

*Exhibit No.:*  
*Issue(s):* *Net Throughput*  
*Disincentive, Net*  
*Margin Rates,*  
*EM&V, Rebound*  
*Effect*  
*Witness:* *Hari K. Poudel, PhD*  
*Sponsoring Party:* *MoPSC Staff*  
*Type of Exhibit:* *Rebuttal Testimony*  
*Case Nos.:* *EO-2023-0136*  
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**MISSOURI PUBLIC SERVICE COMMISSION**

**INDUSTRY ANALYSIS DIVISION**

**TARIFF/RATE DESIGN DEPARTMENT**

**REBUTTAL TESTIMONY**

**OF**

**HARI K. POUDEL, PhD**

**UNION ELECTRIC COMPANY,  
d/b/a AMEREN MISSOURI**

**Case No. EO-2023-0136**

*Jefferson City, Missouri*  
*April 2024*

1 **REBUTTAL TESTIMONY**

2 **OF**

3 **HARI K. POUDEL, PhD**

4 **UNION ELECTRIC COMPANY,**  
5 **d/b/a AMEREN MISSOURI**

6 **CASE NO. EO-2023-0136**

7 Q. Please state your name and business address.

8 A. My name is Hari K. Poudel, and my business address is P.O. Box 360,  
9 Jefferson City, Missouri, 65102.

10 Are you the same Hari K. Poudel that provided direct testimony in this case?

11 A. Yes.

12 **EXECUTIVE SUMMARY**

13 Q. What is the purpose of your rebuttal testimony?

14 A. The purpose of my rebuttal testimony is to respond to four different issues  
15 related to Ameren Missouri's direct testimonies. First, my testimony will respond to Ameren  
16 Missouri's Net Throughput Disincentive ("NTD") proposal discussed in the Missouri Energy  
17 Efficiency Investment Act ("MEEIA") 2025-27 Plan application. I will provide my firm  
18 support to Staff witness Sarah L. K. Lange that Ameren Missouri's NTD calculation  
19 mechanism is unlawful due to changes in circumstances that have occurred since Ameren  
20 Missouri's third MEEIA cycle. Second, I will respond to the net marginal rate analysis  
21 performed by Ameren Missouri using different energy reduction assumptions. Third, I will  
22 respond to Ameren Missouri's Evaluation, Measurement & Verification ("EM&V") process.  
23 Finally, I will discuss the rebound effect, which has been ignored by Ameren Missouri since  
24 the beginning of the first MEEIA cycle.

1 **Net Throughput Disincentive**

2 Q. Does the accuracy of the NTD calculation depend on the accuracy of the  
3 energy savings estimates?

4 A. Yes. The existing NTD calculation depends on the energy savings estimates  
5 of Ameren Missouri's Technical Resource Manual ("TRM") with Net-to-Gross<sup>1</sup> ("NTG")  
6 ratio as reported by Ameren Missouri's evaluators. The evaluators are the third-party vendors  
7 selected by Ameren Missouri to perform an evaluation of the MEEIA programs. The  
8 accuracy of the NTD is directly related to the accuracy and reliability of both the TRM and  
9 the evaluation; the less accurate the TRM is, the less accurate the NTD calculation mechanism  
10 and any resulting evaluations will be.

11 Q. Does the current MEEIA application provide any updates on the existing NTD  
12 calculation mechanism?

13 A. No. The current Ameren Missouri MEEIA application provides the historical  
14 NTD calculation mechanism that does not account for the differences in net-margin rates that  
15 are likely to occur with increasing customers taking service under Time-of-Use ("TOU")  
16 rate structures.

17 Q. Is there a need to change the existing NTD mechanism in the context of the  
18 widespread use of TOU rate structures?

19 A. Absolutely.

20 Q. Why do you think that it is necessary to change the existing NTD mechanism?

21 A. It is important to consider how TOU rate differentials will impact the NTD  
22 calculation mechanism. Most Ameren Missouri residential customers are on a rate plan where  
23 total monthly usage defines the majority of the energy charge, but a time-based overlay that

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<sup>1</sup> The NTG ratio is what established the amount of savings that are attributable to utility programs.  
NTG Ratio = 1- free ridership ratio + Spillover ratio.

1 is dependent on the time of day that energy is used is also included on a customer's bill.  
2 Therefore, both total usage and time of energy consumption must be considered under  
3 the NTD calculation mechanism as used in MEEIA Cycles 2 and 3 going forward. Precision  
4 in measurement is crucial due to the impact on all ratepayers as the NTD is recovered through  
5 the Energy Efficiency Investment Charge (Staff witness Ms. Lange states that if the energy  
6 sales avoided due to a program cannot be measured and verified, then the energy savings  
7 assumed from that program should not be included in an NTD calculation mechanism.<sup>2</sup> As I  
8 described more thoroughly in my direct testimony, the current NTD calculation mechanism  
9 lacks the granularity that is necessary to account for TOU rate structures. Modifying  
10 the NTD, Net Marginal Rate ("NMR"), and the TRM (energy savings estimates) to account  
11 for these differences by measure and by rate code would create a level of complexity that may  
12 make the NTD calculation mechanism unusable. Therefore, a different avoided revenue  
13 mechanism should be used than in the past.

14 Q. Why should a different avoided revenue mechanism be used?

15 A. A different avoided revenue calculation mechanism is necessary because the  
16 existing mechanism does not appropriately account for differences in the timing of expected  
17 reductions within a given day, season, and year, as well as the time period within a given day  
18 that reduction will persist. Staff witness Ms. Lange explains the mechanism in her direct  
19 testimony.<sup>3</sup>

20 Q. Did you provide a detailed explanation in your direct testimony regarding the  
21 timing of energy savings throughout the day and how it affects the value of NTD dollars?

22 A. Yes. My analysis demonstrates that the timing of energy savings throughout  
23 the day is associated with varying NTD dollar values.<sup>4</sup>

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<sup>2</sup> See Staff witness Ms. Lange's direct testimony on Page 29.

<sup>3</sup> See Staff witness Ms. Lange's direct testimony on Pages 24-28.

<sup>4</sup> See Staff witness Poudel's direct testimony, Lines 6-20 on Page 6; Lines 1-3 on Page 7.

1 **Net Marginal Rate (“NMR”) Analysis**

2 Q. Does Ameren Missouri’s existing NMR analysis isolate the profile of reduced  
3 energy sales to calculate the NMR by measure?

4 A. No. Prior to the widespread use of time-based rates, reduced energy sales by  
5 class and by month were the key drivers of the NMR. Ameren Missouri’s NMR calculation  
6 to date has relied on the relationship between monthly customer usage and the block where  
7 the usage falls in a given month, ignoring the differential rate structure of the time-based rate.  
8 The existing NMR analysis should consider the time of day that an individual customer  
9 uses energy.<sup>5</sup>

10 Q. In what way does Ameren Missouri perform NMR analysis?

11 A. Ameren Missouri uses NMR (\$/kWh)<sup>6</sup> values for each applicable Service  
12 Classification and by End Use Category, by calendar month where applicable. The product  
13 of the appropriate NMR and net monthly energy savings from measure installations in a given  
14 month is then included in the calculation of the NTD.

15 Q. Based on the current MEEIA application, is Ameren Missouri going to include  
16 net marginal rate analysis by the time-of-use rate structures?

17 A. No. Ameren Missouri has multiple active rate schedules with different energy  
18 charges per kWh within each rate class; however, the net marginal rate has not been calculated  
19 for multiple active rate schedules by the time-of-use rate structures. The net marginal rate  
20 has been provided in prior general rate cases and proposed by Ameren Missouri in this case  
21 by rate class and month, but not by the time-of-use rate structures. The Company uses three

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<sup>5</sup> See Staff witness Poudel’s direct testimony, Lines 3-13 on Page 5; Lines 15-23 on Page 5; Lines 5-11 on Page 9.

<sup>6</sup> The marginal rate is the retail price of a unit of energy not sold due to Ameren Missouri’s facilitation of customer-funded demand-side programs. The net marginal rate is the difference between the wholesale cost of the energy for a given kWh sold at retail and the marginal retail rate for that kWh of energy. The calculation of the NTD is dependent on the accuracy of the marginal rate calculation, which is dependent on the accuracy of the profile of the avoided sales estimate.

1 assumptions (1%, 5%, and 10%) to simulate the effects of various energy efficient measures.

2 Given the widespread adoption of time-based rates, the existing marginal rate analysis

3 assumptions for the 1%, 5%, and 10% energy reduction scenarios are inappropriate.

4 Q. Given the widespread adoption of time-based rates, why do you think that the  
5 existing marginal rate analysis assumptions are inappropriate?

6 A. Ameren Missouri's marginal rate analysis to date has relied on the relationship  
7 between monthly customer usage and the block where the usage falls in a given month.  
8 Under NMR analysis, a customer's usage was reduced by 1%, 5%, and 10%. However, usage  
9 reduction scenarios are not appropriate to determine corresponding reductions in billing  
10 demands in the context of the widespread use of time-based rates. In time-based rate  
11 structures, the price of the last kWh consumed depends on the type of rate and the time period  
12 where energy reductions occur, rather than the monthly usage reduction alone. Ameren  
13 Missouri's current time-based rate structure includes both a low-differential and a  
14 high-differential design in which the energy charge will vary by the time of the day that the  
15 energy is used (On-Peak or Off-Peak), and the season (Summer or Winter). On-peak prices  
16 are higher and off-peak prices are lower than they would be for a flat rate, based on season,  
17 day of week, and time of day.

18 Q. What are the key drivers of the NMR calculation in the current  
19 MEEIA application?

20 A. Assumed reductions of energy sales by class and by month are the key drivers  
21 of NMR analysis in the current MEEIA application. However, it will be more important to  
22 isolate the profile of reduced energy sales to calculate the NMRs by an energy  
23 efficient measure.

24 Q. Why is it important to isolate the profile of reduced energy sales to  
25 calculate NMRs by an energy efficient measure?

1           A.     The size of the impact of the reduced energy sales due to the energy efficient  
2 measure should be quantified for each measure separately because the marginal reduction of  
3 energy sales depends on the timing of loads.<sup>7</sup> For instance, under a block rate structure, some  
4 customers (Customer type A) will be billed for the usage at the first block rate, while others  
5 (Customer type B) will have a combination of the first block and the second block rate in a  
6 given month. The avoided revenue that occurs if customer type A uses an energy efficient  
7 measure and the avoided revenue that occurs if customer type B uses the same measure will  
8 be different because the rate for first block usage differs from the rate for second block usage,  
9 typically by a few cents. However, Ameren Missouri’s existing NMR calculation does not  
10 isolate the impact of reduced energy sales from TOU rate structures. Therefore, the existing  
11 calculation mechanism does not work for the TOU rate structures. Ameren Missouri’s  
12 MEEIA application needs to have more granular data going forward that does not currently  
13 exist in the NMR calculation. With a TOU rate structure, the rate differential no longer occurs  
14 based primarily upon the total energy usage in a given month by rate class but rather the time  
15 of day that an individual customer uses energy. The use of the existing NMR in NTD  
16 calculation increases the likelihood of overcharging customers or undervaluing a utility has  
17 lost revenues. Therefore, the current MEEIA application requires separate NMRs by  
18 rate code.

19 **Evaluation, Measurement & Verification (“EM&V”)**

20           Q.     Does Ameren Missouri fully rely on an independent third-party evaluator to  
21 assess the effectiveness of MEEIA programs?

22           A.     Yes. In responses to Staff data requests (“DR”) MPSC0110 and  
23 DR MPSC0124, Ameren Missouri states that independent third-party evaluators assess the  
24 effectiveness of MEEIA programs.

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<sup>7</sup> <https://live-etabiblio.pantheonsite.io/sites/default/files/enrgy-srcs-avoid-cost-ds-plan.pdf>

1 Q. Does Staff have access to raw data, statistical analyses, and samples used by  
2 third-parties in this filing?

3 A. To some extent. Staff has very limited access to raw data, statistical analyses,  
4 and samples used by third-parties while assessing the effectiveness of MEEIA programs. For  
5 example, Appendix F<sup>8</sup> is constructed of thousands of assumptions and many of them are  
6 either unreasonable, or hardcoded values without support.<sup>9</sup>

7 Q. Did Staff ask Ameren Missouri to provide all necessary information to assess  
8 the effectiveness of MEEIA programs?

9 A. Yes. Staff's DR MPCS0124 asked Ameren Missouri to provide all  
10 workpapers, citations, links, formulas, and associated appendices in support of  
11 Ameren Missouri's application. Unfortunately, Ameren Missouri did not provide much  
12 information on the EM&V. This information is expected and needed to assess the  
13 effectiveness of MEEIA programs. Since EM&V results are based on the TRM, a complete  
14 and concrete information is necessary to verify the energy efficiency savings estimates.  
15 However, Ameren Missouri's TRM includes thousands of assumptions used to calculate  
16 energy and demand savings for hundreds of energy efficient measures, including many that  
17 Ameren Missouri states it does not intend to implement.<sup>10</sup> Measures that are not intended to  
18 be implemented could result in additional resources and time being required by Staff to search  
19 for other information within extensive TRM.

20 Q. As discussed by Ameren Missouri in its current MEEIA application, the  
21 prospective evaluation approach<sup>11</sup> in this filing emphasizes cost reduction for implementers  
22 due to the low risks from evaluation. Do you agree?

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<sup>8</sup> EO-2023-0136 Item 31.

<sup>9</sup> EO-2023-0136 Rebuttal Testimony of Staff witness J Luebbert.

<sup>10</sup> Part of Ameren Missouri's response to Staff DR 0124 states, "It is important to note that some measures in the Ameren Missouri TRM are not used in our programs, and many have very minimal impacts on the total portfolio savings."

<sup>11</sup> MEEIA 2025-27 Plan Page 55.



1           A.     No. It is not justifiable to shift the entire burden of non-performance in energy  
2 efficiency from implementers and contractors to ratepayers. The non-performance in energy  
3 efficiency could overestimate energy savings, which could lead to increased costs for  
4 ratepayers or decreased cost-effectiveness. The performance of an energy efficiency program  
5 is not limited to the amount of energy reductions, but also to the benefits to all ratepayers  
6 achieved through MEEIA programs. However, the prospective evaluation approach  
7 introduces safeguards to Ameren Missouri's MEEIA program implementers rather than the  
8 ratepayers that will fund the programs. Evaluation of realized ratepayer benefits would  
9 provide a more meaningful opportunity for the Commission to review whether or not the  
10 statutory requirement that a MEEIA portfolio be beneficial to all customers in the customer  
11 class in which the programs are proposed, regardless of whether the programs are utilized by  
12 all customers, has been satisfied. Staff witness Ms. Lange's rebuttal testimony provides a  
13 detailed explanation of whether retrospective EM&V is "punitive" to implementers.

14           Q.     In a response to DR MPSC0124, Ameren Missouri states that:

15                     The evaluators make updates to measures most impactful to the  
16 program savings and use their professional judgment to update actual  
17 inputs from field data they obtain through the programs being  
18 evaluated along with their experience in updating other TRM's across  
19 the country.

20           What is your opinion of Ameren Missouri's approach to reporting evaluated savings data?

21           A.     As an economist, I am hesitant to just depend on subjective information to  
22 create expert opinions for the Commission. A multimillion-dollar project should rely on  
23 robust data that can offer an empirical foundation for assessing the efficacy of MEEIA  
24 activities. Staff witness J Luebbert's rebuttal testimony also explains that the current MEEIA  
25 application appears to be somewhat voluminous, but lacks support for key assumptions.  
26 Additionally, the application includes a lack of details necessary to fully evaluate the impact  
27 that the plan will have on ratepayers.

1 Q. Do other Staff witnesses discuss EM&V?

2 A. Yes. Staff witnesses Brad Fortson, J Luebbert, Justin Tevie, and  
3 Sarah L. K. Lange discuss the EM&V process.

4 Q. What is one of the key elements of EM&V?

5 A. A key element<sup>12</sup> of an EM&V involves the estimation of net energy savings  
6 that account for free-ridership<sup>13</sup> and spillover.<sup>14</sup>

7 Q. What are net energy savings?

8 A. Savings that are adjusted for evaluation factors are the net savings. In other  
9 words, the total change in energy consumption and demand that is attributable to an energy  
10 efficiency program can be referred to as the net energy savings.<sup>15</sup> This change may include  
11 the effects of free-ridership and spillover.

12 Q. How are net energy savings for Ameren Missouri's current MEEIA  
13 portfolio determined?

14 A. NTG ratios are important in determining the net energy savings attributable to  
15 the MEEIA programs. This ratio is applied to gross program savings to determine the  
16 program's net impact in the current MEEIA application.

17 Q. Why should the Commission be concerned about the NTG ratios proposed by  
18 Ameren Missouri?

19 A. Ameren Missouri uses NTG ratio in both NTD<sup>16</sup> and Earning Opportunity<sup>17</sup>  
20 ("EO") calculations in the existing MEEIA application. The accuracy of the NTG ratios

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<sup>12</sup> See Staff witness Poudel's direct testimony Lines 9-15 on page 11.

<sup>13</sup> A program participant who would have implemented the program measure or practice in the absence of the program.

<sup>14</sup> Spillover refers to additional reductions in energy consumption or demand due to program influences beyond

<sup>15</sup> Li, Michael; Haeri, Hossein; Reynolds, Arlis. (2017). Chapter 1: Introduction. The Uniform Methods Project: Methods for Determining Energy-Efficiency Savings for Specific Measures. Golden, CO; National Renewable Energy Laboratory. NREL/SR-7A40-68557.

<http://www.nrel.gov/docs/fy17osti/68557.pdf>.

<sup>16</sup> MEEIA 2025-27 Plan Page 71.

<sup>17</sup> MEEIA 2025-27 Plan Page 73

1 provide important information when the Commission determines whether a utility is receiving  
2 verifiable efficiency savings.<sup>18</sup> As described by Staff witness Mark Kiesling, federal funds  
3 for energy efficiency measures may drive free-ridership of various MEEIA programs.  
4 Therefore, it is important to examine the accuracy of free-ridership and spillover of the NTG  
5 ratios to properly evaluate the effectiveness of various energy efficiency measures. NTG  
6 ratios have an impact on the net savings and cost effectiveness of energy efficiency measures.

7 Q. Did Ameren Missouri show its work regarding the calculation of the NTG  
8 ratios included in their workpapers?

9 A. In a response to DR MPSC0081, Ameren Missouri states that NTG ratios were  
10 estimated by bidders and there were no workpapers to support their calculation to the Staff.

11 Q. Are you concerned about the staff's inability to assess the NTG  
12 ratio calculation?

13 A. Yes. Staff would like to review the typical methodology used by  
14 Ameren Missouri's bidders in NTG ratio calculation in order to provide a recommendation  
15 on the appropriateness of the calculations to the Commission. The NTG ratio is one of the  
16 important factors used in the NTD calculation and EO, which ultimately affects both  
17 Ameren Missouri and ratepayers. The staff's limited capacity to analyze the NTG calculation  
18 precluded them from verifying whether the energy savings indicated by bidders were  
19 overestimated or underestimated.

20 **Rebound effect**

21 Q. In your direct testimony you described the rebound effect<sup>19</sup> of energy  
22 efficiency measure installations. Does Ameren Missouri's MEEIA application address the  
23 rebound effect in its energy or demand savings estimates?

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<sup>18</sup> Surrebuttal Testimony of Staff witness Michael Stahlman, EO-2012-0009, Lines 17-19 on Page 3.

<sup>19</sup> The rebound effect is generally understood as a response to improved energy efficiency in which potential energy savings from efficiency improvements are partially offset by increased consumption of energy services.

1 A. No.

2 Q. What is the rebound effect?

3 A. The rebound effect is generally understood as a response to improved energy  
4 efficiency, in which potential energy savings from efficiency improvements are partially  
5 offset by increased consumption of energy services.<sup>20</sup>

6 Q. Does existing literature support including the rebound effect in energy  
7 efficiency effectiveness studies?

8 A. Yes.

9 Q. Please discuss existing literature supporting the rebound effect in the energy  
10 efficiency effectiveness studies.

11 A. Energy consumers tend to use more energy due to economic benefits from  
12 efficiency improvements; thus, the actual energy savings will be smaller than expected. There  
13 is a general perception that energy efficiency improvements are associated with lower energy  
14 consumption. Stanley Jevons<sup>21</sup> introduced the concept of energy rebound more than 150  
15 years ago, stating that anticipated energy efficiency savings may be “taken back” by  
16 behavioral responses. Jevons’s concern has been reinforced by a growing body of literature  
17 that estimates the size of the rebound effect in residential and industrial sectors. The  
18 following studies provide strong support for including the rebound effect in the energy  
19 efficiency effectiveness studies.

20 Messenger et al. (2010)<sup>22</sup> recommended including the rebound effect in the  
21 evaluation, measurement, and verification approaches because the current evaluation,  
22 measurement, and verification approaches are incomplete and thus inaccurate for modeling

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<sup>20</sup> See Staff witness Poudel’s direct testimony on page 15.

<sup>21</sup> Jevons, W. S. (1866). *The coal question; an inquiry concerning the progress of the nation and the probable exhaustion of our coal-mines.* Macmillan.

<sup>22</sup> Messenger et al. (2010). *Review of Evaluation, Measurement and Verification Approaches Used to Estimate the Load Impacts and Effectiveness of Energy Efficiency Programs* (osti.gov).

1 energy efficiency savings. The authors have made this recommendation based on the  
2 information on energy efficiency evaluation practices and issues from 14 selected states and  
3 a regional energy efficiency organization.<sup>23</sup>

4 Berkhout et al. (2000)<sup>24</sup> empirical evidence shows that the rebound effect is  
5 between 0 and 15%. Similarly, Nadel (2012)<sup>25</sup> also provides evidence of the impact of the  
6 rebound effects, which are generally about 20%. The remaining 80% of the savings from  
7 energy efficiency programs are attributed to the reduced energy use.

8 All of the above studies have found that there is a rebound effect from the energy  
9 efficiency measures. This is an important issue today. However, Ameren Missouri's current  
10 MEEIA application does not consider the rebound effect in its energy savings estimation.

11 Q. Do you agree with the Office of the Public Counsel ("OPC") witness's  
12 Dr. Geoff Marke position on the rebound effect?

13 A. Yes. OPC's witness Dr. Marke believes that "the rebound effect is a very real  
14 phenomenon. It is also something that has not been properly factored into any EM&V study  
15 in Missouri to date." Therefore, real-world data on these issues would be useful.

16 Q. Do you agree with OPC's witness Dr. Marke's proposal or recommendation  
17 to the Commission on this rebound effect?

18 A. Yes. In energy efficiency literature, some analysts raise questions about the  
19 rebound effect, arguing that it is a major factor that needs to be accounted for when analyzing  
20 energy efficiency programs. Mr. Nadel<sup>26</sup> states that:

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<sup>23</sup> Fourteen states include California, Connecticut, Florida, Idaho, Illinois, Iowa, Maine, Massachusetts, Minnesota, New York, Oregon, Pennsylvania, Texas, and Wisconsin. The organization is Northwest Energy Efficiency Alliance

<sup>24</sup> Berkhout, P. H., Muskens, J. C., & Velthuisen, J. W. (2000). Defining the rebound effect. *Energy Policy*, 28(6-7), 425-432. <https://www.sciencedirect.com/science/article/abs/pii/S0301421500000227>

<sup>25</sup> Nadel, S. (2012). The Rebound Effect: Large or Small? An ACEEE White Paper. <https://www.aceee.org/files/pdf/white-paper/rebound-large-and-small.pdf>.

<sup>26</sup> Nadel, S. (2012). The Rebound Effect: Large or Small? An ACEEE White Paper. <https://www.aceee.org/files/pdf/white-paper/rebound-large-and-small.pdf>.

1                   there are both direct and indirect rebound effects, but these tend to be  
2                   modest. Direct rebound effects are generally 10% or less. Indirect  
3                   rebound effects are less well understood, but the best available estimate  
4                   is somewhere around 11%. These two types of rebound can be  
5                   combined to estimate the total rebound at about 20%.

6                   Lutzenhiser et al. (2010)<sup>27</sup> notes that current modeling techniques are insufficient in  
7                   explaining real world energy use, in part because they generally fail to take behavior  
8                   [rebound] into account.

9                   Q.       What are the most plausible estimates of the size of the direct rebound effect?

10                  A.       The rebound effect literature attempts to estimate the direct rebound effects  
11                  for specific energy efficiency programs and policies. Many of these are evaluations of  
12                  individual programs. The existing literature indicates that direct rebound effects will  
13                  generally be about 10% or less.<sup>28</sup>

14                  Q.       Does Staff agree with OPC's witness, Dr. Marke?

15                  A.       Staff agrees with OPC's witness Dr. Marke that:

16                               an across-the-board 10% reduction in energy savings be applied to any  
17                               future EM&V filings to account for the rebound effect or that future  
18                               EM&V studies specifically analyze the rebound effect for households  
19                               participating in the EM&V report.

20  
21                  Q.       What effect does exclusion of consideration of rebound effect have on  
22                  Ameren Missouri's application?

23                  A.       Reducing energy consumption due to energy efficiency has been discussed in  
24                  the existing literature in the form of the rebound effect. The literature demonstrates that the  
25                  failure to take account of rebound effects could contribute to shortfalls in the assessment of  
26                  the contribution that energy efficiency can realistically make. To put it another way, the

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<sup>27</sup> Lutzenhiser, L., Moezzi, M., Hungerford, D., & Friedmann, R. (2010). Sticky points in modeling household energy consumption.

<sup>28</sup> Bento, A. M., Gillingham, K., Jacobsen, M. R., Knittel, C. R., Leard, B., Linn, J., McConnell, V., Rapson, D., Sallee, J. M., van Benthem, A. A., & Whitefoot, K. S. (2018). Flawed analyses of U.S. auto fuel economy standards. *Science*, 362(6419), 1119–1121.

1 exclusion of the rebound effect could lead to overstating the energy efficiency savings'  
2 estimation in the existing MEEIA application. Empirically, the exclusion of the rebound will  
3 result in a substantial overestimation of the net benefits and lost margins.

4 Q. How should the rebound effect be addressed in the existing MEEIA  
5 application?

6 A. Since the rebound effect is typically measured as a percentage of the potential  
7 energy savings, Staff recommends using 10% reduction in energy savings estimations in  
8 the TRM.

### 9 **Recommendations and Conclusions**

10 Q. What are your recommendations?

11 A. Staff witnesses recommend that Commission not approve the current MEEIA  
12 application. The Commission should not approve the multimillion-dollar application without  
13 taking into account the following recommendations.

14 (1) Net Throughput Disincentive: The introduction of larger quantities of customers being  
15 served under rate schedules with rate differentials that occur during the course of a single day  
16 (and that vary by the day of the week) will affect the actual avoided marginal revenues more  
17 than those assumed in the traditional block structure. The mechanism currently in use  
18 requires dozens of margin rate calculations. Therefore, I strongly support Staff witness  
19 Sarah L. K. Lange's mechanism to calculate NTD, as she discussed in detail in her direct  
20 testimony. Staff witness Ms. Lange explains that a different mechanism should be used, in  
21 part because the NTD mechanism used in MEEIA Cycles 2 and 3 is unworkable today.  
22 I would recommend that both the total energy usage and time of energy consumption be  
23 considered under the NTD design as used in MEEIA Cycles 2 and 3.

24 (2) Net Marginal Rate Analysis: The implementation of time-based rate structures leads to a  
25 significant increase in the number of measure-specific net margin rates for use under the

1 mechanism designed in 2014. In time-based rate structures, the price of the last kWh  
2 consumed depends on the type of the rates rather than any of the three scenarios (1%, 5%,  
3 or 10% customers' bill usage reductions), as discussed earlier. The size of the impact of the  
4 avoided energy sales due to the energy efficient measure should be analyzed for each measure  
5 separately in order to estimate NMRs. Therefore, additional granularity in NMRs rates  
6 is necessary.

7 (3) EM&V Process: All Staff witnesses argue that Ameren's EM&V process solely depends  
8 on the third-party evaluators without having a thorough oversight of the evaluation process,  
9 sample selection, sample size, and response rate. EM&V is important for all measures, and  
10 the ability to conduct reasonably reliable EM&V should be considered in designing all  
11 programs. If the energy sales avoided due to a program cannot be measured and verified  
12 empirically, then the energy savings assumed from that program should not be included in  
13 an NTD calculation mechanism.

14 (4) Rebound Effect: Ameren Missouri should consider the rebound effect's impact on energy  
15 savings in the current MEEIA application and moving forward. The significance is that  
16 excluding rebound can result in substantially overestimated net benefits and lost margins.  
17 Therefore, Staff recommends using 10% reduction in energy savings estimations in the TRM.

18 Q. Does this conclude your testimony?

19 A. Yes. It does.



**BEFORE THE PUBLIC SERVICE COMMISSION**

**OF THE STATE OF MISSOURI**

In the Matter of Union Electric Company d/b/a )  
Ameren Missouri's 4<sup>th</sup> Filing to Implement ) Case No. EO-2023-0136  
Regulatory Changes in Furtherance of Energy )  
Efficiency as Allowed by MEEIA )

**AFFIDAVIT OF HARI K. POUDEL, PhD**

STATE OF MISSOURI )  
 ) ss.  
COUNTY OF COLE )

**COMES NOW HARI K. POUDEL, PhD**, and on his oath declares that he is of sound mind and lawful age; that he contributed to the foregoing *Rebuttal Testimony of Hari K. Poudel, PhD*; and that the same is true and correct according to his best knowledge and belief.

Further the Affiant sayeth not.



\_\_\_\_\_  
**HARI K. POUDEL, PhD**

**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 23<sup>rd</sup> day of April 2024.

D. SUZIE MANKIN  
Notary Public - Notary Seal  
State of Missouri  
Commissioned for Cole County  
My Commission Expires: April 04, 2025  
Commission Number: 12412070

  
\_\_\_\_\_  
Notary Public