Exhibit No.: _____
Issue(s): Redistribution: Winners & Losers/ Avoided Costs/The Principal-Agent Problem: HVAC Contractors/The Rebound Effect/Duplicative Funding & Attribution: The Inflation Reduction Act (IRA)/ Demand Response & Aggregators of Retail Choice ("ARCS")/Rate Design: Fixed Cost Recovery & Time of Use Rates/Building Energy Codes & Standards
Witness/Type of Exhibit: Marke/Direct
Sponsoring Party: Public Counsel
Case No.: EO-2023-0136

DIRECT TESTIMONY

OF

GEOFF MARKE

Submitted on Behalf of the Office of the Public Counsel

UNION ELECTRIC COMPANY
D/B/A AMEREN MISSOURI

CASE NO. EO-2023-0136

March 1, 2024

TABLE OF CONTENTS

Testimony	Page
Introduction	1
Redistribution: Winners & Losers	2
Avoided Costs	6
The Principal-Agent Problem: HVAC Contractors	9
The Rebound Effect	17
Duplicative Funding and Attribution: The Inflation Reduction Act (IRA)	22
Demand Response and Aggregators of Retail Choice ("ARCs")	29
Rate Design: Fixed Cost Recovery and Time of Use Rates	34
Building Energy Codes and Standards	41

DIRECT TESTIMONY

OF

GEOFF MARKE

UNION ELECTRIC COMPANY

D/B/A AMEREN MISSOURI

CASE NO. EO-2023-0136

I. INTRODUCTION

Q. Please state your name, title and business address.

A. Geoff Marke, PhD, Chief Economist, Office of the Public Counsel (OPC or Public Counsel), P.O. Box 2230, Jefferson City, Missouri 65102.

Q. What are your qualifications and experience?

A. I have been in my present position with OPC since 2014 where I am responsible for economic analysis and policy research in electric, gas, water, and sewer utility operations.

Q. Have you testified previously before the Missouri Public Service Commission?

A. Yes. A listing of the Commission cases in which I have previously filed testimony and/or comments is attached in Schedule GM-1.

Q. What is the purpose of your direct testimony?

A. The purpose of my direct testimony is three-fold.

1.) To articulate the rationale behind demand-side management programs;

2.) to identify and explain the various challenges that have arisen in achieving the goal of implementing, cost-effective, energy efficiency investments that result in benefits to all customers regardless of participation levels; and

3.) to articulate several alternative options that either complement a traditional MEEIA portfolio or instead serve as a more cost-effective substitute.

I will be providing specific feedback on Ameren Missouri's application and its various elements in rebuttal testimony.

My silence in regard to any issue should not be construed as an endorsement of Ameren Missouri's position.

II. Redistribution: Winners & Losers

Q. What is the argument for aggressively promoting energy efficiency?

A. It is argued that it is cheaper not to produce electricity (often referred to as a "negawatt") than to produce electricity. That is, the cost per kilowatt hour (kWh) avoided due to the adoption of energy efficiency measures (i.e. a negawatt) is less than the cost that the utility incurs by having to produce the next kWh. This is typically referred to as the "avoided costs" of generation or fuel costs (or marginal cost for a utility to produce one more unit of power).

From a planning perspective, the successful promotion/adoption of energy efficiency, or demand-side management ("DSM"), could result in either early retirement of existing generation or delayed build-out of future generation, transmission, and/or distribution investment.

Q. Could you provide an analogous example?

A. Yes. The argument for energy efficiency is similar to the argument for free trade in that they both potentially lead to aggregate economy-wide benefits. However, achieving these net benefits requires some welfare redistribution leading to both winners and losers. In free trade, when a good is offered at a world price below the domestic (no-trade) price, domestic consumers benefit while domestic producers suffer. The outcome here is straightforward, consumers get to consume more of the product at a lower price, while producers with higher production costs end up producing less and receiving a lower price for what they produce.

Aggressive adoption of subsidized energy efficiency produces clear winners and losers as well. I will further explain the similarities between this free trade example and energy efficiency below.

Q. Who are the winners?

A. The winners are the consumers who adopt the efficient measures.[1]

Q. Who are the losers?

A. The losers are the utility and the nonparticipants.[2]

Q. How is the utility a loser in this outcome and how does the MEEIA law attempt to address it?

A. The utility (like the inefficient domestic producer in the free trade example) loses because it has lost revenues that it would have otherwise received under the non-MEEIA baseline of energy usage (e.g., incandescent lightbulb uses more energy than a LED lightbulb).[3]

To address the utility "loser" issue for the investor-owned utilities and encourage energy efficiency adoption where appropriate, RSMo Section 393.1075.3 of the MEEIA statute states:

> 3. It shall be the policy of the state to value demand-side investments equal to traditional investments in supply and delivery infrastructure and allow recovery of all reasonable and prudent costs of delivering cost-effective demand-side programs. In support of this policy, the commission shall:
>
> (1) Provide timely cost recovery for utilities;

[1] Participants can become losers if their utility increases its fixed charge recovery (e.g., a higher customer charge) after they have invested in energy efficiency upgrades. More assured cost recovery for a utility negates the cost savings assumptions for participants.

[2] Nonparticipants are customers who pay a MEEIA surcharge but do not invest their personal finances in ratepayer-subsidized end-use measures. They should not be confused with "opt out" customers, who are certain commercial and industrial customers who do not have to pay any MEEIA surcharge but receive the benefits of the program.

[3] There is an exception to this argument. For example, the electric utility could be a winner in this scenario if the promotion of that energy efficiency end-use induces a customer to fuel switch. For example, the adoption of an efficient geothermal heat pump enables the house to fuel their heat with electricity as opposed to natural gas or propane. In that scenario, the total kWh gains of obtaining a new customer would far outweigh the individual loss in kWh's produced from the geothermal heat pump.

(2) Ensure that utility financial incentives are aligned with helping customers use energy more efficiently and in a manner that sustains or enhances utility customers' incentives to use energy more efficiently; and

(3) Provide timely earnings opportunities associated with cost-effective measurable and verifiable efficiency savings.[4]

The earnings opportunity represents an agreed-to profit that is, in part, equivalent to what, theoretically, could be earned though a needed supply-side investment. In the free trade example, a MEEIA arrangement would be the equivalent of compensating the domestic producer so that they were unharmed (and even profited) by international trade.

Q. How are nonparticipants a loser with regard to MEEIA?

A. The nonparticipant loses because they face a higher price for service by subsidizing the MEEIA participants. Program costs, lost revenues, and an earnings opportunity are all collected through the MEEIA surcharge and are borne by ratepayers whether or not those ratepayers participate in the MEEIA programs.[5]

Participants can also lose if the utility increasingly continues to seek higher customer charges or proposes new, novel fixed charge recovery. This minimizes ratepayers' opportunity to create savings through energy efficiency upgrades. This will be addressed in greater detail later in my testimony.

Q. How does the MEEIA law attempt to address the nonparticipant loser problem?

A. To address the "loser" issue for the nonparticipant and encourage energy efficiency adoption where appropriate, RSMo Section 393.1075.4 states:

> The commission shall permit electric corporations to implement commission-approved demand-side programs proposed pursuant to this section with a goal of

[4] These three provisions (program cost recovery, lost revenue recovery, and performance incentives) are commonly referred to as the "three-legged stool" necessary for investor-owned utilities to promote robust demand-side management programs.

[5] With the exception of opt-out customers. See also footnote 2.

achieving all cost-effective demand-side savings. **Recovery for such programs shall not be permitted unless the programs are approved by the commission, result in energy or demand savings and are beneficial to all customers in the customer class in which the programs are proposed, regardless of whether the programs are utilized by all customers.** The commission shall consider the total resource cost test a preferred cost-effectiveness test. (emphasis added)

Q. What if there was widespread adoption of energy efficiency?

A. If most ratepayers adopted energy efficiency measures then numerous factors would occur that would erode the original participant's benefits relative to a case where the majority of customers do not participate. Thus, in net terms, each participant would be better off in the case where the aggregate number of participants was low. That is, in a situation where the participant can be subsidized by nonparticipants but does not have to subsidize numerous other participants and/or the utility. If most everyone is a participant then the financial savings or "pay back" of the efficient end-use investment would be smaller because the MEEIA surcharge would be larger.

Q. Have you supported MEEIA programs to date?

A. I have historically supported energy efficiency programs under the premise that the aggregate economy-wide net benefits are worth the redistribution of welfare if the adoption of programs leads to meaningful deferral of supply-side investments.[6] Even when I do not believe that is the case, I have been actively involved in this process from the beginning of MEEIA and I have done everything in my power to assist in crafting MEEIA programs that result in benefits for all customers.

Q. Are you supporting MEEIA programs moving forward for Ameren Missouri?

A. I am not supporting the presently-filed application, which I will address in greater detail in rebuttal testimony. The rest of my direct testimony will focus on both challenges and

[6] This is true even in at least one case where that premise was not entirely evident. See, e.g., Case Number ER-2016-0023 filings regarding the Pay As You Save ("PAYS") Study.

opportunities that have arisen at this point in Missouri that should help guide the Commission as it vets Ameren Missouri's application in this case. Where it is applicable, I make recommendations and/or provide the Commission with options to consider.

III. Avoided Costs

Q. What are avoided costs in the context of a MEEIA application?

A. "Avoided costs" refer to the expenses that a utility would have incurred in energy, capacity, transmission, and/or distribution if the efficiency improvements had not been made. The estimated assumed amount of savings is based on the utility's Integrated Resource Plan. These costs are essentially saved or at least deferred, because of the reduced energy consumption. In theory, and at a large enough scale, reduced energy usage should translate into reductions in environmental impacts, improved energy security, lower energy bills, and a new earning opportunity for the utility.

Q. Do you believe that has happened in practice?

A. I do not believe it has in any meaningful way. The first MEEIA cycle revolved almost entirely around compact fluorescent lamp ("CFL") lighting under a MEEIA mechanism that contained no earnings opportunity cap and a net benefit sharing mechanism that heavily favored the utility. All MEEIA meetings and dockets were contentious and the issues litigated.[7]

The second MEEIA cycle began like the first, in litigation. However, it ended with the Commission agreeing with its Staff and OPC that the proposed application was not in the public interest. Despite that ruling, Staff and OPC worked with the Company and found a mutually agreed-to design that enabled MEEIA programs to continue. One week after parties entered into a stipulation and agreement, however, Ameren Missouri's largest

[7] Barker, J. (2014) Consumer advocate disputes Ameren's energy efficiency savings. *St. Louis Post-Dispatch.* https://www.stltoday.com/business/local/consumer-advocate-disputes-ameren-s-energy-efficiency-savings/article_5dcc80fd-5e74-5df1-b9a1-ba10841bd244.html

customer, Noranda, went out of business and Ameren Missouri, which was already long on capacity was now very long on capacity. Because of the excess capacity there were no avoided supply side generation costs.

Ameren Missouri's long capacity position was still present during MEEIA cycle 3 and the three subsequent one-year extensions but each of those cases settled with large modifications to the MEEIA portfolio and an increased emphasis on demand savings.

Now we are preparing for MEEIA cycle 4 and Ameren Missouri's long capacity position has disappeared due to the loss of Meramec and expected loss of Rush Island.

Q. Does this mean we can avoid building a large natural gas-fired plant by ramping up MEEIA programs?

A. I believe that was certainly how MEEIA was sold at various points. Unfortunately, the headlines in the newspaper from the last two weeks suggest that it is likely more of the same—that there are no avoided costs occurring. Consider this announcement on February 16, 2024:

> Ameren plans to build a natural gas-fired power plant in south St. Louis County on the former site of its oldest and smallest coal plant, which closed a year ago, the company announced Thursday.
>
> The St. Louis-based electric utility said the new facility would be used as a "peaker" plant to bolster power reliability when demand is greatest — like the hottest or coldest extremes of summer and winter — **and that it could cost about $800 million**.
>
> The gas-powered plant would be called the Castle Bluff Energy Center, and sit at the confluence of the Meramec and Mississippi rivers, next to where the former Meramec Energy Center burned coal for decades. The company said its old Meramec site is an inviting and cost-effective location for **the proposed 800-**

> **megawatt project** because it already offers coveted and readymade attributes, like electric transmission access and interconnection to an existing gas pipeline.[8]

As well as this announcement on Feb. 23, 2024:

> ST. LOUIS, Feb. 23, 2024 /PRNewswire/ -- Ameren Missouri, a subsidiary of Ameren Corporation (NYSE: AEE), filed its updated Smart Energy Plan with the Missouri Public Service Commission today. **The $12.4 billion, five-year investment plan** is designed to modernize infrastructure and enhance grid reliability and flexibility.[9]

These announcements regarding large capital investments are made on top of the large capital investments (or expected investments) in the Boomtown, Huck Finn, Split Rail, Cass County, Vandalia, and Bowling Green solar farms that have either been approved or are awaiting approval from the Commission.

When a utility announces double-digit billion-dollar investments over a five-year period, I struggle to see what build-out Ameren Missouri is avoiding with another MEEIA application. I also struggle with determining how exactly customers are going to be able to shoulder both the costs of Ameren Missouri's capital investments and its MEEIA-related costs.[10]

---

[8] Gray, B. (2024) Ameren says it will build a natural gas-fired plant in St. Louis County. *St. Louis Post-Dispatch*. https://www.stltoday.com/news/local/metro/ameren-says-it-will-build-a-natural-gas-fired-plant-in-st-louis-county/article_683688ee-cc50-11ee-bc44-6fdd97d27064.html#:~:text=Ameren%20plans%20to%20build%20a,closed%20coal%2Dfired%20Meramec%20facility.&text=Ameren%20plans%20to%20build%20a%20natural%20gas%2Dfired%20power%20plant,ago%2C%20the%20company%20announced%20Thursday.

[9] PRNewswire (2024) Ameren Missouri customers benefit from investments in stronger, smarter grid. *Yahoo! Finance*. https://finance.yahoo.com/news/ameren-missouri-customers-benefit-investments-130000569.html

[10] Ameren Missouri's MEEIA application is requesting $303 million in program costs and up to $56 million in earnings opportunity. There will also be additional costs related to throughput recovery; however that amount can vary considerably depending on the performance of the program.

Q. Have you reviewed Ameren Missouri's avoided cost estimate in its filing?

A. I have but I will address that and other specific points of Ameren Missouri's application in rebuttal testimony. My purpose for providing this direct testimony, including the aforementioned information is to allow the Company ample opportunity to respond and provide a context for all of the interdependent actions in play that call into question moving forward with a "business as usual" MEEIA portfolio. With that in mind, I will now address the other confounding variables that pose significant challenges to a successful MEEIA deployment.

IV. The Principal-Agent Problem: HVAC Contractors

Q. What is the principal-agent problem?

A. The principal-agent problem refers to a situation where one person or entity (the "principal") hires another person or entity (the "agent") to act on their behalf.

The problem arises due to potential conflicts of interest between the principal and the agent, usually stemming from differing goals or information access.

Q. How is this relevant to MEEIA?

A. In many settings, misaligned incentives and inadequate monitoring lead employees to take self-interested actions. MEEIA is no exception. In the case of ratepayer-sponsored HVAC replacement programs there are several principal-agent problems that are almost assuredly resulting in energy efficiency programs overstating the savings that are actually occurring and leading to customers overpaying for their units.

In effect there are two issues at play here. The first is the perverse incentive to upsell and/or misreport the actual conditions of an HVAC system due to the fact that most contractors work on commission. Put another way, because most HVAC contractors are paid based on the amount of the sale, they are incentivized to find a problem with a customer's HVAC unit regardless of whether one exists and to recommend a larger, more expensive unit to replace it. The second issue centers on poor workmanship and/or ignorance of what actions

are necessary to ensure an efficient HVAC installation that is correctly sized and properly installed for the domicile in question. This issue leads to problems in the context of MEEIA because it means that the units may not be achieving the results attributed to them in the savings assumptions. Because asymmetric information is at the core of the principal-agent problem, it is a challenge to observe agent behavior and quantify the costs of self-interested agent (HVAC contractor) actions.[11] However, my literature review on this topic yielded support that this is indeed a problem.

Q. What support do you have for these assertions?

A. I relied on five documents as well as discussions with EM&V contractors and HVAC installation educators to inform this position. The documents I relied on are all publicly available and included here in an annotated bibliography format for ease of use with the full documents available as attachments to this testimony. The reviewed documents are as follows:

(1) Smith, Jesse (2024) Lies, Damned Lies, and Manometer Readings. *Asterisk Magazine*. https://asteriskmag.com/issues/05/lies-damned-lies-and-manometer-readings [12]

Smith is a co-owner of Tay Rivers Builders, a home remodeling company in New Jersey. His article paints a broad-brush stroke picture of a national HVAC crisis where the industry is absent uniform norms and regulations and populated by largely self-serving contractors looking to upsell equipment on commission and/or contractors that are just incapable of meeting the basic industry standards that are expected of them. Smith acknowledges that it is difficult to say how widespread the problem is, but provides an illustrative example in the

[11] That being said, a search on YouTube with the phrase "HVAC scams" reveals a plethora of news reports showing how this plays out. One such example includes a 2012 Dateline NBC episode in which a variety of HVAC contractors were called to fix what appeared to be a failing AC unit but was in fact a HVAC system that merely had a loose fuse. HVAC contractor actions ranged from honest technicians that simply pushed the fuse back at no cost to the customer to those that attempted to replace the system in its entirety. https://www.youtube.com/watch?v=fUAIBZKeK74

[12] See also GM-2

Manual J process—a process used by HVAC installers to ensure the proper size of an HVAC system to ensure accurate heat load/loss calculations. Smith states:

> One of the largest HVAC companies in New Jersey had a very effective system to streamline — and scam — this method. Rather than take measurements of each house, they would simply install whatever equipment the salesperson deemed suitable, and then after the fact submit a Manual J that matched the installed size. They did this by keeping on hand Manual J files sorted according to their capacity — 1 ton, 2 ton, etc. — and then renaming each one to fit the job site address. They might still be doing it if the company's Manual J administrator hadn't gone on vacation. The temporary replacement forgot to rename the files — exposing a practice by which the company had submitted the same handful of designs for thousands of homes.

(2) Downey, T. & J. Proctor (2002) What can 13,000 Air Conditioners Tell Us? *ACEEE*. https://www.aceee.org/files/proceedings/2002/data/papers/SS02_Panel1_Paper05.pdf [13]

With support from California's investor-owned utilities and in conjunction with their own demand-side management programs, Downey and Proctor examined performance data on more than 13,000 air conditioners on residential and commercial buildings over a two-year period in California. They based their measurements on data collected during routine installation, repair, and maintenance visits. Their research concluded that 65% of the residential systems tested required repairs, 71% of the light commercial systems tested required repairs, 57% of the systems were outside specification for refrigerant level, and 21% had inadequate airflow. Downey and Proctor began their article by pointing out that performance issues are the equivalent of having (at the time) a high performing 12 SEER air conditioner operate at a 10 SEER air conditioner level.

[13] See also GM-3

(3) Springer, David (2016) Expert Meeting Report: HVAC Fault Detection, Diagnosis, and Repair/Replacement. U.S. Department of Energy: Energy Efficiency & Renewable Energy. https://www.nrel.gov/docs/fy16osti/60987.pdf [14]

This whitepaper summarizes an HVAC summit that included academic researchers, manufacturers, educators, program managers and implementers, representatives of standards organizations, utilities, HVAC contractors, and home performance contractors who met to discuss the challenges plagued by the industry and possible solutions through the use of a uniformefault detection and diagnosis (FDD) tool to ensure HVAC units are properly operating. Springer concludes his report by summarizing the expert participants' perception that:

> The labor force that is installing new systems does not have the training to comprehend the complexity of HVAC systems, faults that can occur, and their consequences. Even if they apply correct procedures, the tools they are using may lead to incorrect charges. There is no obvious remedy for this problem.

(4) US Department of Energy (2018) Residential HVAC Installation Practices: A Review of Research Findings. https://www.energy.gov/eere/buildings/articles/residential-hvac-installation-practices-review-research-findings [15]

In response to the Springer review, the US Department of Energy commissioned this report to examine gaps and opportunities in the single-family HVAC replacement market. The report examined 44 separate studies supplemented with 17 interviews by HVAC industry experts regarding energy performance impacts due to common HVAC faults (such as equipment sizing, airflow, refrigerant charge, and duct leakage) that occurred because of poor installation and/or maintenance issues. It found:

[14] See also GM-4

[15] See also GM-5

- Duct leakage is the most common source of performance degradation of HVAC systems, with most studies finding 90-100% of systems tested needing sealing or repairs to the supply or return air ducts.

- Low airflow is found more than 50% of the time in all regions studied, while high airflow is a problem in 8-15% of systems.

- Refrigerant charge faults vary by study approach and region, but range between 29-78% undercharge and 4-50% overcharge.

- The presence of non-condensables in refrigerant lines is a potentially common fault that has not been studied extensively.

Findings across all studies revealed pervasive incidences of field performance issues—and savings opportunities—in refrigerant-based central cooling and heating systems. The report concluded that proper sizing can significantly reduce peak demand, which has benefits for the electric grid and consumers by lowering overall energy costs. However, under current industry practice, the majority of systems—especially those installed as emergency replacements—are installed without performing detailed load calculations.

(5) Blonz, Joshua (2018) The Welfare Costs of Misaligned Incentives: Energy Inefficiency and the Principal-Agent Problem. *Resources for the Future*. https://media.rff.org/documents/RFF_WP_18-28.pdf [16]

Blonz's study focused on data from two utilities, Southern California Edison ("SCE") and San Diego Gas and Electric ("SDG&E") that offered identical free low-income programs to customers between 2009 and 2012. Twenty-two contractors (eleven for each utility) were utilized during this period. The most common free upgrade was for refrigerators that were

[16] See also GM-6

identified as being older than 1992 (this date was chosen due to the efficiency gains included in 1993 models). The steps involved in the program were as follows:

1. Utility reached out to eligible households through mail or phone calls. Interested households signed up to start the enrollment process.
2. The utility gave household contact information to their contractor (who was paid a fixed fee for their service). The contractor scheduled a visit with the household to conduct a home assessment.
3. A contractor visited the household to verify that it was low income to complete the program enrollment. The contractor then assessed eligibility for refrigerator replacement and any other major upgrades.

4A. If a household was not eligible for any major upgrade, no action was taken and the contractor left.

4B. If a household was eligible for a major upgrade, the contractor provided up to five energy efficient light bulbs and scheduled a second appointment to replace the refrigerator. Contractors were incentivized $25 if 4B occurred.

5. The contractor provided the refrigerator replacement and any other major upgrades. SCE contractors were given $224 if step 5 occurred. SDG&E contractors did not receive this incentive.

While audits were conducted during the period studied, these audits were not able to prevent unqualified refrigerator replacements resulting from contractor misreporting. In particular, the utility used audits to verify that the contractors provided the replacements they billed to the program.

The audits were completed after refrigerators were replaced, too late to check the prior refrigerator's manufacture year. Program guidelines set by the regulator did not require verification of the reported manufacture year, and SCE did not implement its own

monitoring system. As a result, contractors could intentionally misreport that an ineligible household was eligible for a refrigerator replacement without much chance of being caught.

The opportunity to verify these results was presented when program guidelines changed refrigerator cut-off dates from 1992 to 1998 in 2013.

The compensation structure, combined with the lack of monitoring, created the principal-agent problem where the principal (utility) wanted the contractors to replace only qualifying refrigerators, but contractors had the incentive to misreport and provide ineligible replacements. Blonz concludes this paper with the following statement:

> In this paper, I measure the welfare costs of the principal-agent problem. In the empirical setting I study—an energy efficiency appliance replacement program—contractors intentionally misreport assessment data in order to provide unqualified refrigerator replacements and increase their compensation. This profit-seeking agent behavior has significant welfare costs: I estimate that each unqualified replacement reduces welfare by $106. In contrast, each replacement that follows program rules saves twice as much electricity and increases welfare by $60.

Q. What should the Commission note from this literature?

A. That the principal-agent problem is most likely an underreported phenomenon within ratepayer-sponsored energy efficiency programs and has almost assuredly resulted in both participants and nonparticipants paying more money and receiving fewer benefits while contractors and the utility (by default) have profited.

It also calls into question how much confidence the Commission should have that a half of a billion-dollar investment (the approximate program cost amount for this MEEIA portfolio) will actually result in the savings it claims. This is no small issue, as a failure to materialize or overstate the savings will result in future capital investment buildout.

Q. In light of these assertions, what is your recommendation?

A. I will offer up four options for consideration. Each has tradeoffs.

The first option would be to pause the MEEIA program until proper controls can be put into place to ensure that the energy efficiency measures that we are investing in are actually performing as expected. This will no doubt take time and considerable capital, if it is even possible to attempt to uniformly professionalize and quasi-regulate a separate service industry by proxy.

The second option would be the inclusion of quality control audits across Ameren Missouri's service territory for participating contractors and homes as a specific EM&V process. Historically, EM&V has emphasized attribution to limit free riders, however, an additional emphasis could be placed on identifying the scale of the principal-agent problem and then, hopefully, a plan on how to minimize it. Based on the literature discussed above, this would no doubt negatively impact the claimed savings Ameren Missouri would have otherwise hoped to obtain. It would also be expensive if conducted correctly, which would negatively impact the cost-benefit ratio behind this portfolio. Unfortunately, given the vast amount of money at stake for all parties, there is still probably ample room for suspect behavior.

The third option would be to offer PAYS as the only incentivized program. PAYS's unique program parameters (i.e. full blow-door audit, costs tied to savings) minimize the principal-agent problem to a large extent. The tradeoff here would be an immediate reduction in claimed savings; however, those savings were probably overstated to begin with.

The fourth option would be to dismiss this out-of-hand and move forward with programs like we have for the past twelve years. The end result will be overstated savings and future build-out of supply-side investment.

At this point I am open to stakeholders' feedback before I make any definitive recommendations.

V. The Rebound Effect

Q. What is the rebound effect?

A. The rebound effect (also known as the Jevons paradox) is a phenomenon where the expected energy savings from improvements in energy efficiency are partially—or sometimes entirely—offset by increased energy consumption. This was first articulated in 1865 by the British economist William Stanley Jevons in his book *The Coal Question*. Jevons observed that England's consumption of coal soared after James Watt introduced the Watt steam engine, which greatly improved the efficiency of the coal-fired steam engine from an earlier design. Watt's innovations made coal a more cost-effective power source, leading to the increased use of the steam engine in a wide range of industries. This in turn increased total coal consumption, even as the amount of coal required to operate the steam engine fell. Jevons argued that improvements in fuel efficiency tend to increase (rather than decrease) fuel use, writing: "It is a confusion of ideas to suppose that the economical use of fuel is equivalent to diminished consumption. The very contrary is the truth."[17]

Thus, he essentially found that as efficiencies improved, people found new ways to use more energy. Figures 1 and 2 provide an illustrative example of that paradox at work. Specifically, as lighted Christmas decorations have become more efficient, people will use more to decorate their homes for the holiday season. Thus, using more energy than they would have when displaying the less-efficient decorations.

[17] Jevons, William Stanley (1866). The Coal Question (2nd ed.). London: Macmillan and Co. Chapter VII.

Figure 1: Home Christmas decorations circa 1950

Figure 2: Modern LED Christmas light decorations

Q. How is the rebound effect expressed?

A. As a ratio of the lost benefit compared to the expected environmental benefit when holding consumption constant. For example, a car with a 10% improvement in fuel efficiency that

only results in a 5% drop in fuel use results in a 50% rebound effect. The missing 5% assumed from the improved fuel efficiency was lost by driving faster or further than before.

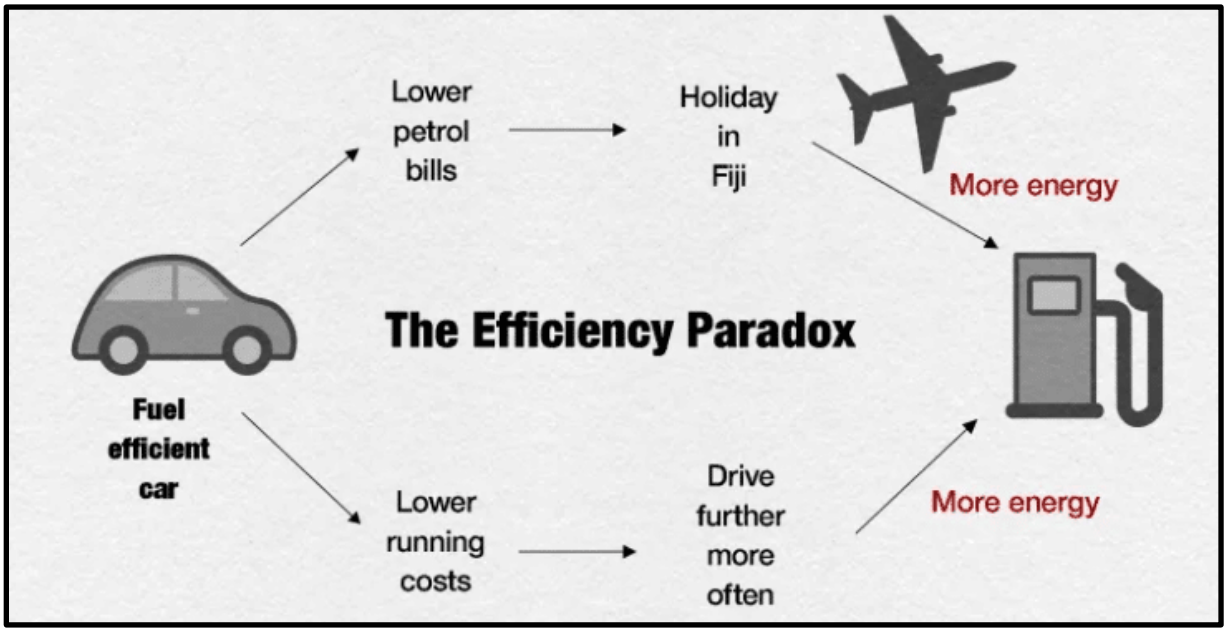
Q. Is the rebound effect controversial?

A. The existence of it is not, as it has been well documented in a variety of cases for over one hundred fifty years. However, the magnitude of the rebound effect can be controversial as context and confounding variables (e.g., price elasticity and changed behaviors) can make it difficult to measure and compare.

Q. Are there different types of rebound effects?

A. Yes. There can be direct rebound effects like Jevon's example regarding coal usage and there can be indirect rebound effects where the money saved from energy efficiency upgrades are used on new services that consume more energy. There can also be economy-wide rebound effects where mass efficiency improvements lower the overall cost of energy services, which then stimulate broader economic changes or shifts that lead to increased energy demand. Figure 3 provides an illustrative example of the indirect (top) and direct (bottom) rebound effects.

Figure 3: Illustrative example of the indirect and direct rebound effect



Q. Can you provide some recent documented cases of this?

A. A 2015 study titled "Do Energy Efficiency Investments Deliver? Evidence from the Weatherization Program" examined the results of 30,000 weatherized homes in Michigan. The abstract to that paper is as follows:

> Conventional wisdom suggests that energy efficiency (EE) policies are beneficial because they induce investments that pay for themselves and lead to emissions reductions. However, this belief is primarily based on projections from engineering models. This paper reports on the results of an experimental evaluation of the nation's largest residential EE program conducted on a sample of more than 30,000 households. The findings suggest that the upfront investment costs are about twice the actual energy savings. Further, the model-projected savings are roughly 2.5 times the actual savings. While this might be attributed to the "rebound" effect – when demand for energy end uses increases as a result of greater efficiency – the paper fails to find evidence of significantly higher indoor temperatures at weatherized homes. **Even when accounting for the broader societal benefits of energy efficiency investments, the costs still substantially outweigh the benefits; the average rate of return is approximately -9.5% annually**.[18]

Another example includes a report issued in 2020 by GdW, the largest German federation of real estate companies that represents 6 million homes and 13 million inhabitants. In this report, GdW noted that more than 340 billion euros had been invested since 2010 in energy efficiency upgrades on buildings with the goal to reduce energy consumption by 15% from 2010 levels. Despite this huge investment, the results showed that energy consumption

[18]Fowlie, Merideth, et. Al. (2015) Do Energy Efficiency Investments Deliver? Evidence from the Weatherization Assistance Program. National Bureau of Economic Research. https://www.nber.org/papers/w21331 See GM-7.

remained relatively the same without significant changes. In 2010 a household consumed an average of 132-kilowatt hours of heat per square meter. In 2018, it consumed 130.[19]

Q. The abstract you quoted would appear to be a strong argument against funding weatherization. Do you agree?

A. I don't believe its evidence to cease Low Income Weatherization Assistance Program ("LIWAP") funding. The rebound effect in the Michigan example indicates a departure from assumed engineered estimates. It does not mean that savings are erased entirely or what is often referred to as the "blowback effect" for the participant. Because weatherization is 100% funded by the federal government and/or utilities the cost benefit assumptions will necessarily be out-of-line. Additionally, there are equity and quality of life arguments that need to be considered in weighing the merits of the program.

Q. Are you aware of any energy efficiency advocates that have acknowledged a rebound effect?

A. The executive director of the American Council for an Energy Efficient Economy ("ACEEE") Steven Nadel believes that direct and indirect rebound effects are generally 10% or less for energy efficiency products.[20]

Q. What is your recommendation to the Commission on this topic?

A. Like Mr. Nadel, I believe the rebound effect is a very real phenomenon. It is also something that has not been properly factored into any EM&V study in Missouri to date. To the extent any MEEIA portfolio is approved, I strongly recommend either: (1) an across-the-board 10% reduction in energy savings be applied to any future EM&V filings to account for the rebound effect or (2) that future EM&V studies specifically analyze the rebound effect for households participating in the EM&V report. I believe the rebound effect could very well

[19] Appunn, K. (2020) Rebound effect undoing decade of Germany's home efficiency investments—housing companies. Clean Energy Wire. https://www.cleanenergywire.org/news/rebound-effect-undoing-decade-germanys-home-efficiency-investments-housing-companies

[20] Nadel, S. (2012) The Rebound Effect: Large or Small. ACEEE. https://www.aceee.org/content/rebound-effect-large-or-small

be much greater than 10% in the aggregate but I recognize that studying this phenomenon comes at a cost in dollars and time (that being said, the emergence of automated meter infrastructure data should be able to facilitate this analysis in a more cost efficient manner). Recognizing the tradeoffs inherent in those two choices, I would be satisfied with either option. What is not acceptable is continuing to overstate the energy savings being credited to MEEIA programs.

VI. Duplicative Funding and Attribution: The Inflation Reduction Act (IRA)

Q. What is the Inflation Reduction Act ("IRA")?

A. The Inflation Reduction Act (IRA) of 2022, signed into law in August 2022, is a major piece of federal legislation aimed at addressing several key issues in the United States including Climate and Energy (e.g., tax credits, grants, and loans), Deficit Reduction (e.g., strengthen tax enforcement and closing loopholes), and Healthcare (e.g., allowing Medicare to negotiate drug prices directly with pharmaceutical companies).

Q. What provisions are in place to promote energy efficiency that are enabled by the IRA?

A. The IRA has several provisions that directly impact energy efficiency adoption.

The first is the availability of more generous tax credits to help offset the cost of energy efficiency improvements. Here's a breakdown of the maximum tax credits available:

Energy Efficient Home Improvement Tax Credit:[21]

- This credit covers upgrades like insulation, windows, HVACs, and home energy audits.
- The maximum annual credit is $1,200 for these general improvements.
- Specific limitations exist for certain items:
    - 30% of total improvement expenses in the year of installation.[22] Specific limitations on items include:

[21] IRS (2024) Home energy tax credits. https://www.irs.gov/credits-deductions/home-energy-tax-credits.

[22] This does not include labor costs.

- Exterior doors: $250 per door, with a total cap of $500.
- Exterior windows and skylights: $600 total.
- Insulation and air sealing materials or systems: $1,200 but must meet International Energy Conservation Code (IECC) standards in effect at the start of the year 2 years before installation.
- Home energy audits: $150.

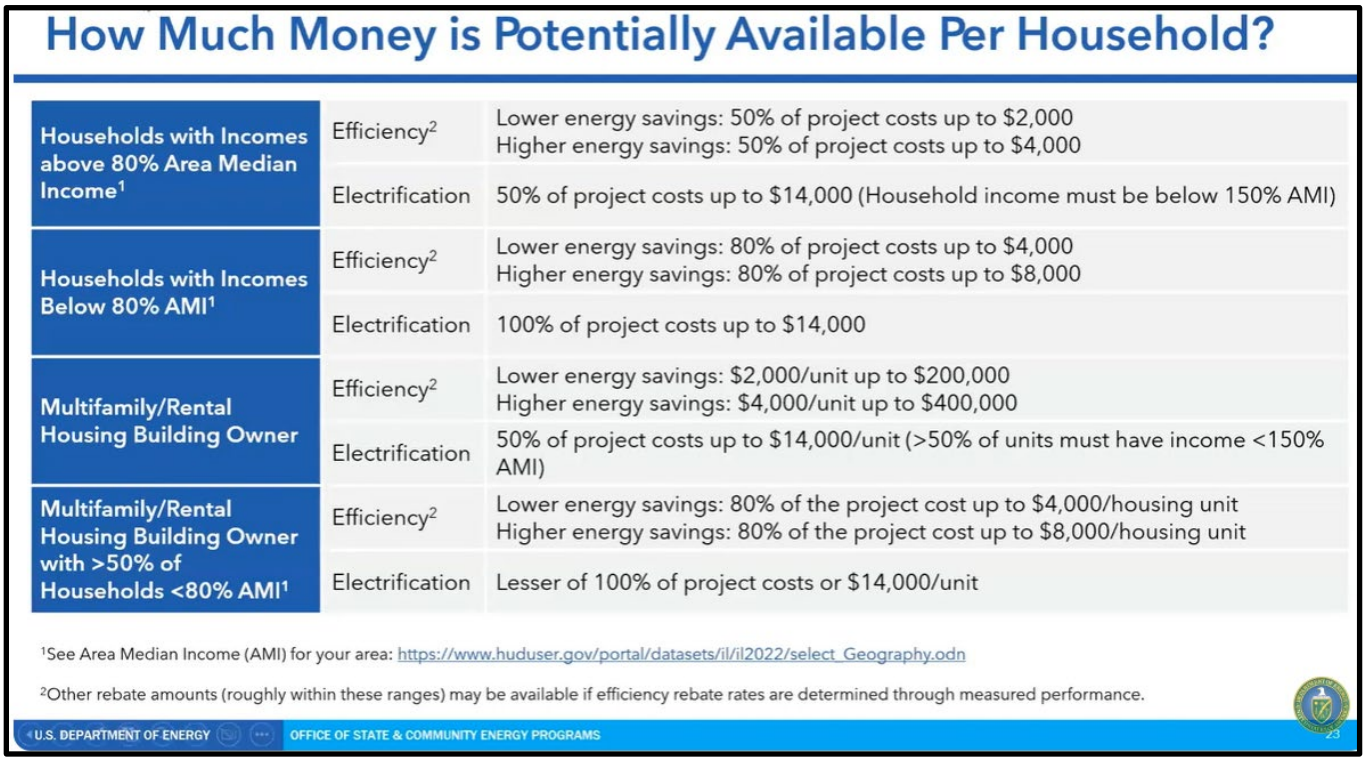
Heat Pump Tax Credit:[23]

- A separate credit applies specifically to qualified heat pumps like geothermal heat pumps and air-source heat pumps.
- The maximum annual credit for heat pumps is $2,000.

The second are direct federal subsidies of approximately $150 million for Missouri residents for energy efficiency rebates through the Home Efficiency Rebates and Home Electrification and Appliance Rebate programs. Eligibility for this program and the potential funding amounts are listed in Table 1.

[23] These tax credits can be combined in a single year ($1,200 general credit + $2,000 heat pump = $3,200 in potential tax credits). These provisions are also in place through December 31, 2032.

Table 1: How Much Money is Potentially Available Per Household for US DOE IRA Home Energy Rebate Programs[24]



How Much Money is Potentially Available Per Household?

Households with Incomes above 80% Area Median Income[1]	Efficiency[2]	Lower energy savings: 50% of project costs up to $2,000 Higher energy savings: 50% of project costs up to $4,000
	Electrification	50% of project costs up to $14,000 (Household income must be below 150% AMI)
Households with Incomes Below 80% AMI[1]	Efficiency[2]	Lower energy savings: 80% of project costs up to $4,000 Higher energy savings: 80% of project costs up to $8,000
	Electrification	100% of project costs up to $14,000
Multifamily/Rental Housing Building Owner	Efficiency[2]	Lower energy savings: $2,000/unit up to $200,000 Higher energy savings: $4,000/unit up to $400,000
	Electrification	50% of project costs up to $14,000/unit (>50% of units must have income <150% AMI)
Multifamily/Rental Housing Building Owner with >50% of Households <80% AMI[1]	Efficiency[2]	Lower energy savings: 80% of the project cost up to $4,000/housing unit Higher energy savings: 80% of the project cost up to $8,000/housing unit
	Electrification	Lesser of 100% of project costs or $14,000/unit

[1]See Area Median Income (AMI) for your area: https://www.huduser.gov/portal/datasets/il/il2022/select_Geography.odn

[2]Other rebate amounts (roughly within these ranges) may be available if efficiency rebate rates are determined through measured performance.

U.S. DEPARTMENT OF ENERGY | OFFICE OF STATE & COMMUNITY ENERGY PROGRAMS | 23

The maximum consumer rebate could be as high as $14,000 per eligible household.[25]

[24] Rebates cannot be combined with each other or with other federal grant funding for the same upgrade measure, though you will be able to stack various funding opportunities within the same overall home retrofit project. For example, you could use a Home Efficiency Rebate for increased insulation and Home Electrification Rebate for a heat pump, assuming you qualify for both programs.
US Department of Energy (2023) IRA Home Energy Rebate Program Information Webinar https://www.youtube.com/watch?v=IqRxntORvxo.

[25] Sierra Club (2023) Understanding the IRA Home Energy Rebates. https://www.sierraclub.org/understanding-ira-home-energy-rebates.

Under the electrification rebates program, the maximum amount for various measures is as follows:
Heat Pump HVAC = $8,000
Heat Pump Water Heater = $1,750
Electric Stove or Heat Pump Clothes Dryer = $840
Breaker Box = $4,000
Electric Wiring = $2,500
Weatherization = $1,600

Table 2 provides an illustrative example of the potential cost savings for two households with different incomes living in different area median income ("AMI") levels.

Table 2: Illustrative Example of Two Households Savings Opportunities[26]

Illustrative Examples of Two Households

Smith Household in Allentown, PA

The Smiths want to insulate their home to make their home more comfortable and save on energy bills.

Smith income: $68,000
80% AMI for Allentown, PA: $72,500
Eligible for lower-income rebate level? **Yes**

Project Scope	
Attic Insulation	$3,000
Whole-home air sealing	$1,000
Duct sealing & insulation	$1,500
Smart thermostat	$200
Gross project cost	**$5,700**

Modeled energy savings from project: **24%**
Eligible Rebate: **$4,000**
Project Cost to Smith Household: **$1,700**

Jones Household in Columbia, SC

The Jones' want to update their home's dated electrical systems and save on their energy bills.

Jones income: $72,000
80% AMI for Columbia, SC: $64,500
Eligible for lower-income rebate level? **No**

Project Scope	
Electrical panel upgrade	$3,700
Electrical wiring upgrade	$1,800
Electric heat pump	$6,500
Kitchen hood ventilation	$800
Gross project cost	**$12,800**

Over cost limits for technologies or total cost? **No**
Eligible Rebate: **$6,400 (50%)**
Project Cost to Jones Household: **$6,400**

U.S. DEPARTMENT OF ENERGY | OFFICE OF STATE & COMMUNITY ENERGY PROGRAMS | 24

Q. Why is the federal government offering subsidies through tax credits and energy efficiency rebates?

A. The stated reason for the subsidies is to reduce our dependence on fossil fuels and reduce emissions. There are also no doubt secondary and tertiary objectives as well (job creation, energy bill reductions, etc.). The reason the federal government is offering both tax breaks and energy efficiency rebates is to entice all families to retrofit their homes regardless of income. Historically, only energy efficiency tax breaks existed for families at the federal level. However, there is no value in a tax break for the many households that don't pay taxes. The energy efficiency rebates address that problem.

[26] US Department of Energy (2023) IRA Home Energy Rebate Program Information Webinar https://www.youtube.com/watch?v=IqRxntORvxo.

Q. Are there options for income eligible families that don't have out-of-pocket capital to invest in energy efficiency?

A. Yes, there is a federally subsidized energy efficiency program for them as well. The Bi-Partisan Infrastructure Law has allocated an additional $77 million for Missouri towards LIWAP which includes "readiness funding." This funding allows homes to be weatherized that would otherwise be "passed over" due to health and safety concerns.

Q. It appears that many families could be eligible for both the Home Energy Rebate Program (eligible at or below 80% of AMI) and LIWAP (eligible at or below 200% of Federal Poverty level). Is one better than the other?

A. All things being equal, free installation and measures under LIWAP is a much more attractive option than the rebated option where money would need to come out of pocket for the income eligible household.

Q. Are LIWAP subsidies available now?

A. Yes. Missouri has received federal LIWAP funding for many years and each of our investor-owned utilities have funding allocated towards LIWAP as well. The $77 million is on top of the existing funding streams.

Q. Are federal tax credits available now?

A. Yes.

Q. Are the IRA home energy rebates available now?

A. No.

Q. When will the rebates be available?

A. It is difficult to say. The program will be administered through the Missouri Division of Energy ("DE"), but the timing, manner of implementation, and any other pertinent details surrounding this endeavor are still largely unanswered. Assuming Missouri does not reverse course and reject the funding outright, like the State of Florida did last year, I believe it is

reasonable to assume the subsidies should be available in 2025, when the next slate of MEEIA portfolios, including the one the Commission considers in this case, will start.[27]

Q. What implications, if any, does this have for Ameren Missouri's MEEIA programs?

A. There are multiple perspectives to consider in accounting for this emerging variable. I will offer three for the Commission's consideration.

The first perspective takes the position that ratepayers should not be throwing money at redundant subsidies that are going to happen regardless of an approved MEEIA portfolio (free riders). Effectively, the federal government has created a MEEIA-like program for all Missourians of all income levels that will likely get rolled out in 2025. Stacking additional subsidies on top of this could create some unintended consequences (supply chain constraints, increased labor costs due to worker shortage, and contractor performance reduction because of the desire to meet the demand) and would be an inefficient use of ratepayer's funds.

Again, MEEIA is designed to reward utilities for inducing energy efficiency upgrades that would otherwise not occur naturally. That is, programs are designed to minimize free riders. The Company is penalized in the evaluation review if it fails to show proper attribution. For example, a customer who claims that the $700 Ameren Missouri HVAC rebate is the reason they made the energy efficient investment can be counted as a positive contribution towards the utility's earnings opportunity. Alternatively, imagine an entirely plausible scenario where a participating customer takes advantage of the federally subsidized Home Energy Rebate program and/or the federal tax credits, *and* the Ameren Missouri rebate, but also would have upgraded to a more energy efficient HVAC regardless of all of these subsidies.

Under this scenario, it would not be accurate for Ameren Missouri or the federal government to claim attribution. If this sounds unlikely, consider that this scenario occurs every day already. Energy efficiency upgrades occurred in Missouri without a MEEIA in place or

[27]Energy Now.Com (2023) DeSantis says no thanks to $377 million in federal energy funds. https://energynow.com/2023/07/desantis-says-no-thanks-to-377-million-in-federal-energy-funds/

federal subsidies and will continue to occur if no MEEIA is approved moving forward and/or Missouri elects not to accept the federal subsidies.

What the appropriate net-to-gross ratios should be for a given program or measure will no doubt be a contentious issue for future EM&V's if this issue is not addressed beforehand. Restated, assuming Missouri accepts the federal subsidies, Missouri households will be eligible for generous rebates, tax breaks, and/or free weatherization regardless of whether the Commission approves a MEEIA portfolio for investor owned utilities or not.

An alternative perspective would be to accept a predetermined reduced level of attribution (e.g., a lower net-to-gross ratio) and focus on stacking subsidies (federal and ratepayer) to induce more adoption than what would otherwise occur. That is, create very generous subsidies. If we assume a traditional EM&V framework this alternative perspective would greatly challenge Ameren Missouri's ability to meet its targeted earnings opportunity thresholds due to the obvious free ridership issue. There may be ways to design EM&V and net-to-gross ratios to limit contentious litigation, but additional dialogue is warranted, should the Commission determine to follow this path. That being said, I do not believe such a scenario would be an efficient use of finite ratepayer funding. It *should*, however, induce greater energy efficiency adoption on an aggregate-wide level.[28]

A third perspective would be a "business as usual" approach. Under this approach, we ignore the uncertainty and impact surrounding the IRA funding and tax breaks and operate "as is." Then, when we see early EM&V and program results, we adapt accordingly. The unfortunate byproduct of this outcome will almost assuredly be further disagreement between stakeholders and contentious litigation over the EM&V results.

[28] For those versed in demand-side management nomenclature, this would be akin to approaching MAP (maximum achievable potential) levels of energy efficiency adoption which is a market potential scenario that is modeled in the Company's integrated resource plan ("IRP"). What's clear when looking at historic MAP-level adoption scenarios is the power of diminishing returns on one's investment (in this case, energy savings) as the level of subsidies increases. Typically, this results in measures, programs, and even the portfolio no longer being cost-effective.

Q. Are there concerns about potential fuel switching associated with these rebates?

A. That is another issue that has not been discussed at any length in dockets before the Commission but is likely top of mind for many stakeholders—especially Spire Missouri. Fuel switching is a very real possibility or at least one can surmise that it can be due to the federal government's emphasis on electrification and heat pumps for rebates as opposed to subsidies for natural gas furnaces and natural gas water heaters.

Q. What is your position on that issue?

A. For purposes of MEEIA-related program funding I maintain that programs designed around promoting fuel switching create potential violations of the Commission's promotional practice rules. As such, given the historic collaborative efforts of our electric and gas utilities I would not support fuel switching subsidies backed by ratepayers. From my vantage point, OPC supports all ratepayers across all regulated investor-owned utilities in Missouri. It would, therefore, be difficult to support a program that helps Ameren Missouri customers but hurts Spire Missouri customers. If the Commission elects to explore "stacking" of federal and utility subsidies there should be some parameters around electrification measures.

Q. Do you have any suggestions on what those parameters should be?

A. I do not at the moment, but I will explore the issue in future testimony, if necessary.

VII. Demand Response and Aggregators of Retail Choice ("ARCs")

Q. What is the most cost-effective MEEIA program currently?

A. Business demand response hands down.

Q. What is the business demand respond program?

A. Large commercial customers can get paid to curtail their power during select "events" that are typically aligned with peak energy usage. At a large enough scale, the combined efforts of these aggregated large customer curtailments can have the same impact as firing up a peaker plant to meet load but at a much more affordable price point.

Q. Has the business demand response program always been a MEEIA program?

A. No. The idea to include business demand response originated through settlement discussions with Kansas City Power and Light's (now Evergy Missouri Metro) first MEEIA application as a potential solution to make its portfolio cost-effective. For Ameren Missouri, it was not until its second MEEIA cycle that business demand response was introduced on a small scale. Subsequent portfolios increased the scale.

Q. Did commercial demand response events occur before MEEIA?

A. Utilities had emergency curtailment agreements and emergency tariffs in place as a means to mitigate stress on the grid during extreme events but such events were rarely called or needed to be called.

Q. Do you believe that Ameren Missouri should still be offering a business demand response program in light of the Commission's recent ruling lifting the prohibition against allowing Aggregator(s) of Retail Customers ("ARCs") to operate in Missouri?

A. Until I see evidence suggesting otherwise, my position is no. To quote economist and former Chairman of the New York Public Service Commission and the U.S. Civil Aeronautics Board:

> "Whenever competition is feasible it is, for all its imperfections, superior to regulation as a means of serving the public interest."[29]

ARC participation in wholesale markets serves the public interest because the lower clearing price that results from bidding demand response in RTO/ISO markets benefits all customers in those markets, not just the bidding demand response aggregator. This is a positive externality. When an action causes a positive externality, that action is typically under-invested and can be viewed as a market imperfection. Conversely, a utility's failure to use

[29] Alfred E. Kahn is largely credited with deregulating the airline industry. See also: https://en.wikipedia.org/wiki/Alfred_E._Kahn

cost-effective demand response can be seen as causing a negative externality, as the inaction raises the market price for everyone.[30]

The premise behind RTO/ISOs is that market forces will push prices down to "just and reasonable" levels. If these market forces are insufficient because demand response is absent (or suboptimal because of barriers to entry caused by government interference) then it calls into question the validity of the RTO/ISO market premise.

Allowing only regulated utilities to aggregate customer demand response converts a potentially competitive market into a monopsony market.[31] This deprives customers of the dynamic efficiencies and differentiated choices that minimize cost and maximize convenience. Just because the utility is the service territory's sole buyer of energy in the RTO market does not automatically mean it should be the service territory's sole aggregator of demand response.

Thankfully, the Commission has partially lifted the ban on ARC participation in Missouri. As I understand the situation, this MEEIA portfolio will represent the first opportunity to see if participating aggregators will be allowed to compete fairly in Missouri.

Q. Are there demand response aggregators that have been granted intervention in this case?

A. No. Voltus and CPower attempted to intervene but their requests were denied, in part, because they filed out-of-time.

Q. When did Ameren Missouri originally file its application in this docket?

A. They filed an application on March 27, 2023.

[30] Admittedly, failure to call events has not been a germane issue for Ameren Missouri like it has been historically for other electric utilities in Missouri.

[31] A monopsony is a market condition in which there is only one buyer. Because there is only one buyer for a good or service, the buyer sets the demand, and therefore, controls the price. Monopsonies, like monopolies, are inefficient as compared to a free market, where supply and demand regulate prices to be fair for consumers.

Q. Is that filed application the same application Ameren Missouri is proposing today?

A. No, it is not the same application.

Parties agreed to delay the procedural schedule and Ameren would refile an application in 2024 due to concerns surrounding the IRA. Ameren did that very thing on January 25, 2024. The fact that it filed its new application in the same docket as its prior application is more a product of a happenstance than anything else. Ameren Missouri could have just as easily closed this docket and filed a new docket because it filed a new application.

Q. When did CPower apply for intervention?

A. They applied six days after Ameren Missouri filed its amended application, on January 31, 2024.

Q. When did Voltus apply for intervention?

A. They applied one day before—January 24, 2024—Ameren Missouri filed its new application on January 25, 2024.

Q. Had the Commission issued an order lifting its prohibition on ARC participation in Missouri by March 27, 2023—the day Ameren Missouri filed its original Application?

A. No. The Commission issued its order in Case No. EW-2021-0267 on October 12, 2023. It ordered that the effective date begin on January 1, 2024.

Q. Will ratepayers be adversely impacted by the exclusion of ARCs in this docket?

A. Yes, for the reasons I have articulated above.

Q. Is the public interest being met by excluding ARCs from this docket?

A. I don't see how the public interest is served by excluding a viable market alternative in favor of the incumbent natural monopoly.

If Ameren Missouri continues to operate as it is today with the financial backing of captive ratepayers, then ARCs have little reason to operate in Missouri and the past several years of workshops, outside help from Lawrence Berkeley National Labs, and other efforts

undertaken by the Commission's Staff in preparation of the Commission partially lifting the ban on ARCs will be for nothing.

Q. Would ratepayers benefit from the inclusion of competitive ARCs in Missouri?

A. Yes. If ARCs are allowed to compete fairly, ratepayers should benefit by no longer having to pay MEEIA related costs for this service but would still receive the benefit of a lower clearing price (in theory).

Historically, utilities have had an unearned advantage in the area of demand response through regulatory-assisted protection, barriers to entry, and an overly generous earnings opportunity. The introduction of ARCs into Missouri represents clear market options for customers and should result in economic efficiencies.

If the Commission continues to allow Ameren Missouri to rely on ratepayer-backed subsidies to compete with outside market actors, then lifting the ban on ARC participation is now effectively a hollow action.

In effect, there will be no ARC participation in Missouri and all parties (minus Ameren Missouri) will be worst off because of it.

Q. What is your recommendation on this issue?

A. I do not know at this point. Originally my testimony was written under the assumption that Voltus and CPower would be granted intervention. Since they have been denied, I am not entirely sure what the Commission's position on business demand response and market competition is.

I would have liked to hear from Voltus and CPower on this issue. As it stands, I find myself in an awkward position in terms of what exactly to recommend and will recalibrate my thoughts on this issue accordingly in rebuttal testimony when I respond to the Company's amended application.

VIII. Rate Design: Fixed Cost Recovery and Time of Use Rates

Q. Does rate design impact MEEIA?

A. Yes. How we price electric service will have an impact on the payback assumptions surrounding a customer's energy efficiency investment which, in turn, will affect the cost effectiveness of MEEIA measures.

Traditional two-part tariff designs include a fixed charge (aka the customer charge) that is billed monthly regardless of how much energy is used and a variable charge (aka the commodity, energy, usage, or volumetric charge) that goes up or down depending on volume and timing of that usage.[32]

Separating these charges and transparently displaying them on a customer's bill encourages conservation and fairness. The variable charge directly reflects the individual's consumption patterns. The fixed charge ensures everyone contributes to the fixed costs of the system, regardless of their individual usage.[33]

Energy efficiency upgrades save customers money by reducing the amount of energy consumed (e.g. kilowatt-hours) and, in some cases, a customer's demand for energy (e.g., kilowatt). This reduced energy usage or demand is reflected in the variable charge. However, if a utility increases its customer charge—the fixed charge—to account for the revenue lost due to its customer's energy efficiency upgrades, then the customer's bill is less affected by the energy savings.

[32] Over the past ten years the General Assembly has also passed many different cost recovery mechanisms that are collected separately on a customer's bill through separate surcharges. MEEIA is one example.

Additionally, certain commercial and industrial customers are required to pay a demand charge, reactive charge and/or a seasonal energy charge.

[33] Today, Ameren Missouri's residential customers pay a customer charge of $9.00 per month. This charge reflects the costs of making service available for an incremental customer being added (e.g., the costs of a meter and billing).

Q. What do you recommend in light of that issue?

A. Ideally, a commitment from the utility that it will not seek to raise its customer charge for a set period of time (e.g., six years). Absent that commitment, the Commission should be cognizant of the interplay between fixed cost recovery and energy conservation in future Ameren Missouri rate cases.

Q. Are there other rate design issues germane to MEEIA?

A. Yes. Time-of-Use ("TOU") rates needs to be discussed.

Q. How are TOU rates relevant to MEEIA?

A. Pricing electricity to more accurately reflect the cost of its service would be the most direct, impactful, and cost-effective action this Commission could do to support a utility's demand-side management operations.

In the next Ameren Missouri rate case, the Commission could order TOU rates that would achieve demand savings that would dwarf any historical MEEIA portfolio. These savings would not cost ratepayers any more than what they are already committed to pay in base rates. That is exactly what TOU rates could accomplish if stakeholders adapt from the lessons learned this past year from the Evergy roll-out.

In Case Nos. EO-2023-0212 & EO-2023-0213 (Evergy Metro's and Evergy West's Annual Integrated Resources Plan ("IRP") update) a sensitivity analysis was conducted by third-party contractor AEG. This sensitivity analysis considered the impact of TOU rates on Evergy's future summer demand baseline assumptions.

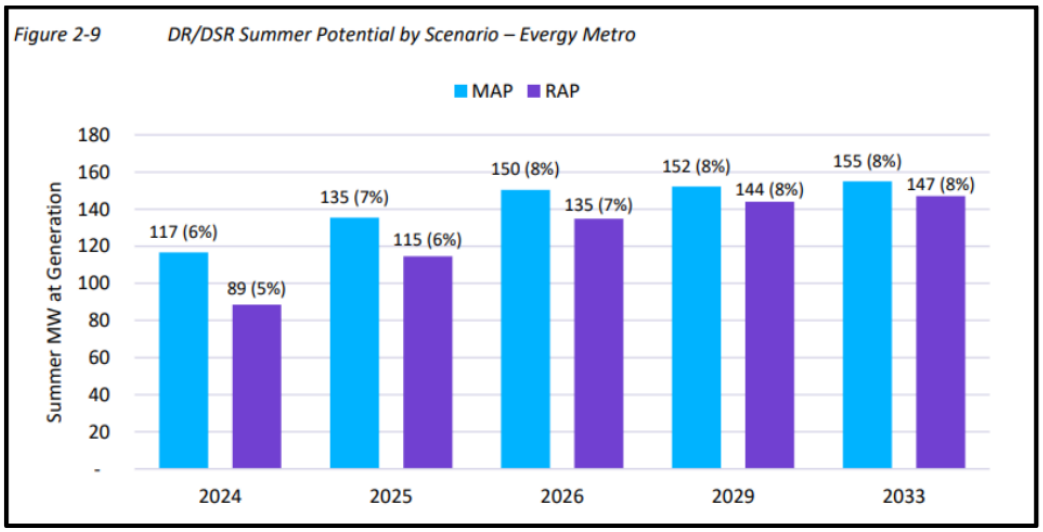
The analysis considered several factors including:

- Customers would be defaulted to the standard (high differential) rate but switch across rate design options;
- Peak savings would increase over time as customers became accustomed to the rates; and

- That modeling customers on the Peak Reward Saver rate (low differential) are negligible (no impact to demand savings).

AEG then ran a number of scenarios based on adoption assumptions across the rates. The range of peak demand savings relative to projected baselines range from a low of 5% in Evergy Metro in 2024 to a high of 10% in 2033 for Evergy West. Figure 4 shows the results of AEG's analysis for Evergy Metro and Figure 5 shows the results for Evergy West.

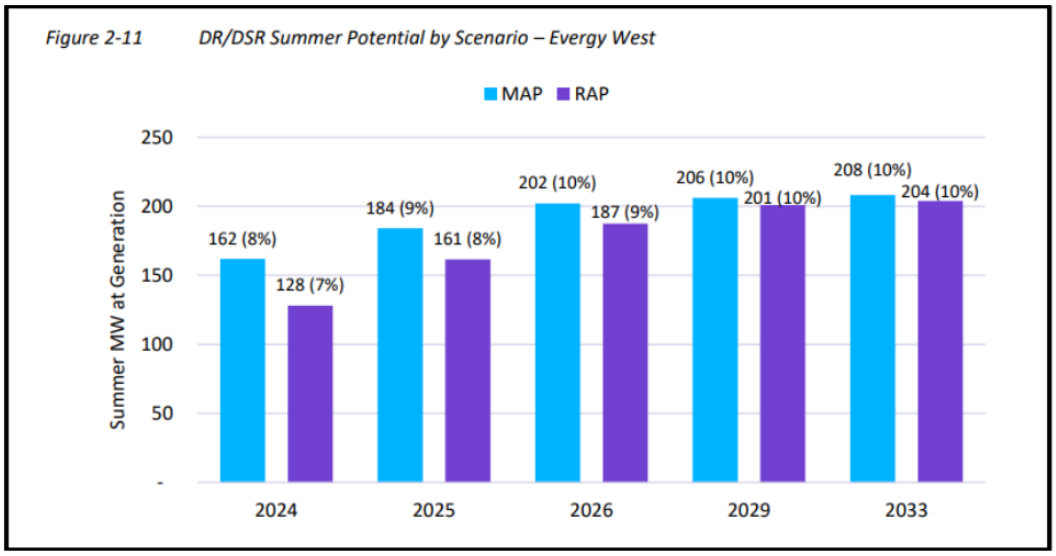
Figure 4: Every Metro TOU Summer Potential with original Commission-ordered TOU rates[34,35]



[34] Case Nos. EO-2023-0212 & EO-2023-0213 AEG: Evergy 2023 DSM Market Potential Study. p. 32

[35] "RAP" stands for Realistic Achievable Potential and "MAP" stands for Maximum Achievable Potential. These acronyms are terms of art utilized in demand-side management planning to indicate various levels of potential. In this case, AEG assumed various levels of self-selection between the rate design offerings ranging from a conservative to an aggressive adoption level of price differentials.

Figure 5: Every West TOU Summer Potential with original Commission-ordered TOU rates[36]



It is worth repeating that there are no modeled bar graphs for the Peak Rewards (the low differential rate that became the default rate option for Evergy customers) because there are no demand savings.

Q. Do you have the same information for Ameren Missouri?

A. Not entirely. Ameren Missouri modeled TOU rates for residential customers and critical peak pricing with and without enabling technology for business customers. The results were extremely positive in terms of demand reductions and in the positive cost benefit ratios for customers. Unfortunately, the Company only modeled for a low adoption figure. Regardless, I have repurposed the results onto Table 3 for reference.

[36] *Ibid*.

Table 3: Ameren Missouri Market Potential Study Demand-Side Rate Impact Analysis[37]

Rate Design Option	**Demand Savings Estimated**	**TRC[38] MAP**	**TRC RAP**	**UCT[39] MAP**	**UCT RAP**
Residential TOU Evening/Morning Savers	0.3% in Summer; 0.2% in Winter	1.98	1.96	1.98	1.96
Residential TOU Overnight Savers	6.8% in Summer; 3.5% in Winter	9.42	7.89	9.42	7.89
Residential TOU Smart Savers	11.8% in Summer; 9.0% in Winter	14.06	10.81	14.06	10.81
Residential TOU Ultimate Savers	12.9% in Summer; 9.3% in Winter	13.99	10.28	13.99	10.28
Business Critical Peak Pricing w/enabling technology[40]	21.47%	8.80	7.88	8.80	7.88

[37] Case No. EO-2024-0020. 2023 Ameren Missouri Integrated Resource Plan. GDS Associates, Inc. 2023 Ameren Missouri DSM Market Potential Study P. 390, 391, & 399. See also GM-8.

[38] "TRC" is an acronym for "Total Resource Cost" test. It is a cost-benefit analysis that compares the relative costs and benefits of a program to both participants and non-participants. If the ratio is above 1.0 it is deemed cost effective.

[39] "UCT" is an acronym for "Utility Cost Test." It is a cost-benefit analysis that compares utility benefits to utility costs and does not consider other benefits such as participant savings or societal impacts. If the ratio is above 1.0 it is deemed cost effective.

[40] Critical Peak Pricing with Enabling Technology: A retail rate in which an extra-high price for electricity is provided during a limited number of critical periods (e.g., 100 hours) of the year. Market-based prices are typically provided on a day-ahead basis, or an hour-ahead basis. Includes enabling technology that connects technologies within building. Only for customers with AC (alternating current).

Business Critical Peak Pricing w/out enabling technology[41]	11.3%	12.93	9.83	12.93	9.83

Q. How should TOU rates affect the Commission's decision in this case?

A. The Commission should be cognizant that the modeled demand savings in Figures 4 and 5 come at no additional costs (or very small costs if marketing and education are included) to consumers, unlike the Company's proposed MEEIA portfolio. This is because ratepayers have been paying (and will continue to pay) the all-in costs of advanced meters, billing and customer portal software, and a private long-term evolution ("LTE") 4G network. These large capital investments have already exceeded over a billion dollars and should translate into real cost savings for customers *if* all of their available features are utilized.

Reducing peak demand by shifting electricity use to times of low demand also puts less strain on utilities themselves and will result in tangible cost savings to customers. These cost savings materialize in a variety of ways, including through a reduction in the amount of fuel that Ameren Missouri seeks to recover through its fuel adjustment clause ("FAC") and through the avoidance of future supply-side generation.

Stated differently, the Commission can utilize the automated meter infrastructure investments ratepayers are already paying for to achieve the demand savings MEEIA is supposed to produce. Failure to unlock those savings means ratepayers will be subject to even further increased costs driven, in part, by Ameren Missouri's investment in generation such as future dispatchable peaker plants to meet demand.

[41] Critical Peak Pricing without Enabling Technology: A retail rate in which an extra-high price for electricity is provided during a limited number of critical periods (e.g., 100 hours) of the year. Market-based prices are typically provided on a day-ahead basis, or an hour-ahead basis.

Q. What would you recommend the Commission do with this information?

A. To not dismiss it out-of-hand due to the challenges realized in the Evergy roll-out. Giving customers a rate design choice with larger differentials and nudging them towards reasonable behavioral modifications will translate into financial savings for all participants.

I fail to see how the Commission can support a MEEIA portfolio with all of its attendant uncertainties and additional cost burdens but not reasonable time differentiated rates that accomplish the same activity at no additional cost.

Price-based demand response as a resource to meet electricity system planning should be prioritized over traditional DSM rebates given the various challenges I identify in this testimony. Nor do the two need to be mutually exclusive. However, any serious discussion centered on funding another MEEIA portfolio should begin with how we can implement meaningful TOU rates in a manner that unlocks the cost-saving benefits that were the basis for the AMI investment to begin with.

I recommend that any order approving a MEEIA portfolio be conditioned on Ameren Missouri including a plan to move residential customers onto an opt-out TOU default rate with meaningful price differentials in its next rate case. Any such plan should include marketing and education deliverables in which TOU rates are framed in a similar vein as Ameren Missouri's public service announcements for safety. In short, I recommend Ameren Missouri "lean in" to the adoption of greater price differential rates as opposed to what occurred on the West-side of the State in 2023.

Q. Would you recommend that multiple choices still be made available, including an option with low differentials?

A. I would.

IX. Building Energy Codes and Standards

Q. What are building energy codes and standards?

A. Energy codes and standards are set at the local, state, and federal level with various levels of enforcement and impact. If properly set and enforced, energy codes and standards provide minimum efficiency requirements for new and renovated buildings, assuring reductions in energy use and emissions over the life of the building. Energy codes are a subset of building codes, which establish baseline requirements and govern building construction. The most direct and simple way to ensure sufficient energy efficiency would be to confirm that buildings are being constructed or retrofitted with a high-level of energy efficiency installation.

Q. Would strongly enforced energy codes and standards be less expensive than a ratepayer funded MEEIA portfolio?

A. Yes, on an aggregate-wide basis it should be significantly cheaper because costs for upgrades would be borne directly by each participant whereas under a MEEIA-scenario all ratepayers (minus the opt-out customers) are paying program costs (rebates tied to energy efficient upgrades, demand response events, and the administrative overhead to deliver those programs), the lost revenues associated with the measures (the throughput disincentive), and an earnings opportunity (a profit motive).

Q. Is this a realistic outcome for Missouri?

A. Not presently. Missouri is a "home-rule" state that has historically emphasized local control. It is one of only seven states without a statewide building code. This philosophy has allowed many parts of Missouri to operate without any building codes in place at all. In fact, many Missouri counties do not require residential building permits. Even in areas that have adopted codes or standards those codes and standards are not always enforced.

The result has been homes and buildings that are comparatively affordable up front but more expensive over the long run due to lower efficiencies in areas such as safety, quality and consistency, and that have poorer energy scores.[42]

Q. Are there any parts of Ameren Missouri's service territory that do have building codes and standards in place?

A. Yes. Some parts of Ameren Missouri's service territory include municipalities that have adopted stricter building codes. Two notable examples include St. Louis County, which adopted an amended version of the 2009 International Code Council ("ICC") Standard and the City of St. Louis, which adopted the 2018 ICC Standard.[43] In fact, the City of St. Louis is one of only twelve cities in the United States to have adopted Building Performance Standards ("BEPS") that result in at least 65% of its buildings improving their energy performance and emission reduction goals.[44,45]

Q. Are these codes and standards enforced in St. Louis County and St. Louis City?

A. My understanding based on discussions with the Building Energy Exchange of St. Louis is that both the City and County of St. Louis have historically been better at enforcing these standards on new buildings and retrofitted building that require extensive upgrades, but much less so for most existing structures, many of which are over 100 years old.

With the adoption of the BEPS and 2018 ICC, the City of St. Louis's Office of Building Performance requires owners of buildings with more than 50,000 square feet to self-report

[42] A home's energy score was developed by the US Department of Energy and its national laboratories to provide homeowners, buyers, and renters directly comparable and credible information about a home's energy use. Using a 1 to 10 scale (least to most efficient), the score estimates a home's energy use and recommends ways to reduce the amount of energy needed as a way to save energy, cut costs, and improve comfort. See also: https://betterbuildingssolutioncenter.energy.gov/home-energy-score

[43] St. Louis was the first municipality in the region — and one of the first nationwide — to adopt the new ICC codes and Building Energy Performance standards.

[44] St. Louis City (2024) Building Energy Performance Standard Targets. https://www.stlouis-mo.gov/government/departments/public-safety/building/building-energy-improvement-board/beps-targets.cfm

[45] US DOE (2024) Office of Energy Efficiency & Renewable Energy. Building Performance Standards. https://www.energycodes.gov/BPS

their energy usage to the City of St. Louis for its benchmarking efforts. Failure to comply can result in a fine of up to $1,000 a year.[46]

The year 2024 is supposed to be the first certification year when existing St. Louis City buildings with more than 50,000 square feet need to show they are complying with energy performance standards. However, no financial penalties will be leveled for noncompliance until 2025. At that point, the City of St. Louis's Office of Building Performance can levy fines up to $1,000 per day, and even pull or deny occupancy permits for those who do not meet the standards. It remains to be seen how adamantly this will be utilized as buildings that are unable to meet energy targets by the end of the compliance period may have opportunities to receive up to four additional years under certain circumstances. Additionally, buildings larger than 50,000 square feet that serve as affordable housing or houses of worship may have up to six years to comply.[47]

Q. Has there been pushback against building codes and standards?

A. Yes. Various bills have been introduced to the General Assembly—such as HB 580 in 2023—that argued building codes should address public health and safety matters only and not be tied to guidelines that seek to improve energy efficiency. Effectively taking the position that energy efficiency standards are not the role of government.

Importantly, HB 580 did not make it to the floor in the 2023 legislative session, but similar bills have appeared in other states.[48]

---

[46] See also: https://stlbenchmarking.com/

[47] Brown, S. (2023) St. Louis aims to slash greenhouse gas emissions—but it won't be easy. *Riverfront Times*. https://www.riverfronttimes.com/news/st-louis-aims-to-slash-greenhouse-gas-emissions-but-it-wont-be-easy-40369971

[48] Tilman, G. (2023) Building energy codes at risk across the United States. The U.S. Green Building Council. *https://www.usgbc.org/articles/building-energy-codes-risk-across-us* .

Q. What implications, if any, does this have for Ameren Missouri's MEEIA programs?

A. Like many things with MEEIA, there are multiple perspectives to consider. I will offer three for the Commission's consideration.

The first perspective takes the position that ratepayers should not be throwing money at projects that would happen regardless of an approved MEEIA portfolio (free riders).

MEEIA is designed to reward utilities for inducing energy efficiency upgrades that would otherwise not occur naturally (or forcefully). That is, programs are designed to minimize free riders. The Company is effectively penalized in the evaluation review if it fails to show proper attribution. For example, a customer who claims that the $1,000 Ameren Missouri rebate is the reason they made the energy efficient investment can be counted as a positive contribution towards the utility's earnings opportunity. Alternatively, a customer who took the $1,000 rebate from Ameren Missouri and made the energy efficient investment because the City of St. Louis would otherwise fine them $1,000 per day would be considered a free rider. This customer would not result in savings attributions towards the Company's earnings opportunity under the traditional EM&V framework.

Restated, energy efficiency upgrades are going to have to occur in the City of St. Louis and (to a much lesser extent) in St. Louis County with or without a ratepayer funded MEEIA program because these entities have adopted building codes and standards that include an enforcement mechanism.[49] With this understanding, individuals taking advantage of rebates offered by Ameren Missouri means those participants are likely free riders. Therefore, offering the rebates to those individuals represents an inefficient use of finite capital. If one considers the additional federal funding streams via tax breaks and potential IRA rebates, then there is an even stronger case that all of these buildings will be free riders to various degrees.

[49] Another perspective is that energy efficiency upgrades will naturally occur regardless of whether MEEIA or any building codes and standards exist.

An alternative perspective would be to recognize that Missouri's historic home rule status necessarily means there are many potential energy savings that can be addressed through the adoption of building codes and standards in most political subdivisions in Missouri. Under this perspective there would be an opportunity to change the market. For example, Ameren Missouri could create a program for eligible buildings and homes that provides greater ratepayer subsidies than its traditional programs. It could choose to offer this program only in political subdivisions that have agreed to adopt and enforce higher energy building codes and standards.

This alternative scenario represents an example of government intervention (Ameren Missouri's regulated status serving as a proxy for the government in this case) to solve a market failure. If adopted at any scale it should result in meaningful long-term energy savings but also likely strong opposition from home builders' associations and other free market advocates. There may be ways to design such a program to limit opposition, but additional research and dialogue would be warranted.

A third perspective would be a "business as usual" approach. Under this approach, the savings opportunity of changing building practices through building codes and standards enforcement continues to be ignored and the attribution issue for participants in political subdivisions that have adopted strong codes and standards is merely kicked down the road until the next EM&V review. In that review, stakeholders, evaluators, and the Commission's independent EM&V auditors will likely agree to disagree over the level of free ridership, which will likely result in a contentious litigation for the Commission to consider yet again. In my opinion this would be by far the worst outcome for ratepayers because it would result in little meaningful savings along with wasted time, money, and opportunity.

Q. Does this conclude your testimony.

A. Yes.

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

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

AFFIDAVIT OF GEOFF MARKE

STATE OF MISSOURI)
) **ss**
COUNTY OF COLE)

Geoff Marke, of lawful age and being first duly sworn, deposes and states:

1. My name is Geoff Marke. I am a Chief Economist for the Office of the Public Counsel.

2. Attached hereto and made a part hereof for all purposes is my direct testimony.

3. I hereby swear and affirm that my statements contained in the attached testimony are true and correct to the best of my knowledge and belief.

Geoff Marke
Chief Economist

Subscribed and sworn to me this 1st day of March 2024.

Tiffany Hildebrand
Notary Public

My Commission expires August 8, 2027.