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MISSOURI PUBLIC SERVICE COMMISSION

CASE NO. EO-2012-0142

REBUTTAL TESTIMONY

OF

RICHARD A. VOYTAS

ON

BEHALF OF

UNION ELECTRIC COMPANY
d/b/a Ameren Missouri

St. Louis, Missouri
November 17, 2014

REBUTTAL TESTIMONY

OF

RICHARD A. VOYTAS

CASE NO. EO-2012-0142

Q. Please state your name and business address.

A. My name is Richard A. Voytas. My business address is One Ameren Plaza, 1901 Chouteau Avenue, St. Louis, Missouri 63103.

Q. By whom are you employed and in what position?

A. I am employed by Ameren Services Company ("Ameren Services") as Director of Energy Efficiency/Demand Response. Ameren Services provides various technical and corporation support services for Ameren Missouri and its sister companies in a number of functions, including the area of energy efficiency and demand response.

Q. Are you the same Richard A. Voytas who filed direct testimony in this case?

A. Yes I am.

Q. What is the purpose of your rebuttal testimony in this proceeding?

A. My testimony is offered for the purpose of responding to the Direct Testimony of Mr. Geoff Marke filed on behalf of the Office of the Public Counsel ("OPC").

Q. Mr. Voytas do you have any response to Mr. Marke's testimony concerning certain "corrections" he proposes to testimony he filed October 6, 2014, in support of OPC's Response to Change Requests file by Ameren Missouri and Staff?

A. Yes, I do. Mr. Marke refers to Staff's original Change Request as its "Primary Position." As a result of the "Non-Unanimous Stipulation and Agreement Settling the Program Year 2013 Change Requests," filed September 9, 2014, that is not true. Staff, the Division of Energy, and Ameren Missouri have one common position, which is the position I discuss in detail in my direct testimony.

Q. Are there any substantial changes in OPC's perspective regarding the 2013 Change Requests that should be noted with respect to Mr. Marke's direct testimony and the testimony he filed in support of OPC's Change Requests ("October 6th Testimony")?

A. Yes. In his October 6th Testimony Mr. Marke stated at page 4, line 24, that accuracy in assessing EM&V results is important in his Change Request:

> Accurate EM&V results are important because all Signatories to the Stipulation are bound by the impact evaluation portion of the final EM&V Reports, as they may be modified by the Commission's resolution of any Change Request. The accuracy of the impact evaluation in each final EM&V Report is significant because it determines the level of performance incentive Ameren Missouri will receive for its implementation of each MEEIA Program. Ameren Missouri will begin to bill its customers for the awarded incentive amounts following the three year cycle of MEEIA Programs.

In the same testimony, at page 45, line 17, Mr. Marke stated that it is important that EM&V best practices be adhered to in 2013 Change Requests: "There are no accepted best practices for the quantification of market effects."

As shown in his direct testimony, Mr. Marke's latest theory that the kWh savings achieved through Ameren Missouri's 2013 residential lighting program should be reduced to account for "Rebound Effects." This new theory indicates Mr. Marke no longer has the perspective that accuracy or best practices are basic tenets of EM&V work.

Q. Please explain how Mr. Marke abandoned his perspective that accuracy in EM&V work is important.

A. Accuracy is a statistical term. In statistics, the term accuracy is used along with the term precision. Accuracy is the degree of correctness, while precision is how strict that correctness is (or isn't) — how reproducible results are. For example, when EM&V contractors design a sample to collect EM&V data from a population of energy efficiency program participants, the standard is to have 90 percent confidence, which is precision, that the sample will yield results that are within 10 percent of the true value, which is accuracy.

With regard to his new theory about Rebound Effects, Mr. Marke simply found an article from 2000 on academic theories about survey results regarding Rebound Effects, created his own estimates from that survey, and then applied them to Ameren Missouri's 2013 residential lighting program results. This is nothing more than a hypothetical game of playing "what if" with estimates of Rebound Effects are not even remotely applicable to Ameren Missouri's residential lighting program or any electric utility residential lighting program. Therefore, Mr. Marke abandons his prior calls for accuracy in EM&V. This reflects Mr. Marke's search for any subjective downward adjustment he can find in academic literature to reduce the cost effectiveness of the Ameren Missouri's residential lighting program.

Q. Please explain how Mr. Marke has abandoned his perspective that EM&V should adhere to best practices when conducting EM&V analyses.

A. The State & Local Energy Efficiency Action Network's ("SEE") "Energy Efficiency Impact Evaluation Guide" is the industry compendium of EM&V best

practices. The SEE Guide clearly states at page 7-7 that the estimation of Rebound Effects is not current energy efficiency evaluation practice:

> The issue for impact evaluation is whether rebound is explicitly or implicitly included in the savings determination. An example of an explicit consideration is the use of a deemed rebound effect factor, a form of a non technical degradation factor. As with all deemed factors, it should be specific to the applications associated with the subject program and based on actual historical data. Another explicit approach would be a long-term study of rebound in the participants and a control group of non-participants. **Current standard energy efficiency evaluation practices do not use either of these approaches or any other explicit approaches for assessing rebound.** (emphasis added)

Similar to Mr. Marke's abandonment of his call for accuracy in EM&V results, Mr. Marke also abandons his prior call for adherence to best practices in EM&V.

Q. What other sources did you review to confirm that estimation of Rebound Effects is not and never has been an EM&V best practice?

A. There are two nationally recognized repositories for EM&V reports. Those repositories are the California Measurement Advisory Council ("CALMAC") and the Consortium For Energy Efficiency ("CEE"). I reviewed both databases and searched for the word "rebound" and did not find a single EM&V report that even mentioned Rebound Effects.

Q. Are there any other EM&V best practices that Mr. Marke has abandoned in his attempts to find an academic theory that might reduce the 2013 Ameren Missouri residential lighting kWh results achieved?

A. Yes. EM&V best practices dictate that the evaluator prepare an initial evaluation plan, submit the plan to stakeholders for their review, revise and finalize the evaluation plan based on stakeholder input, and then implement the final evaluation plan. In accordance with best practices, Cadmus described their proposed approach to

evaluating the LightSavers program in the *Evaluation Plan: LightSavers Program (PY5-PY7)*, and then detailed their approach to assessing Market Effectss in *Evaluation Plan: Cross-Cutting Activities (PY5-PY7)*. After the evaluation plans were finalized, Cadmus carried out the activities described therein. OPC had the opportunity to discuss the inclusion of an analysis of Rebound Effects during the EM&V scope of work review process but did not do so. Note that Mr. Marke cries foul, asseting that rebound effect should have been evaluated eight months after the initial evaluation report was issued to stakeholders.

Similar to how Mr. Marke tried to change the terms of the 2012 Stipulation and the MEEIA rider relative to the net shared benefits calculation that OPC agreed upon and is bound by, Mr. Marke is now trying the change the terms of the EM&V evaluation plan to which OPC had the opportunity to provide input in early 2013 when the EM&V plan was finalized with stakeholders. OPC knows this, or should, as Ameren Missouri was and has been transparent about the residential lighting EM&V workplan. In short, Mr. Marke's proposal is both revisionist and unworkable.

Q. Are there any other noteworthy reversals of prior positions made by Mr. Marke?

A. Yes. Mr. Marke completely reversed his recommendation made in his October 6th Testimony, where he stated on page 64, line 10, "[a]dditionally, Cadmus/ADM spillover estimates should be utilized to calculate the overall net-to-gross ratio for the portfolio." Mr. Marke now favors the Commission Auditor's spillover estimates, and he does so for no other reason than they yield lower kWh savings for the 2013 Ameren Missouri MEEIA programs. Mr. Marke provides no rationale for the

switch in position – such as the reasons why the Commission's Auditor's approach is more robust than that of Cadmus/ADM. Rather, Mr. Marke's changed opinion appears to be part of a pattern that he follows to selectively choose the lowest possible estimate of kWh savings for no other reason than to minimize Ameren Missouri's opportunity to earn a financial performance incentive for superior performance.

Q. Have you reviewed Mr. Marke's testimony concerning his adjustment for what he characterizes as Rebound Effects?

A. Yes, I have reviewed the testimony and fundamentally disagree with his conclusions. His proposed adjustment constitutes an arbitrary reduction in 2013 savings, and should not be accepted. Further, his methodology is unsupported by any empirical analysis and is contrary to accepted EM&V practices. Mr. Marke relies on nothing more than an academic discussion of macro-level theories that apply to overarching strategic choices with respect to energy policy. Mr. Marke then twists these theories to support his arbitrary nine percent discount factor, without application of any modeling or analysis of actual data to substantiate his proposed adjustment. For the first time at this rebuttal stage Mr. Marke now unfairly proposes to layer on top of his recommendations to exclude any savings attributable to Market Effects, a sweeping reduction to the Company's 2013 MEEIA program savings for LightSavers based on Rebound Effects. As I explain below, this position is unsupported and should be rejected.

Q. Mr. Marke states on page 10, line 1, that he applied " a 9% direct rebound effect to the LightSavers program as a conservative mid-point from the range developed from the Greening et al. (2000) residential lighting study." Please discuss the residential lighting study to which that testimony refers.

A. The study referenced by Mr. Marke is an article entitled "Energy Efficiency and Consumption – The Rebound Effect – A Survey," which was written in 2000. It is not a residential lighting study. In fact, it is not a study in any sense. It is just a magazine article. Table 3 from that article shows that only four academic studies were used to derive estimates for residential lighting Rebound Effects described in the article. In additioin, there is a footnote in the study associated with the residential lighting rebound estimates that reads "[t]hese studies are done with only one or two methods and are inconclusive in results." A copy of Table 3 from the magazine article cited by Mr. Marke is reproduced below:

Table 3
Summary of empirical evidence for rebound effects

Economic actor	End use	Potential size of the rebound[a]	Comments	Number of studies[a]
Consumers				
	Space heating	10–30%	The unmeasured part of this effect includes an increase in space conditioned and an increase in comfort.	26+ +
	Space cooling	0–50%	The unmeasured part of this effect includes an increase in space conditioned and an increase in comfort.	9+
	Water heating	< 10–40%	Reports of increased shower length or the purchase of increased water heating unit size indicate some indirect effects, which cannot be measured.	5−
	Residential lighting	5–12%	An indirect effect in terms of an increase in operating hours was reported.	4−
	Appliances ("White Goods")	0%	Indirect effects in terms of the purchase of larger units with more features were reported.	2−
	Automotive transport	10–30%	The unmeasured part of this effect includes changes in automotive attributes, particularly the shifts toward attributes such as increases in weight, horsepower and acceleration.	22−
Firms				
	Process uses (Short-run)	0%–20%	Alhough increases in output occurred for less than 20% of the study participants, no values were reported.	1−
	Lighting (Short-run)	0–2%	Changes in output were not reported. However, labor productivity probably improved.	4−

	Long-run aggregate impacts	< 100-0%	improved. Changes in output show a great deal of variability in the literature.	Any number of studies with a variety of conclusions.
Economy-wide effects				
	Change in total output growth	0.48%	Postulated effects include an increase in standard of living and consumption of more energy-consuming "luxury" goods.	1 -

[a]These estimates are expressed as a percentage increase in consumption estimated to result from a 100% increase in energy efficiency (i.e., the estimated elasticity of demand times — 100%).
*Grading system used for the quality of estimate:
+ + These studies are done with a number of methods that provide good correspondence of estimates.
+ These studies are done with only a moderate number of different methods that show some variability in estimates.
- These studies are done with only one or two methods and are inconclusive in results.
Note: All estimates assume a 10% increase in efficiency of fuel consumption.

Q. Are you saying that Mr. Marke based his proposed nine percent reduction to Ameren Missouri's 2013 achieved residential lighting kWh based on a magazine article from 2000 that references a total of four unnamed studies, which the author of the article emphatically states are inconclusive?

A. Yes. It appears that magazine article is the sole source Mr. Marke used to support his proposed adjustment for Rebound Effects.

Q. Does the magazine article cited by Mr. Marke say anything else about Rebound Effects?

A. Yes, on page 391 the article states "[a]ll the discussion of rebound effects thus far is based on the application of economic theory to a static situation." In addition, on page 389 the article states "[f]or the energy end uses for which studies are available, we conclude that the range of estimates for the size of the rebound effect is very low to moderate."

Q. Is it fair to state that Mr. Marke's recommendation to make a nine percent reduction to Ameren Missouri's 2013 achieved residential lighting kWh is based on imaginary numbers from a handful of unnamed academic articles

published prior to 2000 that have no relevance to energy efficiency evaluation, measurement and verification studies?

A. Yes, that statement is absolutely true.

Q. Are you aware of any support from national energy efficiency organizations or among recognized experts that quantify Rebound Effects?

A. No. I should note however that from time to time there are articles that appear randomly that address Rebound Effects from a scholarly perspective. For example, on October 31, 2014, the American Council For An Energy Efficiency Economy ("ACEEE") published a paper entitled "The Rebound Effect - Mountain or Molehill?" This is what ACEEE has to say about Rebound Effects:

> Regarding electricity use, Breakthrough discusses how electricity use has risen more quickly than generating plant efficiency has increased. The authors call this backfire, even as they acknowledge that these trends are also affected by rising incomes, urbanization, changes in consumer preferences, and other socioeconomic and demographic trends. ***They provide no evidence on the relative importance of energy efficiency relative to these other factors. Furthermore, they seem to mix up energy efficiency and economic efficiency. They focus on the period of 1900-1950 in the United States, when electricity use per capita increased 30 times, while residential prices decreased about 95% in real terms. These price decreases are substantially greater than the energy efficiency improvements, indicating improved economic efficiency, such as economies of scale. Economic efficiency also explains a good portion of the steep declines in the price of lighting and appliances that contributed to rising electricity use. In other words, a large portion of the increase in electricity use was due to improvements in economic efficiency that go beyond the technological energy efficiency improvements.*** **(emphasis added)**

http://aceee.org/blog/2014/10/rebound-effect-mountain-or-molehill

Q. What has the National Resources Defense Council (NRDC") published on Rebound Effects as they pertain to energy efficiency?

A. NRDC published a 21-page white paper in 2011 titled "Are There Rebound Effects from Energy Efficiency? – An Analysis of Empirical Data, Internal Consistency, and Solutions". This paper developed a rigorous and scientifically sound hypothesis for rebound theory. It showed that many of the hypotheses on which the recent papers promoting Rebound Effects are based are neither scientific nor testable. Further, the formulations of previous rebound hypotheses are biased toward only discovering negative second order effects of efficiency policies.

Q. What does the National Renewable Energy Laboratory ("NREL") Uniform Methods Protocol ("UMP") say about residential lighting evaluation protocols as they pertain to Rebound Effects?

A. The UMP states the following on page 6-21 of Chapter 6, which is entiled "Residential Lighting Evaluation Protocol":

> **4.10 Snapback/Rebound or Conservation Effect**
>
> "Snapback" or "rebound" refers to changes in use patterns that occur after the installation of an energy-efficient product, resulting in reducing the overall measure savings. For example, when residential lighting customers use a CFL for more hours per day than they used the replaced incandescent bulb, this constitutes snapback. This behavior change may be due to factors such as the cost savings per unit of time from the CFL or a concern that turning CFLs on and off shortens their effective useful life (although it is unlikely most consumers are aware of this effect on bulb life). Some customers, however, might have lower hours of use after installing a CFL, perhaps due to a corresponding desire to reduce energy consumption or dissatisfaction with the quality of light.
>
> Due to the nature of residential lighting programs, it is not typically possible to conduct metering both before and after the installation of energy-efficient lighting. However, a recent lighting study in the Northeast found that the hours of use were greater for sockets with efficient bulbs compared to all sockets in the house (NMR Group 2014). The difference was believed to be either due to: 1) differential socket

> selection (households selecting higher-use locations for their high-efficiency light bulbs); 2) Shifting usage (households install an efficient bulb in a socket and then begin to use that socket in lieu of sockets containing inefficient bulbs); and 3)snapback. However, this evaluation did not collect any data to determine which of these three theories is correct, or the proportion of the difference between efficient and inefficient HOU that is attributable to each type of behavior. Therefore, the Residential Lighting Protocol recommends researching for snapback/rebound effects in future HOU estimates.

The operative sentence in the preceding extract is "Due to the nature of residential lighting programs, it is not typically possible to conduct metering both before and after the installation of energy efficient lighting." This means that there is no field protocol that can accurately estimate what if any Rebound Effects may exist for lighting programs.

Q. The UMP states a recent lighting study in the Northeast found that the hours of use were greater for sockets with efficient bulbs compared to all sockets in the house (NMR Group 2014). Doesn't this suggest that Rebound Effects may be legitimate for residential lighting programs?

A. No. Lighting studies show that certain rooms have far higher lighting on hours than other rooms. For example, kitchens and living rooms have far higher lighting-on hours than hallways, bedrooms, and closets. Due to the significant investment in CFLs relative to incandescent lighting, customers first put CFLs in those sockets with the highest hours of use in order to get the quickest payback for their investments in energy efficient lighting. To have any idea of a differential in the lighting-on hours of CFLs relative to incandescent lighting would require metering before and after the installation of energy efficient lighting. This is precisely what the UMP states is typically not possible.

Q. Did Rebound Effects have any reduction in savings during 2013 that would have impaired or discounted the savings achieved from Ameren Missouri's residential lighting program?

A. No. There is no evidence or analysis to support such a conclusion. Mr. Marke has not offered any data, new or existing, that would support the occurrence of massive "rebound" of energy efficiency efforts in Ameren Missouri's service territory. Further, logic and common sense cannot support a conclusion that participants would have given back almost 10 percent savings from their Ameren Missouri residential lighting program by rushing out to purchase high energy consuming appliances, cranking up their air conditioners, or keeping their lights on any longer. To the contrary, logic suggests the complete opposite conclusion: consumers, to the extent they used savings to acquire new electric appliances, are more likely to purchase newer more efficient appliances, and are more likely to internalize the benefits of energy efficiency in their decision making than before they were exposed to energy efficiency programs and associated marketing. Rebound Effects are premised on the notion that customers are intrinsically stupid, and after they participate in energy efficiency programs, they simply accept the benefits of those programs without any awareness of the concept that saving electricity saves them money. To the contrary, we believe our customers are intelligent people, and those who participate in, or are exposed to, our programs are much more likely to have new-found awareness and knowledge of how to further energy savings beyond the immediate benefits of the individual programs. Our EM&V and the Commission's auditor found that this actually occurred, attributing savings to Market Effects associated with the LightSavers program.

Q. If Mr. Marke's analysis is unsupported by empirical analysis or data, what is the basis for his proposed nine percent downward adjustment?

A. There is really no basis or calculation that supports Mr. Marke's proposal. He simply made a less than educated guess to come up with his nine percent discount factor.

Q. Mr. Marke claims there is "an extensive amount of empirical research substantiating the existence of a rebound effect," is that claim accurate?

A. No there is not, and my earlier rebuttal testimony supports that conclusion. Mr. Marke did not conduct any empirical analysis of Rebound Effects associated with Ameren Missouri's MEEIA programs in place in 2013. The analysis he suggests supports his adjustment relates to estimates and modeling relevant to markets beyond Missouri , for different time periods, different programs, and for purposes unrelated to EM&V.

By way of example, one article specifically relied upon by Mr. Marke is authored by a scholar that supports conclusion that is 180 degrees opposite of what Mr. Marke recommends. Specifically, Mr. Marke relies upon an article entitled "The Rebound Effect is Over-Played," by Kenneth Gillingham of Yale. As Gillingham succinctly notes, the thesis of that article is "[t]he rebound effect is real and should be considered in strategic energy planning. But it has become a distraction... academic literature shows that rebounds are too small to derail energy-efficiency policies." In fact, Gillingham and his colleagues reach the following stark conclusion about the policy implications for Rebound Effects in their October 2014 article on the subject: "The existing literature does not provide support for claims that energy efficiency gains will be reversed by the rebound effect."

Q. Should the Commission follow the recommendation of Gillingham c consider Rebound Effects a "distraction"?

A. Yes, I agree with Gillingham. There is insufficient support to presume that savings should be reversed, discounted, or otherwise pared down by virtue of any theoretical abstract factor such as the one that Mr. Marke presents.

Q. Is there anything further that concerns you regarding Mr. Marke's conclusions related to Rebound Effects?

A. Yes, the premise of Rebound Effects is at its core, antithetical to energy efficiency. This is a continuing theme that is appearing in Mr. Marke's testimony. Mr. Marke and OPC are increasingly offering a cynical rebuttal to the very concept of large scale energy efficiency programs producing real benefits to utility customers. As I noted in my direct testimony, Mr. Marke's opposition to the market transformative effect of energy efficiency programing (*i.e.* Market Effects) is essentially a criticism of doing energy efficiency programs in the first place. Mr. Marke believes that it was Walmart that transformed the CFL market place. (October 6th Testimony, pp. 46-50). Now Mr. Marke is claiming that energy efficiency efforts actually enable greater consumption of energy as a Rebound Effect. Mr. Mark believes that Market Effects are speculative and cannot be quantified, but yet attempts to quantify Rebound Effects. (October 6th Testimony, pp. 29-44). Mr. Marke believes that Arkansas' estimates of residential lighting leakage should be used in place of primary market research on Ameren Missouri's customers simply because the Arkansas leakage estimates yield lower kWh savings. (October 6th Testimony, pp. 16-18). The selectivity of his adjustments, the authorities he cites as support, and his own cynical observations about energy efficiency

are essentially arguments against utility-sponsored energy efficiency in general. What Mr. Marke is asking the Commission to do is to basically proclaim the benefits originally expected from MEEIA were way off. In fact, Mr. Marke appears to believe these programs provide only marginal savings, which are washed-out by Rebound Effects and do not, therefore, have any market transformative effect. The expectations established when Ameren Missouri's MEEIA program was launched were established by the parties to the 2012 Unanimous Stipulation and Agreement, including OPC.

Q. Are there any long term implications associated with OPC's recommendation with respect to Rebound Effects?

A. To the extent OPC's change of course and position with respect to Market Effects and Rebound Effects are recognized, the consequences are not limited to the 2013 results. While the savings at issue in this case are confined to 2013, the policy implications are not. If we are to accept the theories of OPC and dramatically reduce the savings agreed to by the Company, Staff, and the Division of Energy for the purposes of this EM&V, then it will be difficult to dismiss those same theories as we plan for future MEEIA programing and energy efficiency planning in general. In fact, Mr. Marke's cynicism regarding any EM&V analysis that results in an upward adjustment to energy efficiency savings, while embracing academic theories that may also result in a downward adjustment to those savings, may require Ameren Missouri to revisit its assumptions around risk and uncertainty for DSM programs in its IRP filings. OPC's theories on Market Effects and Rebound Effects, if accepted, would serve only to constrain future choices and options for the Commission and for Missouri as it formulates statewide plans to comply with EPA proposed greenhouse gas rules. Further, as I have

testified at length in this proceeding, such constraints would not be supported by accepted and recognized best practices. Accordingly, the Commission should decline to accept OPC's claims regarding Rebound Effects together with it other unsupported theories intent on reducing the EM&V results at issue in this proceeding.

Q. Does this conclude your rebuttal testimony?

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 Filing to Implement Regulatory Changes Furtherance of Energy Efficiency as allowed by MEEIA.	)))	File No. EO-2012-0142

AFFIDAVIT OF RICHARD A. VOYTAS

STATE OF MISSOURI)
) ss
CITY OF ST. LOUIS)

Richard A. Voytas, being first duly sworn on his oath, states:

1. My name is Richard A. Voytas. I work in the City of St. Louis, Missouri and I am employed by Ameren Services Company as Director of Energy Efficiency/Demand Response.

2. Attached hereto and made a part hereof for all purposes is my Rebuttal Testimony on behalf of Union Electric Company d/b/a Ameren Missouri consisting of 16 pages and Schedule(s) None, all of which have been prepared in written form for introduction into evidence in the above-referenced docket.

2. I hereby swear and affirm that my answers contained in the attached testimony to the questions therein propounded are true and correct.

Richard A. Voytas

Subscribed and sworn to before me this 17th day of November, 2014.

Julie Irby
Notary Public

My commission expires: 1/15/2017

Julie Irby - Notary Public
Notary Seal, State of
Missouri - St. Louis County
Commission #13753418
My Commission Expires 1/15/2017