further steps that are needed to improve the outreach, marketing, and education outlined under Factor One. These include:

- OG&E's CWA program currently has low participation rates among residents in manufactured homes. In addition, several participants mentioned that OG&E's trade allies were not cross-promoting the CWA with its other energy efficiency programs (OG&E 2017 EM&V Report, p. 38).

Factor Two: Adequate Budgetary, Management, and Program Delivery Resources

Whether the program and/or portfolio have adequate budgetary, management, and program delivery resources to plan, design, implement, oversee, and evaluate energy-efficiency programs.

To evaluate budgets and resource sufficiency, the evaluators assessed the performance indicators associated with the adequacy of budget allocations, actual program costs per kWh or therm saved, and whether program staff and trade ally support were sufficient to support program staffing and goals. Overall, the evaluators concluded that the budgets and resources dedicated to the programs in PY2017 were sufficient. The key findings include:

- Most of the Arkansas utilities are able to deliver their energy efficiency programs at or below planned program budgets with sufficient staff. For example, both AOG and BHEA delivered energy efficiency programs below their planned cost per therm (AOG 2017 EM&V Report, p. 3-12; BHEA 2017 EM&V Report, p. 3-5). Both OG&E and SWEPCO achieved their energy savings and demand reduction targets below the program budgets (OG&E 2017 EM&V Report, p. 40; SWEPCO 2017 EM&V Report, p. 3-54); and
- At a portfolio level, EAI achieved its energy saving and fell slightly short of demand reduction targets while spending its allocated budget. However, EAI reorganized its internal staffing allocations which should result in improved program efficiencies in the next program cycle (EAI 2017 EM&V Report, p. 65).

One utility portfolio had programs that did not meet Factor 2 objectives in PY2017:

- Though some CenterPoint programs had significantly lower acquisition costs than planned, three programs had costs that were at least 10 percent higher than planned. Overall, CenterPoint's portfolio overall had acquisition costs that were three percent higher than the program plan. (CenterPoint 2017 EM&V Report, p. 3-6).

Factor Three: Reasonably Addresses All Major End-Uses

Whether the programs and/or portfolio reasonably address all major end-uses of electricity or natural gas, or electricity and natural gas, as appropriate.

The utilities and administrators offered a wide range of major end-uses of electricity and natural gas and improved the range of end-uses addressed in their portfolios in PY2017 relative to previous years, as well as overcoming some existing challenges regarding the diversity and breadth of measures treated in the utilities' portfolios. For example:

- Most of the Arkansas' utilities offer programs that target most major end uses for natural gas and electricity (AOG 2017 EM&V Report, p. 3-13; BHEA 2017 EM&V Report, pp. 3-6-3-7; CenterPoint 2017 EM&V Report, p. 3-7; EAI 2017 EM&V Report, pp. 66-67; OG&E 2017 EM&V Report, p. 42; SWEPCO 2017 EM&V Report, p. 3-56);
- Several utilities also collaborated to deliver joint programs including the CWA (AOG PY 2017 EM&V Report, pp. 3-13; BHEA 2017 EM&V Report, pp. 3-6, 3-7, 3-13; OG&E 2017 EM&V

Report, p. 42 SWEPCO 2017 EM&V Report, pp. 3-56, 3-59). SWEPCO worked with the gas utilities to share the incentive costs for HVAC and water savings measures for shared customers. (SWEPCO 2017 EM&V Report, p. 3-56); and

- CenterPoint has developed a number of joint collaborations with both gas and electric utilities, including sharing implementation and EM&V resources. This has reduced the overall cost of EM&V across all three natural gas utilities. CenterPoint has also participated in several joint-marketing efforts with the other gas utilities as well as with EAI (CenterPoint 2017 EM&V Report, p. 3-10).

Two utilities also cancelled programs due to realignments in the utility portfolio.

- Due to low cost-effectiveness, the AOG and BHEA do not offer rebates for dishwashers and clothes washers (AOG 2017 EM&V Report, p. 3-13; BHEA 2017 EM&V Report, pp. 3-6-3-7); and
- BHEA cancelled their Home Energy Reports program to allow for the development of the Home Energy Savings weatherization program (BHEA 2017 EM&V Report, pp. 3-6-3-7).

Factor Four: Addresses the Needs of Customers Comprehensively

Whether the programs and/or portfolio, to the maximum extent reasonable, comprehensively address the needs of customers at one time, in order to avoid cream-skimming and lost opportunities.

The evaluation teams also reviewed the utilities' portfolios to determine if these programs comprehensively address customer needs. Most of the 2017 portfolios encouraged customers to install comprehensive suites of measures rather than individual measures. For example:

- The three natural gas utilities have modified their programs to focus on tiered incentives to promote premium energy efficient equipment as a way to encourage installations of high efficiency equipment (AOG 2017 EM&V Report, p. 3-14; BHEA 2017 EM&V Report, p. 3-7; CenterPoint 2017 EM&V Report, p. 3-8);
- Consistent with program best practices, both AOG and OG&E program portfolios do not have specific requirements for installation of multiple measures, allowing customers to participate to the fullest extent possible (AOG 2017 EM&V Report, p. 3-14; OG&E 2017 EM&V Report, p. 43). The SWEPCO SBDI, HPwES and REIP programs bundle on-site evaluation with direct installation (SWEPCO 2017 EM&V Report, p. 3-58); and
- EAI staff and implementation contractors reported the challenges encountered during the first participant experience of implementing deeper savings that can have longer paybacks than lower fruit projects such as lighting. For Manufactured Homes, the implementation contractor reports first engaging large parks through direct install measures. The next step will be to recruit these parks to implement envelope measures and AC Tune-ups. EAI used a similar strategy for its Agriculture Energy Solutions program where lighting retrofit installations led to investments in other energy efficiency measures (EAI 2017 EM&V Report, p. 68).

One utility could take some additional steps to fully meet the objectives of Factor 4:

- The evaluators believe that CenterPoint's Commercial Food Service CIP could benefit from offering tiered incentives for different equipment sizes (such as single vs. double-sized ovens). (CenterPoint 2017 EM&V Report, p. 3-8).

Factor Five: Addresses Comprehensive Needs of Targeted Customer Sectors

Whether such programs take advantage of opportunities to address the comprehensive needs of targeted customer sectors or to leverage non-utility program resources.

Factor Five has two components: whether the portfolios target entire sectors in a comprehensive way and if the portfolios leverage non-utility programs to: improve program effectiveness, reduce customer barriers, or maximize delivery assistance. The results were consistently positive across all program portfolios, with one minor exception noted below. For example:

- Each of the natural gas utilities has successfully developed targeted programs in their energy efficiency portfolios which are marketed through a variety of industry partners including professional organizations, trade groups, universities, and homeowners' associations (AOG 2017 EM&V Report, p. 3-15; BHEA 2017 EM&V Report, p. 3-8; CenterPoint 2017 EM&V Report, p. 3-10);
- EAI implemented new and innovative partnerships which led to increased outreach activities for the agriculture and commercial sectors. These efforts included meeting with several Community Action Program agencies and partnering with the Arkansas Association of Energy Efficiency Engineers to co-fund training and seminars (EAI 2017 EM&V Report, pp. 69-70.); and
- SWEPCO's programs are also marketed through community groups, industry partners, professional organizations, trade groups, homebuilder associations, and home shows (SWEPCO 2017 EM&V Report, p. 3-59).

One utility was found to only partially meet the objectives of Factor 5:

- OG&E partially met the Factor 5 objectives in PY2017. While OG&E has successfully targeted, and leveraged, industry partners for many market segments in CEEP, the evaluators suggest that there are other opportunities to create partnerships with manufactured housing industry organizations (OG&E 2017 EM&V Report, p. 44).

Factor Six: Enables the Delivery of All Achievable, Cost-Effective Energy Efficiency

Whether the programs and/or portfolio enable the delivery of all achievable, cost-effective energy efficiency within a reasonable period of time and maximize net benefits to customers and the utility system.

The evaluation reports concluded that the utilities delivered the terms of Factor Six with mixed, but mostly positive, results.

- Nearly all of the utilities have successfully established screening measures to ensure low net-to-gross ratios and cost-effective program offerings (AOG 2017 EM&V Report, p. 3-16; BHEA 2017 EM&V

Report, p. 3-9; EAI 2017 EM&V Report, p. 70; OG&E 2017 EM&V Report, p. 46; SWEPCO 2017 EM&V Report, p. 3-60); and

- Only one CenterPoint program was not cost-effective, but this is due to curtailing program operations for its Home Energy Reports in 2017 (CenterPoint 2017 EM&V Report, pp. 3-11).

Factor Seven: Evaluation, Measurement, and Verification

Whether the programs and/or portfolio have EM&V procedures adequate to support program management and improvement, calculation of energy, demand, and revenue impacts, and resource planning decisions.

The evaluation reports found the EM&V procedures and budgets were adequately performed and adequately funded (measured as a percent of portfolio spending). For example:

- The evaluators determined that the natural gas utilities incorporated industry best practices for EM&V activities and incorporated feedback from the utility, implementation contractors, and the IEM (AOG 2017 EM&V Report, p. 3-16; BHEA 2017 EM&V Report, p. 3-9; CenterPoint 2017 EM&V Report, p. 3-11);
- BHEA has significantly increased the stringency of QA/QC procedures, introducing randomized post-inspection to their programs. (BHEA 2017 EM&V Report, p. 3-9); and
- Both EAI and OG&E program staff and implementation contractors actively engaged with the evaluators and IEM throughout PY2017. They also coordinated on-site visits with the evaluators to minimize customer disruption (EAI 2017 EM&V Report, p. 70; OG&E 2017 EM&V Report, p. 47; SWEPCO 2017 EM&V Report, p. 3-62).

Section 4: Evaluating the Evaluators

One of the responsibilities in serving as IEM is to ensure compliance with EM&V rules or protocols approved by the APSC. The IEM recognizes that we are also serving as advisors; therefore, our approach in conducting this summary was to match the skills of each team member to the appropriate program area. This format allows us to provide the in–depth technical guidance and assistance needed to ensure that EM&V activities conform to the Arkansas EM&V Protocols and industry best practices using the following legend.

4.1 Scope and Methodology Used for Assessing EM&V Activities

Fully Met Criteria = ●	The EM&V contractors met the requirements prescribed by the IEM or provided reports that reflected industry standards and best practices.
Partially Met Criteria = ◑	The EM&V contractors met some criteria but not all of them.
Did Not Meet Criteria = ○	The EM&V reports failed to meet the IEM requirements or industry best practices.
Not Applicable = ■	Identifies those cases where these standards may not be appropriate.

As Table 19 shows, the quality of the EM&V reports was inconsistent across the entire program portfolio. Moreover, some sections within the individual reports were well-written and contained all the necessary information, while other sections within the same report left out important details. In addition, calculating the NEBs did complicate the evaluations and many of these calculations were incorrect.

While the IEM appreciates the hard work and diligence from each evaluation team, we have identified several areas within these reports that require improvement. As always, the IEM team is happy to work with each evaluation team, as well as the implementers and the utilities, to ensure that the EM&V reports truly reflect the excellence provided by these utility programs.

Table 19: Summary of the IEM's Assessment of the 2017 EM&V Evaluation Activities

Evaluator	Utility	Impact Evaluation	Process Evaluation	NEBs
ADM	AOG	◑	◑	○
ADM	BHEA	◑	●	○
ADM	CenterPoint	●	◑	○
Tetra Tech	EAI	●	●	◑
ADM	OG&E	●	●	◑
ADM	SWEPCO	●	●	◑
Fully Met = ●	Partially Met = ◑	Did Not Meet = ○	Not Applicable = ■	

4.2 Impact Evaluation Assessment

To remain consistent with the previous evaluations and with the TRM Version 6.1, the IEM reviewed PY2017 portfolio evaluations to:

- Quantify energy and demand savings resulting from current programs;
- Understand why certain program effects occurred; and
- Identify ways to improve and refine current and future programs.

Similar to previous evaluations, the IEM maintained the following impact objectives in PY2017:

- Verify that program tracking data support total claimed savings;
- Review the current database tracking methodology against the recommended formats in *Protocol A: Program Tracking and Database Development*, as defined in the TRM;
- Verify correct use of the TRM values;
- Estimate PY2017 gross energy and demand impacts at the measure and program levels;
- Estimate net impacts at a program level; and
- Identify key issues and areas of focus for subsequent evaluations and TRM updates.

Table 20 summarizes the IEM's assessment of the impact evaluation activities and methods by the evaluator and the utility or third–party administrator. The basis for these findings is discussed next.

Table 20: Summary of Assessment of Evaluators' Impact Activities

Utility	AOG	CenterPoint	EAI	OG&E	BHEA	SWEPCO
Evaluator	**ADM**	**ADM**	**Tetra Tech**	**ADM**	**ADM**	**ADM**
Prescriptive Measure Certification (On-Sites/Surveys)	◑	●	●	◑	◑	●
Custom Measures Verification	●	●	●	●	●	●
Review Program Databases	●	●	●	●	●	●
Verify Correct Use of TRM Values	◑	◑	◑	◑	◑	◑
Estimate Net Impacts (NTG)	◑	●	●	●	◑	●
NEBs	○	○	◑	◑	○	◑
Fully Met = ● Partially Met = ◑ Did Not Meet = ○ Not Applicable = ■						

The rationale for these ratings are described next. The IEM has also identified the major areas requiring improvement for future EM&V reports.

Prescriptive Measure Verification (On-Sites/Surveys)

Evaluation teams conducted verification of prescriptive impact savings through a sampling of on-site visits and/or telephone surveys. On-site visits and telephone surveys were used to confirm building characteristics and operating parameters as well as verification of measure installation.

The overall goal of EM&V sampling for verification activities is to achieve a minimum confidence interval of 90 percent +/- 10 percent at the program level for evaluated savings estimates.

The general methodology for verification of prescriptive measures are conducting one or more of the following tasks:

- Verification of the implementation status of the measures;
- Verification that the measures were indeed installed, that they were installed correctly, and were functioning properly;
- Data collection on obtaining more specific information regarding facility characteristics; and
- Customer surveys for additional information.

Evaluators submitted Annual EM&V plans identifying approaches to sampling for on-site visits and telephone surveys. Many of the evaluation teams followed their plans with minor deviations. ADM shared that survey samples for Commercial Boiler and Commercial Food Service CIPs were scaled down based on lower participation levels (CenterPoint 2017 EM&V Report, p. 3-11). ADM/Tetra Tech had to deviate from plans by opting for multifamily property manager interviews instead of participant surveys in the Residential Solutions (RSOL) program, upstream lighting NTG, etc. (OG&E 2017 EM&V Report, p. 47).

Arkansas specific findings can inform TRM assumptions. As done in previous years, many of the evaluation teams used the results of the on-site visits to inform refining the Arkansas TRM. ADM identified an opportunity to conduct on-site visits to refine set-point temperatures for Domestic Hot Water measures in the TRM (AOG 2017 EM&V Report, p. 7-1; BHEA 2017 EM&V Report, p. 12-1; CenterPoint 2017 EM&V

Report, p. 12-1). ADM also continued to collect field data on a variety of Commercial Food Service equipment to improve the deemed assumptions in the Arkansas TRM (CenterPoint 2017 EM&V Report, p. 8-8). For SWEPCO, deviations from plans were done for the CIEEP and SBDI program where Partial Participant surveys were not completed due to legal concerns around customer privacy issues regarding non-participant telephone contact information (SWEPCO 2017 EM&V Report, p. 2-38).

Evaluators used varying approaches on their use of on-site or survey findings based on the program. The IEM team noted that evaluation teams applied their results from on-site or surveys in a variety of methods based on the program delivery channel and sample size. In some cases, specific adjustments were only applied to the population impacted by the on-site visit (OG&E 2017 EM&V Report, pp. 73, 169; SWEPCO 2017 EM&V Report, p. 6-21). For Direct Install measures verification inspections of a stratified random sample were extrapolated to other facilities within the same stratum level (CenterPoint 2017 EM&V Report, p. 7-23).

For Equipment Rebate Program measures for CenterPoint, the evaluator applied a weighted basis to identify the percent of early replacement versus normal replacement residential furnaces using the results of the survey and then extrapolating to the population (BHEA 2017 EM&V Report, p. 4-21; CenterPoint 2017 EM&V Report, p. 4-19). However, for AOG, ADM conducted surveys on Residential Furnaces regarding age and replacement type but chose to use early adjustment factors from 2015 EM&V results (AOG 2017 EM&V Report, p. 4-24).

Evaluators can improve their reporting of results from on-sites and surveys. The IEM noted that ADM reported an inconsistency in the total percentage of savings from facilities that had verification conducted (CenterPoint 2017 EM&V Report, pp. 8-7, 8-12) as well as a lack of breakdown on the number of measures and type of measures verified in all nine facilities.

The IEM team found the breakdown by measure and number of sites, as reported by Tetra Tech, in EAI 2017 EM&V Report helpful. However, the results were reported inconsistently in two separate sections. One section showed reported savings and number of measures by type while another section showed the verification by sites and quantity. In addition, the verified savings or realization rates were not provided for on-site verification activities only as they are reported separately for desk reviews and tracking system reviews (EAI 2017 EM&V Report, pp. 237, 300, 309, 315).

In EAI's 2017 EM&V Report, Table A-1 provides a good overview on the summary of confidence and precision across all EAI programs (p. 553). Some of the evaluations indicated the realization rates was a result of survey or on-site verifications, but no further information was presented on other details that would explain the findings (AOG 2017 EM&V Report, p. 5-30, OG&E 2017 EM&V Report, p. 74).

Utility QA/QC Review

The IEM team has seen a significant improvement in not only the restating of QA/QC procedures in place, but also the recommendations made to refine and improve QA/QC efforts. The key findings and areas of improvement are summarized next.

Findings from evaluators can improve QA/QC procedures. Evaluators continued to report on whether QA/QC procedures were in place (AOG 2017 EM&V Report, p. 3-17; CenterPoint 2017 EM&V Report, p. 11-10). For 2017, ADM conducted a best practice review which resulted in several recommendations on how

to improve QA/QC activities (SWEPCO 2017 EM&V Report, pp. 4-105, 8-275). The findings from the best practice review could be shared and applied across to other utilities to streamline operations while refining quality assurance and control practices.

Further reporting on best practices in post inspection QA/QC procedures. For residential programs focused on home energy audits, CLEAResult conducts post inspections for 10 percent of the projects completed by each trade ally. Major or minor violations are designated using a detailed criterion of performance. Future evaluation reports may benefit from a reporting on the results in terms of the percentage of violations noted during the Program Year to help gauge the quality of work conducted by trade allies (CenterPoint 2017 EM&V Report, p. 11-9). Correlating the evaluation findings from on-site verification with the trade allies scores by measure installed could help to refine the focus for targeted training efforts.

Review of Database Tracking

Evaluation teams conducted a review of the utility program tracking databases in reference to *Protocol A: Program Tracking and Database Development*, as defined in TRM Version 6.1. This protocol provides guidance on effectively tracking a variety of critical program attributes. The specific areas in Protocol A that address program impact are listed below.

- ***Participating Customer Information****:* Databases should have updated and accurate participant contact information used to schedule on-site verification and conduct telephone surveys;
- ***Measure Specific Information:*** Databases should contain all relevant fields needed to calculate savings using algorithms and methods defined in the recent Technical Reference Manual; and
- ***Program Tracking Information:*** Total number of measures installed or implemented and status on rebate process which is used to ensure that the sum of measures in the database met program reported totals.

All of the evaluation reports included detailed discussion on the review of tracking databases and indicating any discrepancies and missing parameters. Tetra Tech regularly communicated with the implementation contractors and the utilities to ensure the quality and completeness for database collection needs throughout the program year. This was especially valuable when multiple databases were used for the same program.

Some areas that were specifically noted by the IEM team are described next.

Consider proactive approaches to resolve persistent issues in tracking needs. Some database tracking issues from PY2016 are still unresolved. One issue is the collection of residential home vintage and equipment age for Space Heating measures (AOG 2017 EM&V Report p. 4-5, CenterPoint 2017 EM&V Report, p. 4-5). For CenterPoint, the residential components of the Space Heating and Water Heating CIP were separated out from the commercial program in PY2017. Evaluators, program administrators, and implementation contractors should work together to review outstanding data collection needs and determine how to work them into updated application forms.

Provide consistency in reporting the findings from database review. Evaluators occasionally indicated that all sufficient information was found in tracking data, yet within the report, evaluators would remark that not all parameters are being collected (CenterPoint 2017 EM&V Report, p. 11-6). In some cases, issues with

databases and/or tools would be noted, but the Executive Summary recommendations section would not include that item (AOG 2017 EM&V Report, p. 6-10; EAI 2017 EM&V Report, p. 371).

Clarify issues when reporting realization rates from database review. As noted with the desk reviews and on-site surveys, some evaluation teams also reported realization rates inconsistently from the database review. Some evaluation teams provided useful tables indicating the realization rates from the database/desk reviews (CenterPoint 2017 EM&V Report, p. 11-6). In other cases, when realization rates are significantly lower or higher than 100 percent from the database review, no explanation was provided as to the reasons for that discrepancy (SWEPCO 2017 EM&V Report, p. 7-173). Faucet aerator savings could not be reproduced by the evaluator which resulted in a 99.9 percent realization rate. The IEM notes this discrepancy could be eliminated if it is due to rounding calculations (EAI 2017 EM&V Report, pp. 239, 300).

Recommendations for Evaluators' Improvement of TRM Review

Reports should provide transparency on TRM algorithms, input values and sources. The IEM continued to find issues with the methodologies used by evaluation teams to confirm deemed savings from the Arkansas TRM. In many situations, incorrect references to tables were still noted (OG&E 2017 EM&V Report, p. 58, 99; CenterPoint 2017 EM&V Report, p. 4-1, SWEPCO 2017 EM&V Report, p. 8-225). Algorithms were supplied for some of the programs but not consistently in other program sections (AOG 2017 EM&V Report, pp. 5-31, 6-21; BHEA 2017 EM&V Report, p. 5-29, 5-30, 6-19; EAI 2017 EM&V Report, pp. 300, 310, 474; SWEPCO 2017 EM&V Report, pp. 4-63, 5-111).

To remedy this issue, the evaluators should include the inputs used into the calculation in the format of a table or appendix. The evaluation team found it helpful to see algorithm inputs in a table (CenterPoint 2017 EM&V Report, p. 8-9; OG&E 2017 EM&V Report, p. 65) but would like this practice to be applied consistently (OG&E 2017 EM&V Report, p. 63).

For many measures, early replacement (ER) or replace-on-burn out (ROB) are important conditions to know when applying TRM algorithms (CenterPoint 2017 EM&V Report, p. 6-6). The IEM suggests that the evaluators indicate if that information has been collected (AOG 2017 EM&V Report, p. 4-24; BHEA 2017 EM&V Report, p. 4-21).

Evaluators should double check they are using both the correct algorithms and inputs when including TRM algorithms and/or referencing them. Some evaluation reports provided the algorithms from the TRM, however, there were still some errors. One error included incorrectly reproducing TRM tables with the wrong values or additional categories (OG&E 2017 EM&V Report, p. 112; CenterPoint 2017 EM&V Report, p. 4-2, 10-5). The Commercial Water Heater algorithms are still incorrect from IEM PY2016 recommendations where water heater set-points and supply temperatures were referencing the residential TRM measure (AOG 2017 EM&V Report, p. 4-28; BHEA 2017 EM&V Report, p. 4-24; CenterPoint 2017 EM&V Report, p. 5-14).

In referencing the residential lighting measures in the Arkansas TRM, the evaluators would reference ENERGY STAR LED Bulbs intending both Directional or Omnidirectional which are separated in TRM 6.1 (OG&E 2017 EM&V Report, p. 58). In one evaluation, the program identifies LED Standard and LED Specialty which is confusing when relating to TRM measure categories (SWEPCO 2017 EM&V Report, p. 9-307). Due to confusion on the difference between LED lighting categories, the evaluators should provide specific information regarding measure name when referencing TRM sections.

Reports should clarify key factors leading to realization rates results. The IEM continued to find that key reasons for high or low realization rates were often not explained (BHEA 2017 EM&V Report, p. 4-26; CenterPoint 2017 EM&V Report, p. 4-26, 7-29, 11-26; SWEPCO 2017 EM&V Report, p. 7-173, 8-243; EAI 2017 EM&V Report, p. 240).

SWEPCO omission of gas interactive effects. The AR TRM Version 6.1 Volume 2 Deemed Savings, (p.398) notes that "*the interactive effects for demand (kW), energy (kWh) and natural gas (therms) should be utilized for all programs and installations of lamps covered by this measure."* As noted in the NEBs section, EAI selected to show the gas heating penalty as a "negative NEB," but SWEPCO did not account for gas heating effects in the gross or net savings. Given the importance of commercial lighting in the portfolio this is a significant omission on the SWEPCO evaluation in terms of overstating the TRC benefits.

Use of Primary Data instead of TRM Version 6.1 Deemed Parameters

Evaluation teams identified in the EM&V Reports when deviations were done from the TRM with the use of primary data. Tetra Tech applies language to provide distinction between savings approaches used for Large C&I projects as deemed, measured, or stipulated. *"Deemed"* would be using all the defaults in the TRM; *measure*d would use the TRM algorithm but apply some or all site-specific values measured from the field; and stipulated would use site specific information from participants (EAI 2017 EM&V Report, p. 361).

The IEM has continuously emphasized that there is a need to fully report the implications of using alternative approaches, methods, or values to the TRM. When primary data are collected, either through field investigation or through surveys, the results should be compared against the assumptions used in the TRM to help inform necessary updates.

Specific situations where primary data were collected are summarized next:

- **For residential lighting**, evaluators would reference utility specific values being used such as daily usage values, but there would be no indication of what those values were (OG&E 2017 EM&V Report, p. 58);
- **For Pre-Rinse Spray Valves**, CLEAResult conducted pre- and post- installation flow testing applying these values for GPM reduction. With 15 PRSV's installed through the C&I Solutions program, it would be helpful to be able to see what those values were as they provided unique measurement values in the program tracking data (BHEA 2017 EM&V Report, p. 5-26);
- **For CenterPoint's Commercial Equipment Rebates program**, evaluation teams applied hot water estimates for the Water Heater algorithm based on a paper by SCE on Zamboni hot water usage for an ice rink (CenterPoint 2017 EM&V Report, p. 5-15). This unique application may be better suited under a Custom approach for savings; and
- **CLEAResult has been using estimates of EFLHc and EFLHh** as agreed with a previous evaluator for the Cooling Solutions program for buildings which are not in the TRM. Tetra Tech reported that these values are currently under review and will be confirmed as part of the 2017 evaluation (EAI 2017 EM&V Report, p. 270). The IEM would like more information on whether these estimates are appropriate to include in a future TRM update.

Recommendations for Future TRM Revisions

Evaluation teams made fewer recommendations for future TRM revisions. Out of six unique recommendations, only one was for a new measure, Steam Trap Leak Repair, based on savings defined by CLEAResult. Two recommendations continued from previous years regarding target metering to update the HOU parameter in the TRM and the need to update the default values for food service measures. New recommendations included a correction to a table heading for Commercial Low Flow Showerheads, proposed values for Domestic Hot Water temperature set points, and a request to include "Other Buildings Types" for deemed building types referenced for refrigeration and DHW measures.

The IEM has also identified a few additional recommendations based on our review of 2017 EM&V Reports.

- **Clarification on deriving savings from NEBs**. The IEM will review the TRM to make sure that interactive effects or water savings from applicable measures are defined in a clear and concise manner.
- **Leakage and In-Service Rates.** With program design focusing on different delivery channels, the TRM can provide more guidance on how to determine Leakage rates and ISRs.

Custom M&V

The impact evaluations for custom projects during 2017 included several different tasks: project file reviews to verify inputs and algorithms used to determine savings, and site visits to verify installation and collect specific operating information. All of the evaluations indicated that some project file reviews were completed.

Similarly, all of the evaluations of custom projects involved on-site visits. The evaluations for AOG, BHEA, CenterPoint, EAI, OG&E and SWEPCO all indicated that the evaluators conducted some on-site visits (AOG 2017 EM&V Report, p. 5-33; BHEA 2017 EM&V Report, p. 5-33; CenterPoint 2017 EM&V Report, p. 7-33; EAI 2017 EM&V Report, p. 236; OG&E 2017 EM&V Report, p. 171; SWEPCO 2017 EM&V Report, p. 4-65). The AOG, BHEA and CenterPoint evaluators reviewed all custom projects with on-site visits (AOG 2017 EM&V Report, p. 5-33; BHEA 2017 EM&V Report, p. 5-33, CenterPoint 2017 EM&V Report, p. 7-33). The EAI, OG&E and SWEPCO evaluators specified that samples of projects were selected for on-site visits (EAI 2017 EM&V Report, p. 236; OG&E 2017 EM&V Report, p. 171; SWEPCO 2017 EM&V Report, p. 4-65).

The evaluators noted the data collected during the PY2017 evaluations. All of the evaluation reports indicated that additional data were measured or collected during the verification on-site visits (AOG 2017 EM&V Report, p. 5-33; BHEA 2017 EM&V Report, p. 5-33; CenterPoint 2017 EM&V Report, p. 7-33; EAI 2017 EM&V Report, p. 236; OG&E 2017 EM&V Report, p. 171; SWEPCO 2017 EM&V Report, p. 4-65;). The AOG, BHEA, CenterPoint, EAI, and SWEPCO evaluation reports all included site level reports (AOG 2017 EM&V Report, Appendix A; BHEA 2017 EM&V Report, Appendix A; CenterPoint 2017 EM&V Report, Appendix A; EAI 2017 EM&V Report, Appendix B; SWEPCO 2017 EM&V Report, Appendix C). The OG&E evaluation report did not include on-site specific reports within the annual report for confidentiality reasons. These site level reports were provided confidentially to the IEM to review.

During the PY2017 evaluations, there were a total of 84 custom projects specifically mentioned in the evaluation reports. All 84 (100%) were described in enough detail to determine if any M&V had been

completed. This is a notable improvement compared to PY2015 when 32 of 40 (80%) custom projects were described in enough detail to determine if data was collected, and three of the utilities did not provide any on-site level reports.

Methodologies

The methodologies used by the evaluators when calculating custom project savings in PY2017 were nearly identical to those used in PY2016. The evaluators for each utility reported using billing regressions, engineering equations, implementer-collected data, and/or on-site inspection data to determine custom project savings (AOG 2017 EM&V Report, Appendix A; BHEA 2017 EM&V Report, Appendix A; CenterPoint 2017 EM&V Report, Appendix A; EAI 2017 EM&V Report, Appendix B; SWEPCO 2017 EM&V Report, Appendix C). Evaluating custom projects with applicable engineering equations is an appropriate methodology and was correctly applied based on the types of data available or collected during the evaluation on-site visits.

Report Details

The level of detail for custom projects included in the PY2017 evaluation reports improved substantially from the PY2016 evaluations. The main body of the EAI, OG&E and SWEPCO evaluation reports provided a high-level summary of custom results and total impacts (EAI 2017 EM&V Report, p. 280, OG&E 2017 EM&V Report, p. 173; SWEPCO 2017 EM&V Report, p. 4-71). Similarly, these evaluators provided more granular findings for key measures or technology types (EAI 2017 EM&V Report, pp. 248-278; OG&E 2017 EM&V Report, p. 173; SWEPCO 2017 EM&V Report, p. 4-71;).

However, the AOG, BHEA, and CenterPoint evaluators did not provide any high-level summaries or key findings for custom projects. This is likely due to the realization rates being near 100 percent for many measures. However, key findings are essential for program continuous improvement and should be included in the main body of the report in the future. Having no key findings from custom measures is an important finding and should be properly noted in the evaluation report if applicable.

The site visit reports which were included presented significantly more detail regarding the methodology, equations, and assumptions made when determining the savings (AOG 2017 EM&V Report, Appendix A; BHEA 2017 EM&V Report, Appendix A; CenterPoint 2017 EM&V Report, Appendix A; EAI 2017 EM&V Report, Appendix B; SWEPCO 2017 EM&V Report, Appendix C). Much of the work completed was reasonable for the measures and technology types. The site reports provided sufficient detail into the methodology, calculations, assumptions, and results for custom projects evaluated during 2017. The quantity and quality of custom measure site level reporting was greatly improved compared to 2016 and should be continued in future program years.

Inconsistencies

There was a further reduction in the amount of inconsistencies across the evaluation reports in PY2017 compared to PY2016. The main bodies of the report were generally consistent from start to finish. The reported and verified savings for custom projects were consistently carried through the reports.

This marks the first year where the documentation for custom measures was consistent and complete across all utilities. Evaluators should be commended for their attention to detail in this regard. There is a significant

amount of documentation needed to properly evaluate custom projects, and the evaluators did an excellent job of gathering it for stakeholder review.

Reporting for Gross and Net Savings

The IEM team also reviewed the approaches used to calculate gross and net savings. Recommendations to improve this reporting are summarized next.

Methodologies

The IEM suggests that the evaluators should focus on relative impact of demand reduction and its relationship to energy savings. The ratio of planned energy savings to planned demand reduction across each of the three electric utilities is different from the ratio of evaluated energy savings to evaluated demand reduction. Evaluators may want to recommend utilities review the relationship between planned energy savings and demand reduction within the context of evaluation findings.

Report Details

Completely fill out IEM provided reporting template. The summary reporting template provided by the IEM serves multiple purposes. It helps in the review of the evaluations, provides a convenient resource for reviewing impact overall finds, and importantly, provides a quality assurance function for the evaluators, utilities, and the IEM. Maximum value will be achieved if all fields are completed. Several fields were not filled in and there were a few errors in the data provided.

Ensure data in summary reporting templates match EM&V report data. The IEM provides EM&V contractors with a summary reporting template as a tool to provide high-level data to the IEM including planned savings, ex ante savings, net evaluated savings, etc. Some data provided in the templates did not match the reports. For example, the template provided net evaluated energy savings of 5,930,285 kWh for SWEPCO's HPwES program, whereas the savings shown for that program in the report is 5,907,529 kWh (SWEPCO 2017 EM&V Report, p. 7-175). Additionally, Table 5-30 in the OG&E EM&V report shows a net evaluated NEBs savings of 23,479 gallons of propane (OG&E 2017 EM&V Report, p. 137), whereas the reporting template shows that value as ex post gross and reports 22,329 gallons as ex post net.

Treatment of line losses should be clarified in EM&V reports. The IEM assumes that all reported savings and goals are measured at the meter, exclusive of line losses. Reports would benefit from explanation of the utilities' and EM&V contractors' inclusion or exclusion of line losses in their reporting. This issue is particularly relevant to EAI because in past EM&V reports planned savings values had been reported at the generator, thereby including line losses.

Evaluators should clearly differentiate between gross and net savings. The EM&V reports use various terms to refer to ex post gross and ex post net savings, some of which lead to confusion. For example, in SWEPCO's EM&V report section 2.2 Glossary of Terminology, the terms "Ex Post Savings" and "Ex Post Net Savings" are defined (SWEPCO 2017 EM&V Report, p. 2-32). The IEM assumes that in this case Ex Post Savings is meant to refer to ex post gross savings, but this terminology should be clarified. Overall, the EM&V contractors should take care to clearly define the various savings terms and employ the complete terms consistently.

Provide more detail of programs instead of using entire suite of programs by sector. For utilities, programs are reported as single programs, even though the sub-programs provided DSM incentives in several different sub programs. While it is acceptable to categorize all programs under sector-specific umbrella programs, the sub-programs should, at some level. be treated as individual programs. For example, OG&E reports three programs, the HEEP, the CEEP and the CWA. For the HEEP, sub programs include the following "channels:" Residential Solutions, Schools Outreach, HVAC Replacement and Tune-up, and Consumer Products. On the CEEP side, the following "channels" are identified: Large C&I, SBDI, Schools and Government Efficiency (SAGE), and Midstream lighting (OG&E 2017 EMYV Report p. 36) These "channels" would ordinarily be categorized as programs.

Behavioral Programs Savings Calculations

Home Energy Reports (HER) is a residential behavioral program offered by EAI and CenterPoint. The HER program represents a greater share of portfolio net evaluation savings for CenterPoint relative to Entergy (representing 24% of ex post net savings in 2017 relative to just under 3% for EAI). The relative share declined four percentage points for CenterPoint (from 28% in PY2016) while for EAI has remained constant at three percent since PY2016 (EAI 2017 EM&V Report, p. 191).

The IEM team had pointed out a few areas of deficiency in the PY2016 IEM Report, and most of these issues have been addressed in the 2017 reports. As noted previously, one concern was savings that were attributable to the HER programs. The HER programs sent reports to so many customers, that the savings were a significant portion of the residential portfolio for both programs (though certainly more so for CenterPoint). Savings appears to have leveled off in recent years (savings in 2017 were nearly identical to PY2016, CenterPoint p. 9-1) due to two reasons:

1. Attrition: Wave 1 still represents over half the savings, and is now facing about 33 percent attrition (CenterPoint 2017 EM&V Report, p. 9-13); and
2. Savings from Other Program: The program appears to be functioning even more than in the past as a "feeder" program for other CenterPoint programs, so that leads to a reduction in savings to avoid double counting the same savings. (CenterPoint 2017 EM&V Report, p. 9-13)

The billing analysis approach for both CenterPoint and EAI were identical to prior reports. Some of the same shortcomings were still not included in PY2017 reports such as:

- Description of how the control group was chosen;
- The CenterPoint description of how the models were selected (especially as different models were used for passive and active/opt-in households);
- Neither report referenced the guidance for models in Protocol J; and
- The EAI model l contains a large number of independent variables without discussing how the variables might be correlated (e.g., checking a correlation matrix or presenting variance inflation factors to ensure the model is not over specified). (EAI 2017 EM&V Report pp. 192-200)

Since the PY2017 HER evaluations relied on the same modeling approach as was used in the PY2016 reports, there were no significant change to per-home savings in PY2017. However, the IEM strongly encourages the evaluators to follow more closely the Protocol J and provide these missing details in future reports.

Estimate Net Impacts (NTG)

The evaluators made some notable improvements to estimating and reporting on the program net-to-gross methods and findings. First, all of the utility reports included updated primary research for many programs, some of which had not received updated research for three or four years (IEM Annual Report, pp. 24-25). The evaluators also shared draft evaluation plans that described the scope, general methodology, anticipated sample sizes, which programs would receive updated research in PY2017, and which programs would receive primary research in PY2018 or PY2019. Additionally, some evaluation reports included clear descriptions of deviations from the original evaluation plans (SWEPCO 2017 Report, p. 2-38), summaries of which programs received updated primary research – along with what this research involved (EAI 2017 Report, Table 3-3, p. 63, SWEPCO 2017 Report, p. 2-39), and clearly defined methodological approaches and findings (OG&E 2017 Report, p. 31).

In fact, the IEM team made recommendations in the PY2016 IEM report (IEM PY2016 Annual Report, pp. 70-71) that discussed some of the strongly recommended improvements the evaluation reports should make. These improvements included:

- A high-level methods table that shows the source of each programs NTG research (participant surveys, billing analysis, literature reviews, etc.);
- The overarching methods section should be consistent with the methods that are described in each specific program section;
- Each program report section should provide sufficient detail to have readers understand the logic used, while relying on appendices for more detailed (and lengthy) survey battery criteria or more complete methodology discussions;
- Clear rationale for leveraging previous research or literature reviews (cite evidence that the delivery, incentives, measures, program design was unchanged) – a checklist could help make this transparent; and
- If program has separate components that receive unique NTGR estimates, then the report should include independent savings and NTGR values for each unique program component.

The IEM team sought to capture the breadth of the details included in the PY2017 reports by summarizing unique components to the evaluation reports. The specific components the IEM team reviewed are summarized as the following:

Table 21: IEM Review of EM&V Contractors' NTG Assessment

NTG ELEMENT	AOG	BHEA	CenterPoint	EAI	OG&E	SWEPCO
Included NTG methods/activity summary table	NO	NO	NO	YES	YES	YES
Included intro methods, with general approach	YES	YES	YES	NO	YES	YES
Individual Program NTG logic	YES	YES	YES	YES	YES	YES
Clear sampling details for NTG	NO	NO	YES	YES	YES	PARTIAL
Provided discussion FR vs SO findings	NO	NO	NO	YES	YES	NO
Reported FR vs SO findings	NO	NO	NO	YES	YES	YES
Delineation of Methods vs Findings	NO	NO	NO	YES	YES	YES

The IEM Team has a number of observations over various aspects of the NTG analysis, including:

Continued use of stipulated values: Evaluators continued to use stipulated values even though PY2016 IEM report had recommended against the continued usage of these (IEM PY2016 Annual Report, p.79). The option for use of the stipulated 80 percent value was removed from the TRM[6] after discussions with the PWC and was replaced by the literature search. Stipulated values were used for BHEA Prescriptive Boiler and commercial cooking measures (BHEA 2017 EM&V Report, pp. 5-29, 5-32). SWEPCO's advanced power strip measure received stipulated values (SWEPCO 2017 EM&V Report, p. 9-305) even though the 2015 Entergy report had included primary research to estimate the NTG. Another program received a default or deemed 100 percent NTGR (SWEPCO Residential Energy Improvement Program; 2017 EM&V Report, p. 8-246) yet lacked any literature review or citation to provide the rationale for the default 100 percent NTG value. Other multifamily direct install programs have shown evidence of both free ridership and spillover savings.

Defining why primary research was/not conducted: While all PY2017 reports included new NTG primary research, for some programs that relied on previous estimates or literature reviews, some reports did not include verifying that the contribution to savings by measure did not change significantly, incentive levels remained relatively static, market conditions did not dramatically shift, marketing and outreach activities remained stable, and trade ally recruitment and training did not change substantially (CenterPoint 2017 Report, p. 10-8, EAI 2017 Report, p.173). Though reports included mention of needing to update the NTG research due to the time span since the last research was conducted, it would be ideal to at least mention whether any program design elements had shifted since the previous effort.

Spillover: A minority of PY2017 program evaluations reported spillover savings, yet the documentations and inconsistent reporting of the methods and findings made it difficult to determine. It was not always clear whether each program had received spillover research, and if the research had yielded any spillover estimates. Further, it was also not clear if the NTG values included spillover or just free ridership. Finally, the spillover savings were inconsistently applied to some of the same programs, differing across evaluators; this was particularly evident for the upstream lighting programs between EAI and SWEPCO (EAI 2017 EM&V Report, p.103, SWEPCO 2017 EM&V Report, p. 9-304).

Distinction between methods and findings: Because some programs offer different components, like custom versus direct install, or new construction versus retrofit, and each of these unique components received unique NTGR values; however, the evaluators failed to include how each component's assumed NTGR was weighted – likely savings weighted – to create a program-wide NTGR score (AOG 2017 EM&V Report, pp. 4-20, 5-39, BHEA 2017 EM&V Report, p. 4-17; CenterPoint 2017 EM&V Report, pp. 4-24, 7-39,).

Another issue was the inconsistent approach vs. findings sections. In some instances, these finding were reported within a given approach (CenterPoint PY2017 EM&V Report, pp. 95-97), and sometimes the results were reported separately (OG&E PY2017 EM&V Report, pp.79-87, 91-96). In other cases, the sections did not include sufficient detail to identify the differences between methods or findings (AOG PY2017 EM&V Report, pp.4-18—4-32, BHEA PY2017 EM&V Report, pp.5-30-5-38).

[6] Arkansas TRM Version 6.1, http://www.apscservices.info/EEInfo/TRM6-1.pdf, May 2, 2017.

Evaluators using inconsistent approaches or applying inconsistent findings to the same programs: There were some noticeable discrepancies across programs that were not evident during the IEM's review of the evaluation plans. Two similar programs or program elements across EAI and SWEPCO portfolio showed inconsistent NTG approaches: upstream lighting and multifamily installations. The SWEPCO report excluded spillover savings from the upstream lighting program, yet the EAI report included eight percent spillover (EAI 2017 EM&V Report, p.103, SWEPCO 2017 EM&V Report, p. 9-304). The SWEPCO REIP Multifamily NTG was assigned as 100 percent by default, with no literature review or benchmarking against other multifamily programs (SWEPCO 2017 EM&V Report, p. 8-246). Other multifamily programs have shown free ridership or spillover (EAI 2017 EM&V Report, p. 173), and the evaluation plan had originally called for NTG research (SWEPCO 2017 Evaluation Plan, p. 24).

Inconsistent or non-use of trade allies: Trade allies are an important part of evaluation research, for those programs where these market actors play a significant role in either delivering the program or supporting the program to consumers. Some program evaluations included interviews with trade allies (EAI 2017 EM&V Report, p. 161), yet the resulting NTG excluded any adjustments to account for trade ally feedback. Some evaluation plans included trade ally feedback (SWEPCO Evaluation Plan, p. 25), yet the report did not include any trade ally feedback for NTG research. Further, in some reports, there was discussion on using trade ally feedback, yet the report failed to include any discussion of the findings (OG&E 2017 EM&V Report, Section 4.6.3).

Relative distribution and savings of sample used for NTG: Though all reports included details on the total sample used for impact or process research, many lacked any specific details regarding the NTG surveys (sometimes only a portion of the total survey sample will be included in the NTG battery). None included details on the relative savings contribution of the sample used for the NTG estimates, and many reports did not include any details on the relative savings stratification of the sample.

Recommendations for Evaluators' Improvement of NTG

Based on this review, the IEM suggests that the evaluators improve NTG estimates in the following ways:

For PY2018, the evaluation and IEM teams should continue to review all proposed program NTG research, including the use of prior NTG values during the evaluation planning stage and discuss whether or not these warrant an updated NTG ratio. This would include verifying that the contribution to savings by measure did not change significantly, incentive levels remained relatively static, market conditions did not dramatically shift, marketing and outreach activities remained stable, and trade ally recruitment and training did not change substantially. The evaluation plans should explicitly include these criteria for each evaluated program.

Since there are two different firms leading the evaluations for the electric utilities, there is an increased likelihood of similar measures receiving different NTG values due to disparate methodologies between the firms.

- **The IEM therefore, recommends 1) additional coordination among the evaluators, (2) the use of a consistent approach to the same programs/measures, and (3) leverage the research being done in the same year by other evaluators.** The IEM will coordinate with the evaluators to help ensure evaluation resources are allocated to the research that will provide the greatest value to the broadest set of similar programs;

- **Future evaluations should use secondary data sources (i.e., a literature review), rather than the prior stipulated value** of 80 percent, or a default value of 100 percent, as a source for NTG values for low priority programs. If possible, the review should focus on measure level NTG, or at least programs that are comparable in offered measures and program design; and
- **The IEM strongly encourages the PY2018 evaluation reports to report clear NTG methodology and findings, including:**
    - A high-level methods table that shows the source of each programs NTG research (participant surveys, billing analysis, literature reviews, etc.);
    - The overarching methods section should be consistent with the methods that are described in each specific program section;
    - Deviations from approved work plans should be documented and the rationale for changes should be detailed;
    - Evaluations should clearly define whether a program received spillover research and if the research identified spillover savings;
    - Evaluations should be consistent with work plans, indicating how trade ally interviews or surveys were integrated as part of the NTG research, and if not, detail why trade allies were not used for NTG;
    - Each program report section should provide sufficient detail so that readers understand the logic used, while relying on appendices for more detailed (and lengthy) survey battery criteria or more complete methodology discussions;
    - Clear rationale for leveraging previous research or literature reviews (cite evidence that the delivery, incentives, measures, program design was unchanged) – a checklist could help make this transparent; and
    - If program has separate components that receive unique NTGR estimates, then the report should include independent savings and NTGR values for each unique program component.
- **The evaluation and IEM teams need to review all proposed uses of prior NTG values during the evaluation planning stage and discuss whether or not these warrant an updated NTG ratio**. This would include verifying that the contribution to savings by measure did not change significantly, incentive levels remained relatively static, market conditions did not dramatically shift, marketing and outreach activities remained stable, and trade ally recruitment and training did not change substantially.

Non-Energy Benefits (NEBs)[7]

The IEM noted in the PY2016 report and in a number of PWC meetings the importance of including matrices with planned NEBs by program, measure, and NEB category as part of the evaluation plans. The IEM also specifically requested each evaluation firm to share preliminary results, including the calculation spreadsheets. Despite these requests, inclusion of these tables and sharing of preliminary results was inconsistent (e.g., SWEPCO residential plans included these matrices, but the commercial plans did not), and unfortunately led to numerous challenges and errors in the NEBs calculations for PY2017. These challenges and errors include:

- **Omitted NEBs that should have been included**. There were a number of prominent NEBs that should have been quantified but were not included in the analysis. For example, all of the gas reports claimed additional savings due to early replacement, in some cases representing approximately 60 percent of the participants (e.g., AOG 2017 EM&V Report, p. 4-24). As noted in the TRM section on NEBs, Avoided and Deferred Replacement Costs (ADRCs) apply in two cases: different measure lives and early replacement (AR TRM V6.1 Volume 1 Protocols, pp. 90-93). In fact, the IEM spreadsheet even provided an example of ADRCs for furnaces (example 3). The omission of the ADRCs (along with the first cost of full replacement) means the incremental cost is likely understated compared to the additional lifetime savings that are being achieved, overstating the TRC benefit (i.e., the benefits go up for early replacement, but the costs are incorrectly left static). There are other examples of potentially omitted NEBs, including the exclusion of water savings for residential tankless water heaters (AOG 2017 EM&V Report, p. 4-18), gas savings for door gaskets (SWEPCO 2017 EM&V Report, p. 4-79), and electric savings for smart thermostats (CenterPoint 2017 EM&V Report, p. 4-2);
- **Inconsistent use of interactive effects (gas heating penalty) for commercial lighting as a NEB**. The AR TRM V6.1 includes the calculation for gas interactive effects as part of the gross savings calculations (AR TRM V6.1 Volume 2 Deemed Savings, p. 398). EAI selected to show these gas interactive effects as "negative NEB" (i.e., an increase in gas usage; EAI 2017 EM&V Report, p. 421), while SWEPCO did not include these interactive effects in the NEBs calculations, and incorrectly did not account for these in the gross savings either;
- **Use of incorrect assumptions for the discount and inflation rates**. There were numerous examples of NEBs calculations using discount and inflation rates that did not match what the utilities were using for the TRM. For example, the example spreadsheets on NEBs calculations provided by ADM included the use of nominal discount rates of 7.75 percent and inflation rates of 2.1 percent, for a real discount rate of 5.53 percent ("Commercial Lighting ARC 2017.xlsx" provided to IEM on April 19, 2018). However, the SWEPCO SARP workbook shows a nominal discount rate of 6.1 percent and an inflation rate of 1.93 percent, for a real discount rate of 4.09 percent. In addition, each of the gas evaluation reports used a real discount rate of 4.9 percent for the DRCs for tankless water heaters (e.g., AOG 2017 EM&V Report, Appendix B), but the actual real discount rate varies for each of the

[7] Based on the IEM's assessment of NEBs as reported in the 2017 EM&V Reports, CURAD from the Attorney General requests that future filings of EM&V Reports and Reporting Work Books include Total Resource Cost (TRC) test results with and without the inclusion of NEBs in their annual reports. We believe that it would help alleviate any concerns regarding cost effectiveness until the NEBs calculation are easily verified.

gas utilities in their SARP workbooks. AR TRM V.6.1. Volume 1 Protocols (p. 90) notes *"The discount rates used to calculate the NPV of the avoided cost benefits should be the same as those used for the corresponding cost-effectiveness tests (e.g., when calculating the TRC test, the NPV of the other fuel benefits should be discounted at the same rate as the primary fuel avoided cost benefits)."*;

- **Misunderstanding and misuse of the dollar value for the water NEBs from the TRM**. A number of evaluations misunderstood the calculation for water savings and assumed the cost for the first 1,000 gallons was for savings, when it was intended for usage (e.g., SWEPCO 2017 EM&V Report, p. 7-177 and p. 8-250). Instead the marginal rate above 1,000 gallons of use should have been used. In fact, the AR TRM states "*To calculate future annual avoided water costs, utilities shall use the marginal rate of $0.00558/gallon for programs that serve the residential sector and $0.0069/gallon for programs that serve the commercial or industrial sector "* (AR TRM V6.1 Volume 1 Protocols, p. 91;);
- **Other fuel avoided costs that appear low**. The avoided gas costs appear to be extremely low in some cases.[8] For example, the SWEPCO REIP gas NEB used avoided costs of approximately 6 cents/therm (SWEPCO 2017 EM&V Report, p. 7-177). As a point of comparison EAI used CenterPoint avoided costs, with a value of 53 cents/therm (EAI 2017 EM&V Report, p. 413), approximately nine times the value of the SWEPCO stated avoided gas NEB costs. While it is possible these costs are correct, the gas avoided costs do appear extremely low when compared to EAI and could misstate the value of NEBs by potentially millions of dollars; and
- **Use of first cost assumptions that may not have aligned with the utility assumptions**. The cost values presented in Appendix B of each of the gas reports for the deferred replacement cost need to match exactly to what each of the gas utilities used for their incremental cost assumptions, where possible (e.g., for the first cost of the tankless). It appears that ADM did their own research to determine costs, which may then apply a DRC that uses inconsistent assumptions with the first cost value.

The overall net effects of these errors are difficult to estimate. For example, the combination of low valued therms, omitted NEBs, and an overstated discount rate for SWEPCO would lead to more conservative NEB calculations, although the incorrect water NEB value and exclusion of gas interactive effects would overstate the savings.

EAI has requested developing a NEB-specific Working Group to help during PY2018 to establish consensus definitions, methodologies, and protocols for the identification and calculation of avoided and deferred replacement costs, including processes for efficiently identifying, estimating, and/or verifying ADRCs associated with custom projects. The IEM supports this recommendation, and offers the following immediate recommendations for the group to discuss regarding addressing the challenges and errors above:

- Evaluators need to include the matrices for program/measure and NEB as part of the evaluation plan;
- Account for the lighting interactive effects as part of the gross savings calculations;

[8] The IEM was in discussions with ADM and SWEPCO regarding these values (possibly correcting the use of incorrect avoided cost values) during the finalization of this report.

- The evaluators need to confirm that the discount and inflation rates used in the NEBs match the utility TRC calculations;
- The evaluators need to use ADRCs for every instance of either differing measure lives or early replacement;
- Evaluators should follow the direction of Protocol L2 and only use the marginal cost of water;
- Evaluator needs to provide the source of the avoided cost for the other fuel; and
- All assumptions in the NEBs calculations, including cost assumptions, need to match any available utility cost assumptions.

Process Evaluation Methodology

This section summarizes the IEM's assessment of the process evaluations completed during PY2017.

Summary and Assessment of EM&V Process Evaluation Activities

In PY2017, the process evaluation objectives were to:

- Document the programs' PY2016 evolution, processes, and key success factors, and challenges;
- Track progress incorporating recommendations from the previous evaluations;
- Identify significant gaps, achievements, and areas where improvements are warranted;
- Provide new recommendations to help streamline program delivery and operations; improve customer satisfaction; enhance participation, energy, and demand savings; and achieve varied program objectives;
- Report key metrics regarding each utility's Consistent Weatherization Approach program; and
- Identify areas for future program improvements.

This section summarizes the IEM's assessment of the process evaluations relative to these criteria.

As Table 22 shows, all of the evaluations met these most of the requirements as specified in Protocol C. Additional feedback regarding each requirement is summarized next.

Table 22: Summary of Assessment of Process Evaluators' Activities

Utility	AOG	BHEA	CenterPoint	EAI	OG&E	SWEPCO
Evaluator	**ADM**	**ADM**	**ADM**	**Tetra Tech**	**ADM**	**ADM**
Requirement #1-Review Databases/Conduct Staff Interviews	●	●	●	●	●	●
Requirement #2: Provided Progress Report on Previous Recommendations	○	●	○	●	●	◑
Requirement #3: Assessed Comprehensive Checklist	●	●	●	●	●	●
Requirement #4: Reported CWA Metrics	●	●	●	◑	●	●
Requirement #5: Identified Areas for Future Exploration	◑	◑	◑	◑	◑	●
Overall Report Quality	◑	◑	◑	●	●	●
Fully Met = ● Partially Met = ◑ Did Not Meet = ○ Not Applicable = ■						

Sources: PY2017 EM&V Reports

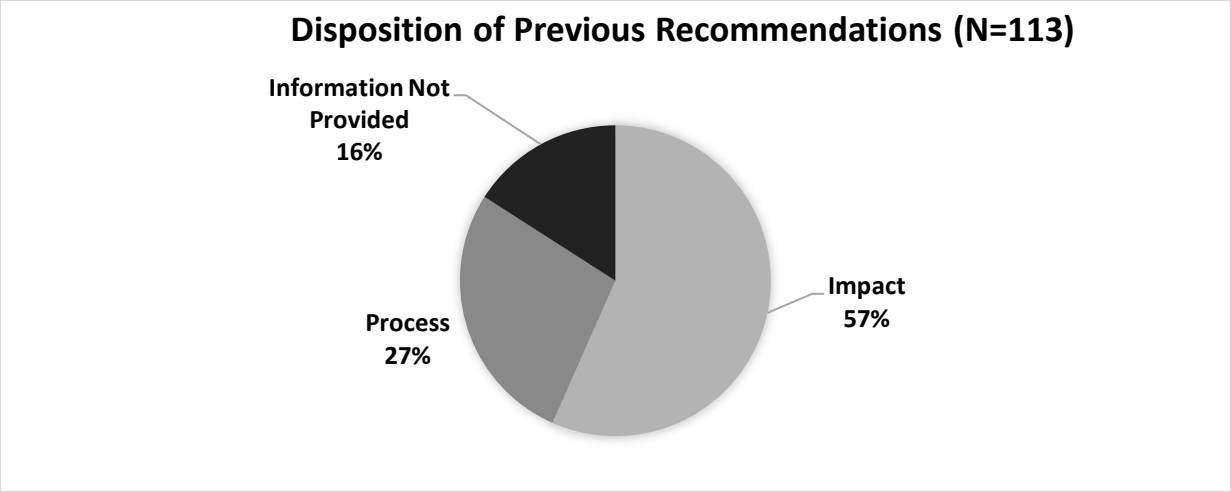
Requirement 1: Did the EM&V Activities Include Database Reviews and Staff Interviews.

All of the evaluations included summarizes of in-depth interviews as well as the rationale for completing either a full or limited process evaluation. In addition, all of the evaluators correctly used and referenced both *Protocol A-Database Review* and *Protocol C –Process Evaluations* in the reports.

Requirement 2: Did the Evaluators Provide a Progress Report on Previous Recommendations?

The reporting on the status of all of the previous recommendations was incomplete for four of the six reports in this evaluation year. Specifically, the AOG and CenterPoint evaluation reports did not provide sufficient information to determine if the completed recommendations were to improve program processes or impact activities. The SWEPCO report contained some information on some of the recommendations, but it was not provided in the same level of detail as reported in the EAI and OG&E reports.

Figure 23 illustrates the status of the recommendations as reported in the individual evaluation reports.



Sources: PY2017 EM&V Reports

Figure 23: Disposition of the Previous Recommendations

Table 23 summarizes the 18 recommendations that were reported on by utility; however, incomplete information was provided to determine if each recommendation was designed to improve program process or impact program activities. This lack of detail prevented the IEM from completing a full accounting of the previous recommendation. The reports with the missing details are summarized in the following table.

Table 23: Disposition of Previous Recommendations

Utility	Total	Completed	Incomplete	No Longer Applicable	Rejected
AOG	2			1	1
CenterPoint	12	6	3		2
SWEPCO	4	4			
Total	18	10	3	1	3

Since the purpose of Protocol C is to ensure that an accurate accounting of the status of the previous recommendations is reported each evaluation period, this year's reporting fell markedly short compared to the previous years.

Requirement 3: Did the Evaluators Identify Progress Towards Comprehensive Checklist Factors?

All of the evaluators fully met the criteria for Requirement 3. They also provided good examples regarding the innovative collaborations and partnerships that are occurring across the Arkansas energy efficiency program portfolio.

Requirement 4: Reported Key Metrics for the Comprehensive Weatherization Approach (CWA) for Each Utility

All of the evaluators provided the requested information for monitoring the progress of the CWA program, as it is delivered for each utility. However, the evaluations for EAI and OG&E required additional follow-up

as evaluations did not report all of relevant information in the recommended reporting template. Going forward, the evaluators should report the metrics in the template provided to ensure they are standardized across the entire Arkansas energy efficiency program portfolio.

Requirement 5: Did the Evaluators Identify any Additional Areas for Future Exploration

Most of the discussion of future exploration focused on recommendations to improve the TRM or changes in program design and delivery. Of note, SWEPCO's report provided additional guidance on issues to consider in future program activities, rather than just focusing on recommendations to improve current program activities. This is an area that requires additional improvement in the next evaluation cycle.

Requirement 6: Overall Quality of the Report

There were many noticeable editing errors in several reports, which detracted from the overall quality of the reports. These errors included;

- **Repeated spelling errors**, such as "respondants," in multiple reports (AOG 2017 EM&V Report, p. 4-16; BHEA 2017, EM&V Report, p. 4-13; CenterPoint 2017 EM&V Report, p. 4-15);
- **Referencing the wrong utility in the reports***:* Examples included referencing BHEA in CenterPoint's report, (CenterPoint 2017 EM&V Report, pp. 1-5. 1-7.11-5);
- **Other grammatical errors** such as starting sentences with numbers rather than words (AOG 2017 EM&V Report, p. 4-4), missing the name of the program (CenterPoint 2017 EM&V Report, p. 5-21), and missing the year in a sentence (BHEA 2017 EM&V Report, p. 1-5);
- **Repeated recommendations** in the summary tables in the SWEPCO Report, (SWEPCO 2017 EM&V Report, pp. 5-214, 8-288); and
- **Inconsistent reporting of program changes in the EAI Report.** The evaluators provided guidance for the Midstream Program but did not provide the same level of detail for the Large C&I Solutions Program (EAI 2017 EM&V Report, pp. 228, 290).

These errors required further clarification from the evaluators and suggest that the reports are not properly proofread and edited prior to finalization.

4.4 Guidance for the Arkansas Energy Office

The Arkansas Energy Office (AEO) worked closely with the IEM and members of the PWC to issue and solicit responses to a Request for Proposals (RFP) for an evaluation contractor. AEO selected its evaluator, ADM, late PY2017. The evaluation activities began in early PY2018.

The IEM participated in the initial project kick off meeting, reviewed program interview guides, and customer surveys. The IEM has also provided guidance ensuring that this process evaluation will meet the Protocol C guidelines.
Draft results will be presented to the PWC and IEM in mid-July and the PY2016 evaluation will be filed by August 31, 2018. The IEM will provide a memorandum summarizing its review and assessment as part of this filing.

Section 5: IEM Recommended Next Steps and EM&V Priorities

The PWC members remain active and engaged participants and are clearly committed to achieving the energy savings goals established by the Commission. This has been demonstrated by their willingness to work together to deliver joint programs, and to implement the recommendations from the previous program evaluations. These reports reinforce the importance and value that annual EM&V activities offer to utilities, program implementers, and stakeholders. Ultimately, these findings benefit the Arkansas ratepayers by ensuring that the energy efficiency programs are well designed, implemented, and effective.

The two evaluation teams, ADM Associates and Tetra Tech, completed six portfolio evaluations for the regulated IOUs in Arkansas. Overall, these evaluations met the requirements as defined in the EM&V Protocols in TRM V6.1, Volume 1.

However, these evaluations fell short of the IEM's expectations in several areas. Specifically, the evaluators made a number of errors as part of the NEBs calculations, despite using the guidance provided in Protocol L. The reports also omitted important details required to assess the accuracy and quality of the overall findings, such as providing insufficient detail regarding net-to-gross calculations, free ridership and spillover calculations, and the status of the previous EM&V recommendations.

Overall, the quality of the PY2017's reports, with some exceptions, detracted from the overall value provided by the actual energy efficiency programs that were evaluated. While, the IEM appreciates the diligence and hard work of each evaluation team, we believe some of these issues, especially calculating NEBs, could have been avoided by incorporating our suggestions into the final reports. Therefore, we have formulated several specific recommendations for the upcoming program cycle to ensure that each evaluation report meets the EM&V Protocol requirements and reflects industry standards and best practices.

5.1 Status of Previous IEM Previous Recommendations

The evaluators have addressed recommendations from the IEM PY2016 Annual EM&V Report in the following areas:

- ***Conducting Impact Evaluations:*** Each evaluation firm completed the template developed by the IEM, which facilitated the analysis of savings estimates across the energy efficiency portfolio;
- ***Future evaluations should summarize the total net savings (i.e., net of lighting leakage) that should be used for the LCFC relative to the total savings that should be used for goal assessment***. This has been addressed by both EAI and SWEPCO;
- ***Seeking IEM Guidance:*** The evaluators proactively sought out the IEM's guidance on a number of technical issues throughout the year. However, there were still significant delays in providing the NEB calculation spreadsheets, which delayed or prevented the IEM's review of these materials;
- ***Evaluators should inform the IEM and leverage the EM&V findings.*** The evaluators have addressed this issue satisfactorily and are using the previous EM&V findings to inform future program designs;
- ***The evaluation and IEM teams need to review all proposed uses of prior NTG values during the evaluation planning stage and discuss whether or not these warrant an updated NTG ratio***. While we have seen some improvement, the EM&V reports should still include information such as

verifying all inputs and assumptions required to determine NTG. Therefore, we encourage continued meeting and collaboration with the IEM on planned NTG activities early in the planning and evaluation design period.

- ***The evaluation reports should include site specific reports for all custom projects verified during the evaluation.*** The PY2017 EM&V reports did include this information, which was beneficial to the IEM's review;
- ***AEO should ensure that its next program evaluation identifies areas for program improvement and enhancement***. AEO did solicit and select a qualified evaluator to conduct its process evaluation for PY2016. The final report will be filed no later than August 31, 2018; and
- ***The IEM will work with the PWC members and interested parties to provide greater clarity to the myriad of issues identified in these reports***. Specifically, the IEM team provided additional guidance and enhancements to the following protocols:
  - Protocol C – to provide additional language documenting the Consistent Weatherization Approach in future process evaluations, including program metrics;
  - Protocol F – to provide better guidance regarding the citation of secondary research for NTG;
  - Protocol J – to review the approach for quantifying savings from behavioral programs; and
  - Protocol L – to provide more examples as requested by the evaluators in calculating NEBs correctly and accurately.

However, the IEM team still believes that continued guidance is needed to address these issues. We will add further clarifying language in TRM Volume 1 on a number of issues including: documenting the progress of the CWA in a standardized way, fully reporting on the status of previous recommendations; determining new values for NTG, quantifying savings from behavioral programs, and providing additional guidance on reporting NEBs.

5.2 Repeated IEM Recommendations

None of the recommendations has been fully implemented by the evaluators, and are therefore repeated;

- ***Future evaluations should include detailed sampling strategies and statistics surrounding the findings.*** The EM&V reports provided this information for some programs; however, this information is not provided consistently across all reports. Of note, important sampling data were not consistently provided regarding the NTG calculations;
- ***Parameter assumptions should include citations and be explicitly detailed.*** The IEM continues to emphasize the need for transparency when using key parameters, including hours of use and coincidence factor assumptions for high-impact measures. This reporting is inconsistent within individual reports and across all the entire Arkansas energy efficiency program portfolio; and
- ***Future evaluations should use secondary data sources (i.e., a literature review), rather than the prior stipulated value of 80 percent, as a source for NTG values for low priority measures.*** The IEM repeats this recommendation for the third year. This needs to be addressed in all future EM&V reports. It is also important for the evaluators to review relevant studies completed in Arkansas to ensure consistency across programs.

5.3 New IEM Recommendations

The IEM makes the following new recommendations that should be incorporated in the future EM&V reports based on the findings from this year's evaluation reports:

- ***Utilities should try to ensure that wherever possibly both gas and electric utilities try to jointly install measures that save both fuels***. The PY2017 NEBs analyses found significant gas savings reported by several electric residential programs. However, these claimed gas savings exceeded the savings form the largest gas utility program. These measures provide opportunities for both electric and gas utilities to cost-share and achieve dual fuel cost-effective savings with improved economies of scale;
- ***The evaluators need to include the matrices for program/measure and NEB as part of the evaluation plan, provide the detailed calculations to the IEM in advance of the final report, and document more clearly the assumptions in the evaluation reports.*** The review of the PY2017 reports found numerous errors in the use of NEBs, many of which could have been avoided by following these recommendations. Of concern, the IEM team asked to review these calculations in advance and were not provided this requested information in a timely manner to help identify and correct calculation errors. Therefore, we will require evaluators to provide this information, even if in draft form, no later than March 15, 2019;
- ***Evaluation teams need to provide explicit detail when realization rates are not 100 percent.*** The IEM team continues to struggle with understanding the depth of issues discovered during database reviews and TRM savings verification when realization rates are not at 100 percent. The IEM review found instances in all of the evaluation reports where explanations behind these differences were missing. In some cases, realization rates were only provided for Net Savings and not Gross Savings, which is not in accordance with industry standards and reporting best practices.
- ***The IEM will work with the PWC and interested parties to review, consider, and incorporate the recommended TRM updates for TRM 7.0***. The IEM will try to address as many of these issues as possible prior to the August 31, 2018 filing date;
- ***The process evaluations should provide an accurate and complete status report of the previous recommendations rather than just an abbreviated summary in the EM&V reports.*** This is an essential reporting task in Protocol C; and
- ***The IEM will continue to provide the PWC with updates on advances in new technologies and evaluation methodologies to ensure that its EM&V Protocols are aligned with national best practices.*** To the extent possible, we will incorporate the findings and recommendations from the two PWC Working Groups:
    - *National Standard Practice Manual:* We will incorporate any recommended changes in future evaluation protocols, as approved by the Commission; and
    - *Act 1102:* We will document the ways in which the current Arkansas Energy Efficiency Program Portfolio is addressing the two target groups identified in Act 1102:
        - LIHEAP eligible utility customers and
        - Utility customers aged 65 or older.

References

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