BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of Union Electric Company d/b/a Ameren Missouri's 2nd Filing to Implement Regulatory Changes in Furtherance of Energy Efficiency as Allowed by MEEIA	))))	**File No. EO-2015-0055**

STAFF'S CHANGE REQUEST FOR ADJUSTMENT TO THE CADMUS REPORT OF PROGRAM YEAR 2016 ANNUAL NET ENERGY AND DEMAND SAVINGS FROM MEEIA PROGRAMS

COMES NOW the Staff of the Missouri Public Service Commission, by and through the undersigned counsel, and files this Change Request with the Missouri Public Service Commission to state as follows:

OVERVIEW

1. On February 5, 2016, Union Electric Company d/b/a Ameren Missouri ("Ameren Missouri") and the parties to this case filed (or did not object to) a *Unanimous Stipulation and Agreement* ("*Cycle 2 Stipulation*"), which was approved by the Commission on February 10, 2016.[1]

2. In part, the *Cycle 2 Stipulation* provided for Ameren Missouri's implementation of 11 Demand-Side Management Programs pursuant to the Missouri Energy Efficiency Investment Act ("MEEIA Programs"). The *Cycle 2 Stipulation* requires Ameren Missouri to complete annual Evaluation, Measurement, and Verification Reports ("EM&V Report") on its MEEIA Programs and file final EM&V Reports 135 days after the end of each MEEIA program year. Ameren Missouri hired The Cadmus Group, Inc. ("Cadmus") to evaluate residential energy efficiency

[1] The Cycle 2 Stipulation has been modified through three Commission Orders: 1. *Order Approving Stipulation and Agreement* filed July 7, 2017, 2. *Order Approving Request to Revise Technical Resource Manual*filed June 6, 2017, and 3. *Order Approving Non-Unanimous Stipulation and Agreement Regarding Use of R&D Funds and Modification of Measure Incentives* filed April 13, 2017.

programs, and it hired ADM Associates, Inc. ("ADM") to evaluate the business energy efficiency programs. On July 14, 2017, Cadmus and ADM ("Evaluators") filed their PY2016 EM&V final reports in this case. On July 25, 2017 Cadmus filed a revised PY2016 EM&V final report to correct minor mathematical errors.

3. In accordance with Commission Rule 4 CSR 240-20.093(7), the Commission hired Evergreen Economics to serve in the capacity of its independent contractor ("Auditor") to audit and report on the work of each independent EM&V contractor hired by utilities with Commission-approved MEEIA programs. On July 31, 2017, the Auditor filed its PY2016 EM&V final report in this case.

STAFF'S CHANGE REQUEST

4. The *Cycle 2 Stipulation* requires any stakeholder group that wants a change to the impact evaluation portion of a final EM&V Report to file a request before the Commission within 21 days of the filing of a final EM&V Report ("Change Request").

5. Staff completed a limited review of annual net energy and demand savings in the PY2016 EM&V final reports of the Evaluators and the Auditor. ADM and the Auditor appear to be in complete agreement on the annual net energy and demand savings for the BizSavers programs and CommunitySavers program, and Staff agrees with those results. Conversely, the Auditor recommended changes to Cadmus' PY2016 annual net energy and demand savings. With one exception described in Staff's *Memorandum* (attached hereto as Appendix A and incorporated by reference), Staff agrees with the Auditor's recommended changes to the annual net energy savings. It is Staff's position that if changes are made to the Cadmus annual net energy savings, the

Cadmus DSMore® Model should be re-run to determine the annual net demand savings as a result of the changed annual net energy savings.

IMPORTANCE OF EM&V RESULTS

6. All Signatories to the *Cycle 2 Stipulation* are bound by the impact evaluation portion of the final EM&V Reports, as they may be modified by the Commission's resolution of any Change Request. The accuracy of the impact evaluation in each EM&V final report approved by the Commission is significant, because the EM&V will be used for the calculation of the true-up of the Throughput Disincentive ("TD") and for the calculation of the Earnings Opportunity ("EO") for Ameren Missouri's Rider EEIC.

STAFF'S RECOMMENDATION

7. As described in Staff's *Memorandum*, Staff recommends the Commission accept the Auditor's recommended changes to Cadmus' PY2016 annual net energy savings with one exception. The exception is the methodology used to allocate the residential portfolio total non-participant spillover ("NPSO") annual energy savings to individual residential programs. Staff recommends the Even Allocation methodology described in the Cadmus PY2016 EM&V final reports be used to allocate the Auditor's residential portfolio's NPSO annual energy savings to individual residential programs.

8. If Staff's Change Request to annual net energy savings is approved by the Commission, Staff recommends that:

a. Cadmus enter the Commission-approved program level annual net energy savings into the Cadmus PY2016 DSMore® model ("Revised Cadmus PY2016 DSMore® model") to determine the annual net demand

savings which will result from the Commission-approved program-level annual net energy savings; and

b. The data in the Revised Cadmus PY2016 DSMore® model is used to update the TRM and to determine the TD and EO for Ameren Missouri's Rider EEIC.

9. As the Auditor is the Commission's expert, the Commission may choose to call its expert to testify at a hearing if necessary, should Ameren Missouri not accept Staff's recommendation to adjust the annual net energy savings and re-run the DSMore® model with the revised annual net energy savings amounts to determine the appropriate demand savings. If the Commission does not intend to call its Auditor as a witness, Staff may choose to do so.

WHEREFORE, Staff files this Change Request and recommends the Commission accept its Auditor's final EM&V Report, but use the Even Allocation methodology to allocate the Auditor's residential portfolio's NPSO annual energy savings to individual residential programs, and re-run the DSMore® model to determine the annual net demand savings.

Respectfully submitted,

/s/ Marcella L Forck
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CERTIFICATE OF SERVICE

I hereby certify that true and correct copies of the foregoing were mailed, electronically mailed, or hand-delivered to all counsel of record this 14th day of August, 2017.

/s/ Marcella L. Forck

M E M O R A N D U M

TO: Missouri Public Service Commission Official Case File
Case No. EO-2015-0055
Union Electric Company d/b/a Ameren Missouri

FROM: Brad J. Fortson, Regulatory Economist III
J Luebbert, Utility Engineering Specialist III

/s/ John Rogers 08/14/2017 — Energy Resources Department / Date
/s/ Marcella Forck 08/14/2017 — Staff Counsel's Office / Date

SUBJECT: Change Request Concerning Incremental Annual Net Energy and Demand Savings Resulting from the Evaluation, Measurement and Verification Reports for Ameren Missouri's Program Year 2016 MEEIA Programs

DATE: August 14, 2017

Background

This memorandum is a "Change Request" for the Missouri Public Service Commission's ("Commission") determination of the program year 2016 ("PY2016") incremental annual net energy and demand savings resulting from the evaluation, measurement, and verification ("EM&V") of Union Electric Company's d/b/a Ameren Missouri ("Ameren Missouri") Missouri Energy Efficiency Investment Act of 2009[1] ("MEEIA") energy efficiency programs. PY2016 is the first program year of Ameren Missouri's MEEIA Cycle 2 (including energy efficiency programs, demand-side programs investment mechanism ("DSIM"), and technical resource manual ("TRM")) which was initially described[2] in the Non-Unanimous Stipulation and Agreement ("Cycle 2 Stipulation") filed on February 5, 2016 in Case No. EO-2015-0055 and was approved by the Commission in its February 10, 2016 *Order Approving Non-Unanimous*

[1] MEEIA is the Missouri Energy Efficiency Investment Act of 2009, § 393.1075, RSMo, Supp. 2016. The Commission's MEEIA Rules include 4 CSR 240-3.163, 4 CSR 240-3.164, 4 CSR 240-20.093 and 4 CSR 240-20.094, which all have an effective date of May 30, 2011.

[2] The Cycle 2 Stipulation has been modified through three Commission orders. 1) Commission's July 7, 2017 *Order Approving Stipulation and Agreement* established the process for long-lead energy efficiency projects' implementation and completion, impact measurement and verification, and demand-side programs investment mechanism treatment; 2) Commission's June 6, 2017, *Order Approving Request to Revise Technical Resource Manual* modified measures in the TRM; 3) Commission's April 13, 2017, *Order Approving Non-Unanimous Stipulation and Agreement Regarding Use of R&D Funds and Modification of Measure Incentives* 1) addresses appropriate uses for remaining research and development ("R&D") funds 2) modifies the Cycle 2 budget, and 3) modifies the incentives available to customers for adopting certain measures.

Stipulation and Agreement. PY2016 covers the period March 1, 2016, through February 28, 2017, while Cycle 2 covers the period March 1, 2016, through February 28, 2019.

The Change Request process for Cycle 2 EM&V is described on page 1 of Exhibit A[3] and includes:

> Any stakeholder group participant which wants a change to the impact evaluation portion of the Final EM&V Report will have twenty one days from the issuance of the Final EM&V Report to file a request with the Commission to make such a change ("Change Request"). Any stakeholder group participant filing a Change Request will set forth all reasons and provide support for the requested change in its initial Change Request filing. Responses to a Change Request may be filed by any stakeholder group participant and are due twenty one days after the Change Request is filed. The response should set forth all reasons and provide support for opposing or agreeing with the Change Request. Within five business days after the deadline for filing a Change Request (if a Change Request is filed) the Signatories agree that the stakeholder group participants will hold a conference call/meeting to agree upon a proposed procedural schedule that results in any evidentiary hearing that is necessary to resolve the Change Request to be completed within sixty days of the filing of the Change Request, and which will recommend to the commission that the Commission issue its Report and Order resolving the Change Request within thirty days after the conclusion of such a hearing. The Signatories anticipate a hearing with live testimony may be required to resolve a Change Request, but if a hearing is not required, they agree to cooperate in good faith to obtain Commission resolution of a Change Request as soon as possible.

Final Commission-approved EM&V for each program year of Cycle 2 is used to retrospectively determine Ameren Missouri's Rider EEIC earnings opportunity[4] ("EO") and to annually update the deemed gross annual energy and demand savings of measures in the TRM.[5] The updated deemed gross annual energy and demand savings of measures in the TRM are used prospectively to determine the amount of monthly throughput disincentive ("TD") Ameren Missouri is allowed to collect from its customers through its Rider EEIC.[6]

In 2016, Ameren Missouri contracted Cadmus Group, Inc. ("Cadmus") and ADM Associates, Inc. ("ADM") to conduct comprehensive impact and process EM&V of Ameren Missouri's energy efficiency portfolio in PY2016. Cadmus conducted evaluations of the

[3] Appendix A is a 4-page document which is Appendix C of the Cycle 2 Stipulation.
[4] Union Electric Company, MO.P.S.C. Schedule No. 6, 1st Revised Sheet No. 91.9.
[5] Paragraph 11. a. (iii) of the Cycle 2 Stipulation.
[6] Union Electric Company, MO.P.S.C. Schedule No. 6, 1st Revised Sheet No. 91.6 – 91.8.

residential energy efficiency programs. ADM conducted evaluations of the business energy efficiency programs. On May 1, 2017, the Commission contracted with Evergreen Economics to serve in the capacity of its independent contractor ("Auditor") to audit and report on the work of each utility's independent contractor.[7]

On July 14, 2017, Cadmus and ADM ("Evaluators") filed their PY2016 EM&V final reports in this case. On July 25, 2017, Cadmus filed revised PY2016 EM&V final reports to correct minor mathematical errors. On July 31, 2017, the Auditor filed its PY2016 EM&V final report.

Staff Change Request

Staff has completed its limited review of annual net energy and demand savings in the PY2016 EM&V final reports of the Evaluators and the Auditor. As a result of its limited review, Staff finds that ADM and the Auditor are in complete agreement on the annual net energy and demand savings for the BizSavers[8] programs and CommunitySavers[9] program for PY2016, and Staff likewise agrees with those results. However, the Auditor PY2016 EM&V final report contains recommended changes to Cadmus's PY2016 annual net energy and demand savings; these recommended changes are summarized in the report's Section **1.3.1 Portfolio Level Findings.** With one exception, Staff agrees with the recommended changes to the annual net energy savings summarized in the Auditor's Table 3. The one exception is the methodology used to allocate the residential portfolio total non-participant spillover ("NPSO") annual energy savings to individual residential programs. Staff recommends the Even Allocation[10] methodology described in the Cadmus PY2016 EM&V final reports be used to allocate the Auditor's residential portfolio's NPSO annual energy savings[11] to individual residential programs. Should there be a

[7] 4 CSR 240-20.093(7).
[8] BizSavers programs the commercial and industrial programs offered by Ameren Missouri including: Standard Rebate, Custom Rebate, Retro-Commissioning, New Construction, and Small Business Direct Install programs.
[9] CommunitySavers is a residential program which provides financial incentives and services to encourage energy efficiency improvements in income-eligible multifamily properties.
[10] From page 109 of the Cadmus *Ameren Missouri Heating and Cooling Program Impact and Process Evaluation: Program Year 2016*: **Even Allocation**: The most straightforward approach allocated NPSO evenly across the residential programs (i.e., made a 20.4% adjustment to each program's NTG). This equaled applying NPSO at the portfolio-level, and, therefore, assumed all programs contributed equally to generating NPSO.
[11] The residential portfolio's NPSO annual energy savings for the Evaluators and the Auditor are for the Efficient Products, Smart Thermostats, Energy Efficiency Kits, Heating and Cooling, and Lighting programs.

change to the Cadmus annual net energy savings, it is Staff's opinion that the Cadmus DSMore® model should be used to determine the annual net demand savings.

Exhibit B includes a summary of PY2016 program-level and portfolio annual net energy savings as determined by the Evaluators, the Auditor, and Staff. Staff's Change Request annual net energy savings are contained in Table 3 of Exhibit B. Exhibit C is a glossary of terms used in Exhibit B. If Staff's Change Request to annual net energy savings is approved by the Commission, Staff recommends that:

1. Cadmus enter the Commission-approved program level annual net energy savings into the Cadmus PY2016 DSMore® model ("Revised Cadmus PY2016 DSMore® model") to determine the annual net demand savings which will result from the Commission-approved program level annual net energy savings; and
2. The data in the Revised Cadmus PY2016 DSMore® model is used to update the TRM and to determine the TD and EO for Ameren Missouri's Rider EEIC.

The remainder of this Change Request contains 1) support for Staff's Change Request and 2) Staff's concern for and recommendation regarding non-participant non-like spillover.

Support for Staff's Change Request

The following support for Staff's Change Request is based primarily upon the findings and recommendations of the Auditor. It is Staff's opinion that, with one exception, the PY2016 recommendations of the Auditor are valid reasons for changing the PY2016 EM&V annual net energy savings results and will improve the overall quality of the PY2016 EM&V results. It is also Staff's opinion that changing the allocation methodology for the residential programs' NPSO adjustment from the Auditor's allocation methodology to the Even Allocation methodology option identified by Cadmus, but not chosen by Cadmus or the Auditor, will improve the overall quality of the PY2016 EM&V results.

Difference in ex-post gross MWh

The Auditor recommends a 28.1% decrease to the Cadmus ex-post gross energy savings for the Heating and Cooling program.[12] There are three contributing factors for this decrease: 1) baseline assumed for early replacement units; 2) using a consistent value of the effective full load hours ("EFLH") when calculating the heating savings for air-source heat pumps ("ASHP") and ductless heat pumps; and 3) a portion of the savings relating to electronically commutated motor's ("ECM") being double counted.

Support for changing the baseline for early replacements. For early replacements, Cadmus used a baseline energy efficiency based on the load profile of a SEER[13] 7.2 unit, which the Auditor believes to be too low for several reasons. The Auditor states that in other jurisdictions the most common baseline efficiency for early replacement is SEER 10. The Auditor used the energy use based on a tuned-up unit as the baseline for early replacement units. To estimate this baseline, the Auditor used the metered energy consumption from the Cadmus PY2013 evaluation for central air conditioner ("CAC") tune-ups for early replacement units. The Auditor states that using these values brings the savings for CAC retrofits in line with the savings for other jurisdictions. The result of using this baseline is a reduction of approximately 10,000 MWh[14], or approximately 22%, of the Cadmus gross savings for the program.

Support for changing the EFLH. For ASHP and ductless heat pumps, Cadmus estimated savings using metered data collected on equipment installed during PY2016. Cadmus estimated the EFLH using the operating efficiency observed during the equipment metering, and the operating efficiency value was lower than the nameplate efficiency of the units. To calculate the savings for ASHP and ductless heat pumps, Cadmus used the EFLH related to the lower operating efficiency rather than the nameplate efficiencies of the new units. The Auditor points out that by using this approach, the savings are under-estimated for some measures and over-estimated for others. The Auditor recalculated the savings for these measures using consistent EFLH based on the metered operating efficiency and the assumed operating efficiency. The result of this

[12] See Auditor's report from Early Replacement Cooling Savings on page 7 through Table 1 on page 9.
[13] Seasonal Energy Efficiency Ratio. The SEER rating of a unit is the cooling output during a typical cooling-season divided by the total electric energy input during the same period. The higher the unit's SEER rating the more energy efficient it is.
[14] See Auditor's report from Early Replacement Cooling Savings on page 7.

recalculation is a decrease in savings of approximately 1,000 MWh[15], or approximately 2%, of Cadmus gross savings for the program.

Support for ECM fan savings. Cadmus based savings on a 2003 report for the state of Wisconsin and metered data collected during the Cadmus PY2013 evaluation of the Ameren Missouri program. This savings algorithm separates fan use into three components: 1) fan operation when the air conditioner is on; 2) fan operation when the furnace is on; and 3) fan operation to provide circulation when the other HVAC equipment is not in use. However, the Auditor points out that Cadmus' evaluated savings do not appear to use an operating hours criterion that is consistent with the savings algorithm. This leads to the calculations double-counting a portion of the ECM savings that are related to both general circulation and ECM use when the furnace is operating. The Auditor recalculated the savings using the same methodology, but without the use of the correction factor related to the hours of fan operation that may double-count time when the fans are in heating mode. The result of this recalculation is a decrease in savings of approximately 900 MWh[16], or approximately 2%, of Cadmus gross savings for the program.

Support for correcting water heater pipe wrap savings calculation. The Auditor also recommends a 3.9% decrease to the savings for the Energy Efficient Kits program. This is due to the improper savings calculation for water heater pipe wrap. The algorithm for the heater pipe wrap assumes the heat loss from the pipe decreases by 75% based on changing the R-value from 1 to 4. The current savings calculation assumes the circumference of the pipe and the circumference of the pipe plus insulation are the same, which the Auditor points out is incorrect. The Auditor recalculated the savings using the correct algorithm. The result of this recalculation is a decrease in savings of approximately 214 MWh, or approximately 3.9%, of Cadmus gross savings for the Energy Efficiency Kits program.

Difference in Non-Participant Spillover

NPSO comprises a significant share (20.4%) of the total residential portfolio net energy savings in the Cadmus report, which the Auditor points out is higher than typically reported for similar residential program portfolios. The Auditor reviewed the survey responses of

[15] See Auditor's report from **ASHP And Ductless Heating Savings For Electric Resistance Baseline Replacements** on pages 7 – 8.
[16] See Auditor's report from **ECM fan double counting of continuously operating fans savings** on page 8.

the 27 customers that were used to calculate NPSO. To qualify as NPSO, the 27 customers who adopted measures that were not incentivized had to meet 6 criteria[17]. The Auditor found several instances where customers failed one or more of the qualifying criteria or had missing or "NA" values but were still assessed by Cadmus as meeting the criteria. Also, the Auditor points out that multiple responses clearly indicate that measures were adopted for reasons other than saving energy but were still considered to be NPSO, even though it appears that the motivation for adopting the measure was primarily from something other than Ameren Missouri's program and outreach efforts.

In order to address these concerns, the Auditor recommends that for the question used to address Criterion #2 (Ameren Missouri influenced the adoption), only responses that Ameren Missouri was "very influential" should be counted. Currently, "somewhat influential" responses are given a 50% savings, but given all the other factors influencing the decision (cost, quality, etc.), and given the extremely small sample size, the Auditor is concerned this is not strong enough. Also of note, is that only the "very important" responses are used for participant spillover, which is inconsistent with the inclusive "somewhat influential" responses the Evaluators used for non-participant spillover. The Auditor also recommends that for the question and response analysis for Criterion #5 (have a valid reason for adopting the measure) only those respondents who provide a reason relating to energy efficiency should be counted. Those respondents can therefore more plausibly be considered as influenced by Ameren Missouri.

After applying these recommended changes to the Cadmus residential NPSO calculation, the 'like' NPSO decreased from 5,050 MWh to 2,988 MWh, a 41% reduction, and 'non-like' NPSO from 14,396 MWh to 6,697 MWh, a 53% reduction. This resulted in an overall decrease in total NPSO from 19,446 MWh to 9,685 MWh, a 50% reduction[18].

Allocation Method for NPSO

Cadmus considered three possible approaches for allocating total observed NPSO to individual programs: 1) even allocation; 2) "like" programs; and 3) marketing budget and program size. The following is a description of each approach:

[17] See Auditor's report from section 1.1 Residential Non-participant Spillover (NPSO) page 3.
[18] See Auditor's report from **1.1 Residential Non-participant Spillover (NPSO)** on pages 3 – 4.

> **Even Allocation**: The most straightforward approach allocated NPSO evenly across the residential programs (i.e., made a 20.4% adjustment to each program's NTG). This equaled applying NPSO at the portfolio-level, and, therefore, assumed all programs contributed equally to generating NPSO.
> **"Like" Programs:** Another approach allocated NSPO savings to specific programs based on the measure that the nonparticipant installed. Note that this approach is only applicable to like NPSO. ….
> **Marketing Budget and Program Size.** The final allocation approach the team considered—and eventually chose to use—assigned overall NSPO as a function of each program's marketing and program budget (shown in Table 52). This approach remained consistent with the theory that NPSO resulted from the cumulative effects of program-specific marketing and program activity over a period—not necessarily by a single, program-specific marketing effort. In addition, while NPSO most commonly was associated with mass media marketing campaigns, the scale of program activity also counted as a factor. For example, even without a significant marketing campaign, a program's size can drive NPSO through word-of-mouth and in-store program messaging. The team found this approach accurately reflected and attributed NSPO to programs, ensuring those total costs (including marketing) and total benefits (net savings including NPSO) are properly accounted for when assessing overall program cost-effectiveness. [19]

As mentioned above, Cadmus allocated NPSO based on marketing budget and program size. Cadmus' methodology allocates 92% of all the estimated NPSO MWh savings to the HVAC program. Of the NPSO savings estimate of 19,446 MWh, 14,396 MWh is estimated as non-like NPSO. In Staff's opinion, utilizing the marketing budget and program size allocation methodology gives an unfair amount of credit to the HVAC program. Cadmus allocation methodology would suggest that as a result of Ameren marketing and outreach, 92% of the energy savings from a non-participating customer that purchased an energy efficiency measure outside of Ameren Missouri's MEEIA program (i.e. an energy efficient refrigerator or clothes washer) should be credited to Ameren Missouri's HVAC program. Of the five residential programs that NPSO is allocated to, the HVAC program also provides by far the greatest MW reduction per MWh.[20] So essentially, the 92% of the MWh savings from the purchase of the energy efficient refrigerator in the example above are treated identically to the MWh savings from an HVAC unit when calculating the demand reduction for that non-program measure. The Auditor allocated NPSO based on an even allocation. However, the Auditor allocated NPSO evenly across

[19] See Cadmus' Ameren Missouri Heating and Cooling Program Impact and Process Evaluation: Program Year 2016 report pages 109 – 110.
[20] See page 2 of 2 of Appendix E of the Cycle 2 Stipulation.

all residential programs by taking the portfolio NPSO savings amount (9,685 MWH), dividing 9,685 MWh by the number of residential programs (5), and allocating the same savings amount (1,937 MWh) to each residential program. Staff interprets the Even Allocation approach differently. Staff understands the Even Allocation approach[21] to mean an allocation of the portfolio NPSO energy savings amount evenly across all residential programs based on an even allocation of the portfolio NPSO *percent*. Staff recommends using the Auditor ex-post gross energy savings (82,504 MWh) and the Auditor NPSO energy savings (9,685 MWh) to calculate the Auditor NPSO percent (11.74%).[22] The product of 11.74% and the Auditor's ex-post gross energy savings for the Efficient Products program, Smart Thermostats program, Energy Efficiency Kits program, Heating and Cooling program, and Lighting program produces the NPSO annual net energy savings for these programs contained in Table 3 of Exhibit B.

Staff's concern for and recommendation regarding non-participant non-like spillover

Cadmus calculated the total residential non-participant non-like spillover to be 14,396 MWh.[23] Some of the responses to the question "why was the measure installed" (used for Criterion #5) contained in the Nonparticipant Survey Data[24] provided by Cadmus, clearly indicates the measures were adopted for reasons other than saving energy.[25] The Auditor PY2016 EM&V final report recommends that a more stringent process be used in order to qualify for non-participant spillover.[26] The Auditor believes that due to the unusually high amount of NPSO claimed, more supporting information needs to be provided to confirm that the NPSO measure is truly energy efficient and Ameren had a significant influence on the decision to install the measure in question. Given that the NPSO claimed is very large and the ultimate sample used for the estimate is quite small (less than 30 customers), a significant amount of proof

[21] See EFIS Item No. 180, Final EM&V Auditor Report and Supporting Documentation, EO-2012-0142, pages. 6 – 7.
[22] 9,685 MWh / 82,504 MWh = 11.74%
[23] Table 51. Non-like NPSO Analysis in Cadmus *Ameren Missouri Heating and Cooling Program Impact and Process Evaluation: Program Year 2016*
[24] Appendix C in Cadmus *Ameren Missouri Heating and Cooling Program Impact and Process Evaluation: Program Year 2016*
[25] Page 63 of Evergreen Economics *Independent EM&V Audit of the Ameren Missouri PY2016 Program Evaluations Final Report July 31, 2017*
[26] Ibid.

is required to show that these measures should truly be counted as spillover.[27] Additionally, the Auditor recommends that for all spillover calculations (participant and non-participant), savings should only be claimed for measures that would qualify for the program, i. e., like measures. However, the Auditor recommends that this change be adopted beginning in PY2017.[28] Staff interprets the Auditors recommendation to exclude all non-like NPSO in PY2017 and beyond.

According to the Illinois Statewide Technical Reference Manual, "As spillover may be rare in the general, nonparticipating population, determining spillover will likely require a large sample of customers who have not participated in any energy efficiency programs, including a behavioral program, within the past three years." This further bolsters the Auditor's claim that the NPSO estimated by Cadmus is higher than what is typically reported for similar residential program portfolios. Cadmus cited the National Renewable Energy Laboratory report titled, *The Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures* ("UMP"), several times in its report. The calculation of NTG, defined in Appendix C of the Cycle 2 Stipulation[29] excludes market effects. According to the UMP, market effects refer to "a change in the structure of a market or the behavior of participants in a market that is reflective of an increase in the adoption of energy efficiency products, services, or practices and is causally related to market intervention(s)" (Eto et al. 1996). [30] Non-participant non-like spillover is very similar to the definition of market effects defined by the UMP. The similarity between market effects and non-participant non-like spillover further strengthens Staff's support of the Auditor's estimate of NPSO when compared to Cadmus' estimate.

Staff is concerned that allowing non-like NPSO in the PY2016 EM&V may reduce the quality of the PY2016 EM&V by overestimating annual net energy and demand savings. Staff recommends that Ameren Missouri, Evaluators, Auditor, and stakeholders discuss non-like NPSO in the near future with the following objectives:

1. Understanding the difference between market effects and non-like NPSO;
2. Understanding EM&V best practices for non-like NPSO; and

[27] Page 62 of Evergreen Economics *Independent EM&V Audit of the Ameren Missouri PY2016 Program Evaluations Final Report July 31, 2017*
[28] Page 64 of Evergreen Economics *Independent EM&V Audit of the Ameren Missouri PY2016 Program Evaluations Final Report July 31, 2017*
[29] Non-Unanimous Stipulation and Agreement and Tariff Revision (YE-2016-0198) filed February 5, 2016
[30] https://www.nrel.gov/docs/fy14osti/62678.pdf

3. Achieving alignment, or at least closer alignment, of the Evaluators and Auditor on the process to fairly estimate non-like NPSO.

EM&V Plan and Timeline

The Company strives to provide useful, impactful and cost effective programs. Ongoing analysis of programs performance through Evaluation, Measurement & Verification (EM&V) is an important aspect to that end. Approximately but not more than five percent 5% of the three-year MEEIA Programs' costs budget will be spent for EM&V. The Company will work with the stakeholder group to develop an evaluation plan to determine how best to allocate and utilize the EM&V budget. The plan will address three main areas, process evaluation, impact evaluation and cost effectiveness.

The overall timeline and process described below will be used for EM&V reports:

EM&V reports will be completed for each year of the three-year MEEIA program cycle. Sixty days after the end of each program year, the EM&V contractor will circulate a draft EM&V report to all stakeholders participating in the stakeholder group and the Commission's independent EM&V Auditor ("Auditor"). This provision does not affect the requirement in the MEEIA rules for the EM&V contractors to provide copies of draft EM&V reports to stakeholders participating in the stakeholder group at the same time the draft reports are provided to the Company.

Forty five days after circulation of the draft EM&V report, the Auditor and each stakeholder group participant will provide any comments and recommendations for report changes to the EM&V contractor and to all other stakeholder group participants and the Auditor. The Signatories recognize there is a benefit to providing comments as early as possible, as providing comments and recommendations earlier to the EM&V contractor will allow for more time for the incorporation of comments and changes into subsequent drafts and the Final Report.

Prior to issuing the Final EM&V Report, the EM&V contractor will host at least one meeting with the Auditor and the stakeholder group participants to discuss the comments and recommendations for report changes. The EM&V contractor will determine what comments and/or changes are incorporated into the Final EM&V Report. Thirty days after the deadline for comments and recommendations for report changes, a Final EM&V report will be provided to all stakeholder group participants and the EM&V Auditor by the EM&V contractor. Ten days following the Final EM&V report, the Commission's Auditor will issue its final report.

Any stakeholder group participant which wants a change to the impact evaluation portion of the Final EM&V Report will have twenty one days from the issuance of the Final EM&V Report to file a request with the Commission to make such a change ("Change Request"). Any stakeholder group participant filing a Change Request will set forth all reasons and provide support for the requested change in its initial Change Request filing. Responses to a Change Request may be filed by any stakeholder group participant and are due twenty one days after the Change Request is filed. The response should set forth all reasons and provide support for opposing or agreeing with the Change Request. Within five business days after the deadline for filing a Change Request (if a Change Request is filed) the Signatories agree that the stakeholder group participants will hold a conference call/meeting to agree upon a proposed procedural schedule that results in any evidentiary hearing that is necessary to resolve the Change Request to be completed within sixty days of the filing of the Change Request, and which will recommend to the commission that the Commission issue its Report and Order resolving the Change Request within thirty days after the conclusion of such a hearing. The Signatories anticipate a hearing with live testimony may be required to resolve a Change Request, but if a hearing is not required, they agree to cooperate in good faith to obtain Commission resolution of a Change Request as soon as possible. The Signatories will be parties to a Change Request resolution proceeding without the necessity of applying to intervene. The procedural schedule for such a Change Request proceeding will provide that data request objections must be lodged within seven days and responses will be due within ten days (notifications that additional time is required to respond will also be due within seven days).

All signatories agree to accept the impact evaluation energy and demand savings (kWh and kW) estimates of the Final EM&V Report, as it may be modified by the Commission's resolution of issues in a non-appealable Order related to the impact evaluation portion of the Final EM&V Report, for purposes of calculating achievements towards targeted net energy and demand savings Earnings Opportunities.

Table 1 Annual EM&V Timeline (2016 Program Year example)

# of Days	Projected Date	Description
	3/1/2016	Program Year Begins
	3/1/2016	EM&V Data Collection and Analysis Starts
	2/28/2017	Program Year Ends
60	4/29/2017	EM&V Draft Completed
45	6/13/2017	Stakeholder comments due
	TBD	Stakeholder meeting
30	7/13/2017	Final Draft Report Due
10	7/23/2017	Final PSC Auditor Report due
21	8/13/2017	Grace period to file with Commission to request impact change
5	8/18/2017	Conference call if needed
21	9/3/2017	Stakeholder group responses to impact change requests to Commission are due
60	10/12/2017	Evidentiary hearings complete, 60 days from Change Request Due
30	11/11/2017	Commission Order resolving change requests
246	11/11/2017	EM&V Results Final

EM&V use in the Throughput Disincentive Adjustment Calculation

EM&V will be used for the calculation of the true-up of the Throughput Disincentive (both Ex Post Gross and Net to Gross adjustments subject to a floor and a cap) for the purposes of determining Net (kWh and kW) savings attributed to the programs for each year during the three year cycle. For more details on the detailed mechanics of the Throughput Disincentive true-up calculation refer to Appendix D of the Stipulation and Agreement.

Also, for the purposes of calculating the Throughput Disincentive, any measure installed after a shift in baseline conditions will reflect the baseline shift in the net kWh and kW savings attributable to that measure. The baseline shift will not apply to net kWh and kW savings attributable to any measure installed prior to the baseline shift. For example, if the baseline conditions for LED bulbs change in 2017, the Company would continue to calculate net kWh and kW savings over the entire life of the LED bulbs installed in 2016 at the original baseline conditions. However, any LED bulbs installed in 2017 or later would use the new baseline for net kWh and kW savings for the purposes of calculating the Throughput Disincentive.

EM&V use in the Earnings Opportunity Calculation

EM&V will be used for the calculation of Earnings Opportunity for the purposes of determining the Net (kWh and kW) savings attributed to the programs for each year during the three year cycle. For more details on the mechanics of the Earnings Opportunity calculation refer to Appendix D of Stipulation and Agreement.

Each year the EM&V contractor will review the gross program impacts and provide recommendations regarding the adjustment of gross energy and demand savings. This review will help the Company improve the design and delivery of the energy efficiency programs. At the end of the three-year MEEIA cycle the EM&V contractor will determine the net energy and demand savings based on the results of the individual program year approved EM&V report, which the Company will use to calculate the Earnings Opportunity.

Also, for the purposes of calculating the Earnings Opportunity, any measure installed after a shift in baseline conditions will reflect the baseline shift in the net kWh and kW savings attributable to that measure. The baseline shift will not apply to net kWh and kW savings attributable to any measure installed prior to the baseline shift. For example, if the baseline conditions for LED bulbs change in 2017, the Company would continue to calculate net kWh and kW savings over the entire life of the LED bulbs installed in 2016 at the original baseline conditions. However, any LED bulbs installed in 2017 or later would use the new baseline for net kWh and kW savings for the purposes of calculating the Earnings Opportunity.

Table 2 Evaluation, Measurement & Verification Update Status of Inputs to Establish Earnings Opportunity and Throughput Disincentive Adjustment

Earnings Opportunity and Throughput Disincentive Inputs Status			
Category	When is it updated?	Who updates?	Description
Net kWh/kW Savings	Ex Post Gross and Net evaluated savings calculated after each of the 3 program years. Net to Gross Ratio savings calculated after the 3 year program cycle – excludes baseline shifts that occur after the date that the measure is installed	Initially developed by EM&V Contractor subject to feedback from parties in case and approval from commission	Ex Post Gross Energy and demand savings per measure. Net Savings = NTG Ratio * Ex Post Gross Savings
Net To Gross ("NTG") Ratio	Annually by measure	Initially developed by EM&V Contractor subject to feedback from parties in case and approval from commission	NTG Ratio = 1 - Free ridership rate + participant spillover rate + nonparticipant spillover rate
Technical Resource Manual ("TRM")	No later than 24 months from commencement of Plan Annually on prospective basis only	Company	Listing of annual kWh/kW measure savings
Earnings Opportunity Award	After the 3 year program cycle post EM&V	Company including data (Net kWh/kW savings) provided from EM&V contractor	See Appendix E to Stipulation
Throughput Disincentive Ex Post Gross Adjustment	After the 3 year program cycle post EM&V	Company	TD recalculation using the normalized savings for each measure at customer meter per measure determined through EM&V ex-post gross analysis for each program year less TD calculation using TRM
Throughput Disincentive Net to Gross Adjustment	After the 3 year program cycle post EM&V	Company	TD recalculation using the NTG determined through EM&V for each program year less TD calculation using the NTG Factor of 0.85

Table 1 Evaluator - Energy Savings

Program	Ex Ante Gross Savings (MWh/Yr)	Ex Post Gross Savings (MWh/Yr)	Participant Net Savings (MWh/Yr)	NPSO (MWh/Yr)	Total Net Savings (MWh/Yr)	NTG Ratio
Efficient Products	2,883	2,940	2,004	190	2,194	75%
Smart Thermostats	3,788	3,732	3,071	130	3,201	86%
Energy Efficiency Kits	4,773	5,478	4,212	5	4,217	77%
Heating and Cooling	49,539	44,661	40,463	17,977	58,440	131%
Lighting	27,810	38,439	24,409	1,144	25,553	66%
Home Energy Reports	33,750	32,292	32,292	0	32,292	100%
CommunitySavers	2,099	2,350	2,350	0	2,350	100%
Residential Total	**124,642**	**129,892**	**108,801**	**19,446**	**128,247**	**99%**
BizSavers Total	**75,565**	**76,914**	**73,236**	**1,992**	**75,228**	**98%**
Portfolio Total	**200,207**	**206,806**	**182,037**	**21,438**	**203,475**	**98%**

Evaluators savings components which differ from Auditor savings components

Table 2 Auditor - Energy Savings

Program	Ex Ante Gross Savings (MWh/Yr)	Ex Post Gross Savings (MWh/Yr)	Participant Net Savings (MWh/Yr)	NPSO (MWh/Yr)	Total Net Savings (MWh/Yr)	NTG Ratio
Efficient Products	2,883	2,940	2,004	1,937	3,941	134%
Smart Thermostats	3,788	3,732	3,071	1,937	5,008	134%
Energy Efficiency Kits	4,773	5,264	4,048	1,937	5,985	114%
Heating and Cooling	49,539	32,129	28,736	1,937	30,673	95%
Lighting	27,810	38,439	24,409	1,937	26,346	69%
Home Energy Reports	33,750	32,292	32,292	0	32,292	100%
CommunitySavers	2,099	2,350	2,350	0	2,350	100%
Residential Total	**124,642**	**117,146**	**96,910**	**9,685**	**106,595**	**91%**
BizSavers Total	**75,565**	**76,914**	**73,236**	**1,992**	**75,228**	**98%**
Portfolio Total	**200,207**	**194,060**	**170,146**	**11,677**	**181,823**	**94%**

Auditor savings components which differ from Evaluators savings components

Table 3 Staff - Energy Savings

Program	Ex Ante Gross Savings (MWh/Yr)	Ex Post Gross Savings (MWh/Yr)	Participant Net Savings (MWh/Yr)	NPSO (MWh/Yr)	Total Net Savings (MWh/Yr)	NTG Ratio
Efficient Products	2,883	2,940	2,004	345	2,349	80%
Smart Thermostats	3,788	3,732	3,071	438	3,509	94%
Energy Efficiency Kits	4,773	5,264	4,048	618	4,666	89%
Heating and Cooling	49,539	32,129	28,736	3,772	32,508	101%
Lighting	27,810	38,439	24,409	4,512	28,921	75%
Home Energy Reports	33,750	32,292	32,292	0	32,292	100%
CommunitySavers	2,099	2,350	2,350	0	2,350	100%
Residential Total	**124,642**	**117,146**	**96,910**	**9,685**	**106,595**	**91%**
BizSavers Total	**75,565**	**76,914**	**73,236**	**1,992**	**75,228**	**98%**
Portfolio Total	**200,207**	**194,060**	**170,146**	**11,677**	**181,823**	**94%**

Staff Change Request savings components which differ from Evaluator savings components

Table 4 Evaluator *less* Auditor - Energy Savings

Program	Ex Ante Gross Savings (MWh/Yr)	Ex Post Gross Savings (MWh/Yr)	Participant Net Savings (MWh/Yr)	NPSO (MWh/Yr)	Total Net Savings (MWh/Yr)	NTG Ratio
Efficient Products	0	0	0	-1,747	-1,747	-59%
Smart Thermostats	0	0	0	-1,807	-1,807	-48%
Energy Efficiency Kits	0	214	164	-1,932	-1,768	-37%
Heating and Cooling	0	12,532	11,727	16,040	27,767	35%
Lighting	0	0	0	-793	-793	-2%
Home Energy Reports	0	0	0	0	0	0%
CommunitySavers	0	0	0	0	0	0%
Residential Total	**0**	**12,746**	**11,891**	**9,761**	**21,652**	**8%**
BizSavers Total	**0**	**0**	**0**	**0**	**0**	**0%**
Portfolio Total	**0**	**12,746**	**11,891**	**9,761**	**21,652**	**5%**

Auditor savings components which differ from Evaluator savings components

Table 5 Evaluator *less* Staff - Energy Savings

Program	Ex Ante Gross Savings (MWh/Yr)	Ex Post Gross Savings (MWh/Yr)	Participant Net Savings (MWh/Yr)	NPSO (MWh/Yr)	Total Net Savings (MWh/Yr)	NTG Ratio
Efficient Products	0	0	0	-155	-155	-5%
Smart Thermostats	0	0	0	-308	-308	-8%
Energy Efficiency Kits	0	214	164	-613	-449	-12%
Heating and Cooling	0	12,532	11,727	14,205	25,932	30%
Lighting	0	0	0	-3,368	-3,368	-9%
Home Energy Reports	0	0	0	0	0	0%
CommunitySavers	0	0	0	0	0	0%
Residential Total	**0**	**12,746**	**11,891**	**9,761**	**21,652**	**8%**
BizSavers Total	**0**	**0**	**0**	**0**	**0**	**0%**
Portfolio Total	**0**	**12,746**	**11,891**	**9,761**	**21,652**	**5%**

Staff Change Request savings components which differ from Evaluator savings component

EXHIBIT C

ex-ante gross savings: annualized savings reported by Ameren Missouri, or calculated using tracked program activity and the Ameren Missouri TRM savings values

ex-post gross savings: annualized savings calculated and provided by the evaluation team

ex-post net savings: ex-post gross savings *minus* free ridership *plus* participant spillover *plus* non-participant spillover

free ridership: program participants who would have implemented a program measure or practice in the absence of the program

like spillover: program-induced actions participants make outside the program that are of the same type as those made through the program

market effects: a change in the structure of a market or the behavior of participants in a market that is reflective of an increase in the adoption of energy efficiency products, services, or practices and is causally related to market intervention(s)

net-to-gross ratio (NTG): ex-post net savings divided by ex-post gross savings

non-participant spillover (NPSO): additional energy savings that are achieved when a nonparticipant implements energy efficiency measures or practices as a result of the program's influence but is not accounted for in program savings

participant spillover: additional energy savings that are achieved when a program participant—as a result of the program's influence—installs energy efficiency measures or practices outside the efficiency program after having participated

unlike (or non-like) spillover: energy efficiency actions participants make outside the program that are unlike program actions but that are influenced in some way be the program

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of Union Electric Company d/b/a Ameren Missouri's 2nd Filing to Implement Regulatory Changes in Furtherance of Energy Efficiency as allowed by MEEIA	))))	**File No. EO-2015-0055**

AFFIDAVIT

State of Missouri)
) ss.
County of Cole)

COMES NOW Brad Fortson and on his oath declares that he is of sound mind and lawful age; that he contributed to the attached Recommendation; and that the same is true and correct according to his best knowledge and belief.

Further the Affiant sayeth not.

Brad Fortson

Brad Fortson

JURAT

Subscribed and sworn before me, a duly constituted and authorized Notary Public, in and for the County of Cole, State of Missouri, at my office in Jefferson City, on this 14th day of August, 2017.

Dianna L. Vaught

NOTARY PUBLIC

DIANNA L. VAUGHT
Notary Public - Notary Seal
State of Missouri
Commissioned for Cole County
My Commission Expires: June 28, 2019
Commission Number: 15207377

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of Union Electric Company d/b/a Ameren Missouri's 2nd Filing to Implement Regulatory Changes in Furtherance of Energy Efficiency as allowed by MEEIA	))))	**File No. EO-2015-0055**

AFFIDAVIT

State of Missouri)
) ss.
County of Cole)

COMES NOW J Luebbert and on his oath declares that he is of sound mind and lawful age; that he contributed to the attached Recommendation; and that the same is true and correct according to his best knowledge and belief.

Further the Affiant sayeth not.

J Luebbert

JURAT

Subscribed and sworn before me, a duly constituted and authorized Notary Public, in and for the County of Cole, State of Missouri, at my office in Jefferson City, on this 14th day of April, 2017.

Dianna L. Vaught
NOTARY PUBLIC

DIANNA L. VAUGHT
Notary Public - Notary Seal
State of Missouri
Commissioned for Cole County
My Commission Expires: June 28, 2019
Commission Number: 15207377

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of Union Electric Company d/b/a Ameren Missouri's 2nd Filing to Implement Regulatory Changes in Furtherance of Energy Efficiency as allowed by MEEIA	))))	**File No. EO-2015-0055**

AFFIDAVIT

State of Missouri)
) ss.
County of Cole)

COMES NOW John A. Rogers and on his oath declares that he is of sound mind and lawful age; that he contributed to the attached Recommendation; and that the same is true and correct according to his best knowledge and belief.

Further the Affiant sayeth not.

John A Rogers
John A. Rogers

JURAT

Subscribed and sworn before me, a duly constituted and authorized Notary Public, in and for the County of Cole, State of Missouri, at my office in Jefferson City, on this 14th day of April, 2017.

Dianna L. Vaught
NOTARY PUBLIC

DIANNA L. VAUGHT
Notary Public - Notary Seal
State of Missouri
Commissioned for Cole County
My Commission Expires: June 28, 2019
Commission Number: 15207377