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MISSOURI PUBLIC SERVICE COMMISSION

FILE NO. EO-2018-0211

SURREBUTTAL TESTIMONY

OF

STEVEN M. WILLS

ON

BEHALF OF

UNION ELECTRIC COMPANY

d/b/a Ameren Missouri

St. Louis, Missouri
September, 2018

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I. INTRODUCTION

Q. Please state your name and business address.

A. Steven M. Wills, Union Electric Company d/b/a Ameren Missouri ("Ameren Missouri" or "Company"), One Ameren Plaza, 1901 Chouteau Avenue, St. Louis, Missouri 63103.

Q. What is your position with Ameren Missouri?

A. I am the Director of Rates & Analysis.

Q. Please describe your educational background and employment experience.

A. I received a Bachelor of Music degree from the University of Missouri-Columbia in 1996. I subsequently earned a Master of Music degree from Rice University in 1998, then a Master of Business Administration ("M.B.A.") degree with an emphasis in Economics from St. Louis University in 2002. While pursuing my M.B.A., I interned at Ameren Energy in the Pricing and Analysis Group. Following completion of my M.B.A. in May 2002, I was hired by Laclede Gas Company as a Senior Analyst in its Financial Services Department. In this role, I assisted the Manager of Financial Services in coordinating all financial aspects of rate cases, regulatory filings, rating agency studies and numerous other projects.

In June 2004, I joined Ameren Services as a Forecasting Specialist. In this role, I developed forecasting models and systems that supported the Ameren operating companies' involvement in the Midwest Independent Transmission System Operator, Inc.'s ("MISO")[1] Day 2 Energy Markets. In November 2005, I moved into the Corporate Analysis Department of Ameren Services where I was responsible for performing load research activities, electric and gas sales forecasts, and assisting with weather normalization for rate cases. In January 2007, I accepted a role I briefly held with Ameren Energy Marketing Company as an Asset and Trading Optimization Specialist before returning to Ameren Services as a Senior Commercial Transactions Analyst in July 2007. I was subsequently promoted to the position of Manager, Quantitative Analytics, where I was responsible for overseeing load research, forecasting and weather normalization activities, as well as developing prices for structured wholesale transactions.

In April 2015, I accepted a position with Ameren Illinois as its Director, Rates & Analysis. In this role I was responsible for the group that performed Class Cost of Service, revenue allocation and rate design activities for Ameren Illinois, as well as maintained and administered that company's tariffs and riders. In December 2016, I accepted a position with the same title at Ameren Missouri.

II. PURPOSE OF TESTIMONY

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

A. My surrebuttal testimony in this proceeding responds to certain portions of the Rebuttal Report ("Staff Report") filed by the Missouri Public Service Commission Staff ("Staff") and also to an issue raised by Office of the Public Counsel ("OPC") witness Dr.

[1] Now known as the Midcontinent Independent System Operator, Inc.

Geoff Marke. I first provide comments in response to the Staff Report and Dr. Marke regarding the juxtaposition of this MEEIA application and the Company's "Charge Ahead" filing that seeks to incentivize development of electric vehicle charging infrastructure, and also provide incentives to commercial and industrial customers to replace equipment that uses propane, gasoline, or diesel fuels (e.g., forklifts) with more efficient electric-powered equipment. Next, I address Staff's stated concerns regarding the calculation of the margin rates proposed by the Company that are used to calculate the throughput disincentive. Finally, I will provide an update to the margin rates the Company proposed in this proceeding in order to reflect the impact of the rate reduction that the Commission approved for Ameren Missouri earlier this summer as a result of the federal income tax law changes.

III. MEEIA AND CHARGE AHEAD

Q. What issues are raised in this case related to the Company's "Charge Ahead" proposal, which is currently pending before the Commission in File No. ET-2018-0132?

A. Both the Staff Report and Dr. Marke's testimony reference the Charge Ahead proposal as relevant context for the Commission's consideration of the Company's MEEIA application. Specifically, Dr. Marke states, "[t]hat approval of both applications would seemingly be at odds with one another. OPC questions the appropriateness of supporting both a load building and a load reduction program …" (Marke Rebuttal, page 17, lines 13-14).

Meanwhile, the Staff Report expresses similar sentiment and stated, "…Ameren Missouri has also proposed additional load building programs stating that through the

implementation of the programs, customers would better utilize the system that is in place and provide benefits to customers. … [t]hese programs' supposed benefits are in direct conflict with each other." (Staff Report, page 34, lines 2-5 and 7-8).

Q. Are OPC and Staff right? Is there a conflict between seeking to continue demand-side management programs under MEEIA and seeking to electrify certain end uses?

A. No, there is not, although I can understand why, on a very superficial level, the juxtaposition of the two programs might elicit this type of questioning. The reality, though, is that the MEEIA plan and the Charge Ahead program share common goals and complement each other extraordinarily well. Both OPC and Staff have participated in workshops on both programs, have obviously already filed testimony on MEEIA, and are preparing to file testimony on Charge Ahead later this month. Based on that level of familiarity with the filings, I would expect it should have been very evident to these parties that the programs fit together well in their common pursuit of both energy and economic efficiency.

Q. Please provide a high-level overview of the Charge Ahead filing.

A. The Charge Ahead filing encompasses three distinct tariff revisions or additions: (1) revisions to the Company's line extension policy; (2) incentives for third-party owned and operated electric vehicle charging infrastructure; and (3) incentives for commercial and industrial customers to adopt electric technologies for certain end uses where those end uses are currently powered by gasoline, diesel, or propane. In my Direct Testimony from File No. ET-2018-0132, I stated:

> This filing proposes a portfolio of programs reflected in new and revised tariff sheets designed to enhance the utilization of the

> electric grid in a manner that reduces overall rate levels for existing customers while simultaneously creating a number of benefits. These include reducing overall energy consumption across fuels on a total BTU basis, reducing emissions, and/or enabling expansion of customer operations on equitable terms that may improve the efficient utilization of the Company's distribution system. These new terms for customer expansions may also generate ancillary economic development benefits in the Company's service territory.

Overall, much like the Company's MEEIA proposal, Charge Ahead is a proposal that the Company is excited to get an opportunity to bring to its customers because of the many benefits it has the potential to create for them.

Q. You mentioned that MEEIA 3 and Charge Ahead share common goals and complement each other well. Please provide an overview of the many ways that this is true.

A. The most critical point to understand is that both MEEIA 2019-24 and Charge Ahead are, at their core, energy efficiency programs. Charge Ahead taps into a large emerging area of interest being discussed, analyzed, and studied across the industry and supported by a broad array of stakeholders that is sometimes called "Efficient Electrification" and sometimes called "Beneficial Electrification." As I described in my direct testimony in that case, Ameren Missouri expects the new end uses that are incentivized under Charge Ahead to *reduce* overall energy consumption. Charge Ahead and MEEIA are therefore kindred spirits in their focus on providing energy services more efficiently so that overall energy consumption is reduced. I have prepared Table 1 below, where I compare MEEIA and Charge Ahead based on how they contribute toward the creation of a number of categories of benefits. Across all these categories of benefits, the effects of the two programs are similar, despite achieving them in different ways.

Table 1 – Comparison of MEEIA and Charge Ahead Attributes

Benefit Category	MEEIA 3	Charge Ahead
Energy Efficiency	Reduces overall energy consumption by improving the efficiency of electric energy consuming devices and processes.	Reduces overall energy consumption on an equivalent BTU basis by substituting substantially more efficient electric motors for processes currently powered by less efficient internal combustion engines.
Reduce Emissions	Reduces emissions by reducing the overall amount of electric generation required to provide energy services for a given level of end use output.	Reduces emissions - even with today's fuel mix - by substituting substantially more efficient electric motors for processes currently powered by less efficient and directly emitting internal combustion engines. Includes potential for even greater emissions reductions as the generation mix becomes cleaner and renewables are added to power the electrified devices and processes.
Grid Utilization	Improves system utilization by focusing on electric energy reductions in peak periods, resulting in a lower capacity requirements over time.	Improves system utilization by focusing electric energy increases that result from fuel substitution for processes and equipment that operate in off-peak periods and/or with very good load factors, which limit the incurrence of increased capacity requirements and allow new loads to take advantage of previously underutilized infrastructure.
Consumer Choice	Provides utility customers with new options to manage their electric bills.	Provides utility customers with new options to manage their overall energy bills, as well as addresses barriers that currently limit customers' ability to take advantage of the flood of new high performing electric vehicles entering the market from many major auto manufacturers.

Q. Are there any other ways that you see parallels between the two programs?

A. Yes. There is increasing discussion in the industry (and at the Missouri Public Service Commission – e.g. the Emerging Issues Workshop docket (File No. EW-2017-0245)) about the transformation that electric utilities are undergoing to incorporate rapidly evolving distributed and renewable (i.e. intermittent) technologies. Foundational to utilities' ability to incorporate higher levels of clean but intermittent resources in a cost-effective and reliable manner is the ability to sometimes shape load to the available supply, rather than always follow demand with dispatchable resources. Said another way, with increasingly intermittent resources we will continue to have enough energy supply – what we will need is flexible demand. Both MEEIA and Charge Ahead create opportunities to make load more responsive to supply conditions and/or facilitate integration of renewables. Truly, the utility business model of the future will require innovative demand-side programs like both MEEIA and Charge Ahead. To reject MEEIA because of Charge Ahead would be counter to good public policy when energy systems need to become *more* innovative and flexible, rather than less so.

Q. Please summarize the relationship of MEEIA and Charge Ahead.

A. Electric energy efficiency as promoted by MEEIA and the efficient electrification found in Charge Ahead are, in fact, completely aligned with respect to the customer outcomes they are designed to create. As technology advances and utilities evolve to an integrated grid that incorporates higher levels of distributed and intermittent resources, utilities will necessarily have to become more agile with the use of demand-side tools to balance the system. The benefits of energy efficiency, regardless of what fuel is

being offset, are broad and substantial. MEEIA and Charge Ahead both have prominent and very complementary places in Ameren Missouri's plans to deliver customer value into the future.

IV. MARGIN RATES

Q. What is the purpose of the margin rates that were calculated for the Company's MEEIA filing and included in Rider EEIC?

A. The margin rates are described in full detail in the Company's MEEIA 2019-24 Report that was filed at the outset of this case, but, in short, these are the rates that are used to determine the financial impact to the Company of reduced sales resulting from the Company's MEEIA demand-side programs (i.e., the margin lost when a megawatt-hour of energy is saved due to energy efficiency or during a demand response event). Energy savings associated with those programs are multiplied by the margin rates to determine the throughput disincentive the Company is eligible to recover through Rider EEIC.

Q. Did Staff take any issue with the margin rates calculated for the Residential or Small General Service ("SGS") rate classifications?

A. No. Staff did not identify any issues with these margin rates, so I will not provide any additional evidence as to their reasonableness. However, Staff did question certain elements of the calculations used for the determination of margin rates applicable to the Large General Service ("LGS" or "3M"), Small Primary Service ("SPS" or "4M"), and Large Primary Service ("LPS" or "11M") rate classifications.

Q. What is different about these rate classifications relative to the Residential and SGS rates that gives rise to the issues that Staff identified?

A. All three of these service classifications have a demand charge component of the rate structure, while the Residential and SGS classifications do not. Staff's questions respecting these margin rates relate to certain details regarding the incorporation of the demand charge into the margin rate calculations.

Q. Please describe the demand charges that are included in these rate structures.

A. A customer's billing demand is established for each monthly bill based on the highest level of usage recorded over any 15-minute interval within the month.[2] This is a typical rate design across the industry for large commercial and industrial customers. It allows for the fixed costs of infrastructure that is sized generally to meet the maximum demand placed on the electric system to be covered with revenues from customers in proportion to their contribution to that demand. Demand charges are assessed only on usage that is taking place during the customer's peak usage period. Energy charges, by contrast, are assessed, as the name implies, on all energy usage, regardless of when it occurs.

Q. Does the concept of the throughput disincentive that accompanies utility investment in demand-side resources apply to demand charges as well as energy charges?

A. Absolutely. Energy efficiency measures (and to a lesser extent, demand response) reduce customer usage and the revenues derived from that usage by the utility to cover its fixed costs whenever the affected appliance consumes electricity. Obviously all usage reductions from such measures impact revenues derived from energy charges, but

[2] In some circumstances, demands that occur during off-peak time periods defined in the applicable tariff are reduced by 50% for purposes of determining the billing demand. The Company's analysis considers the demand to analyze for each customer individually to ensure that the appropriate level of demand is reflected in the analysis.

only those usage reductions that occur simultaneously with the customer's individual peak period consumption impact demand charges. In both cases, however, the utility loses revenues that would otherwise contribute to covering the largely fixed costs of providing service to its customers.

The impact of any particular measure may tend to be greater on demand than on energy, or vice versa, depending on the end use it affects.[3] For example, cooling end uses tend to drive summer peak loads, both on the system and for many individual customers. Therefore it is logical that cooling efficiency measures may have a proportionally larger impact on customer peak (billing) demands than on energy consumption. By contrast, a measure impacting outdoor lighting, which tends to be used overnight, but not during typical daytime peak load conditions, may have a proportionally larger impact on energy consumption than on customer peak demand.

Unfortunately, a measure's impact on peak demand can be harder to assess than its energy impact, especially given the focus of Evaluation, Measurement, and Verification ("EM&V") processes on energy and Coincident Peak[4] ("CP") demand savings. However, the Company undertook detailed analysis in support of its initial filing to understand the impacts that MEEIA measures can be expected to have on billing demand, and ultimately, the throughput disincentive experienced by the Company.

Q. What issues did the Staff Report raise with that analysis?

A. Staff questioned a number of details of the Company's analysis, including:

[3] MEEIA's emphasis on demand savings results in the Company designing programs that focus more on measures that have significant demand savings.

[4] EM&V focuses on the impact of the efficient measure on the system peak in order to assess the impact on utility peak demand, and therefore utility costs for supplying generation capacity to customers. While on average, individual customers tend to be higher in the usage spectrum when the system peak is reached, their peak usage ("billing demand") may or may not occur at the same time as the system peak demand.

- The hourly end use load shapes that were an input into the analysis of the demand impact;
- The assumptions used to translate the load shapes into a peak demand estimate;
- The method of averaging end use specific demand impacts to come up with an overall average demand impact of MEEIA business portfolio measures; and
- The application of minimum demands to the margin rate analysis.

I will address each of these issues in detail below:

Q. Please discuss the first issue – the end use load shapes used by the Company in the analysis.

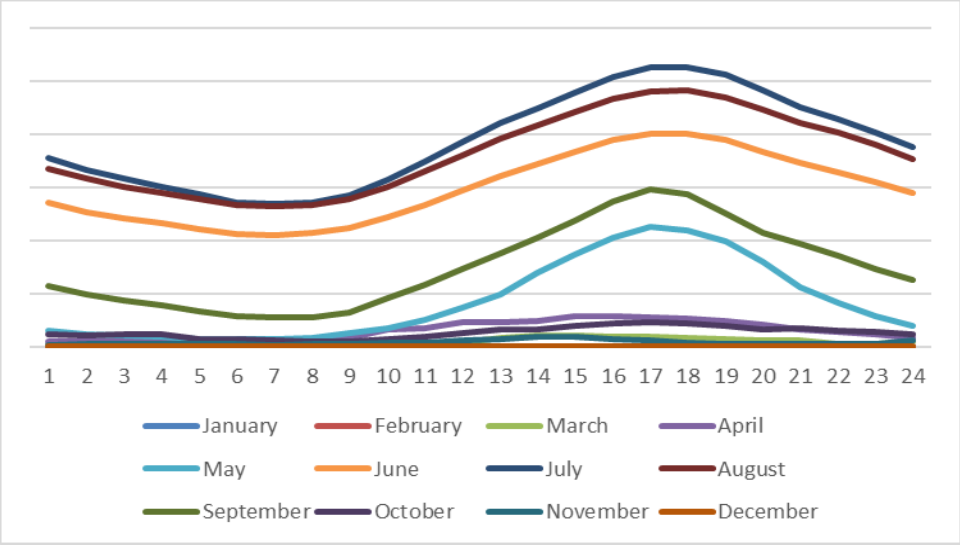
A. The end use load shapes form the underlying basis of the entire analysis. These shapes utilize load research that was performed in order to understand usage characteristics of various electrical end uses – exactly the type of information that is necessary to assess the impact a reduction in usage (as may be caused by implementing an efficiency measure) would have on customer demand at different points of time (e.g., peak times when the billing demand is likely to be established). The detailed and robust end use load research activities that underlie the end use load shapes used in this analysis are described thoroughly in the Company's 2017 Integrated Resource Plan ("IRP"). It is notable that these very load shapes are being used as a part of the Company's current MEEIA 2016-18 plan and were employed by the Company and *Staff* in the development of MEEIA 2016-18-related adjustments to the billing units in the Company's rate case settlement in File No. ER-2016-0179. Suffice it to say, these load shapes have been through a robust analytical

process, thoroughly reviewed, and utilized – including by Staff – in a number of important regulatory contexts in front of this Commission. So the concerns raised by Staff about the load shapes at this time are surprising, to say the least.

Q. Please provide an example of the types of load shapes you are talking about.

A. Figure 1 below shows the average daily cooling load shape by month used to assess savings patterns associated with energy efficiency measures applicable to cooling end uses (e.g., air conditioning) in the proposed Business portfolio. Notice in Figure 1 the relatively lower load in the overnight hours and the increase throughout the day, peaking around 5:00 p.m., before temperatures start to decline and businesses close for the day. Also observe in this example the monthly levels of load reflected in this analysis – the July and August curves are by far the highest, suggesting cooling load is heaviest in the core summer months. June, September, and May loads are next in the figure, followed by lower levels in spring and fall months. Winter months shown in Figure 1 are imperceptible on the graph because of how little cooling use occurs during the winter.

Figure 1 – Daily Cooling Load Shape by Month



Q. What are the specific concerns that Staff raised?

A. Staff simply states the load shapes the Company used include "some unreasonable estimates of hourly usage for [that] measure in certain instances." Once again it is notable that Staff does not have any specific criticism of the overall load shapes or the process used to develop them. Instead, Staff claims to find ***two*** examples of individual hourly values that do not make sense and uses these examples to question the integrity of ***all*** the load shapes. It should be noted that these are hourly load shapes designed to explain utilization patterns of different end uses over the course of a whole year. With respect to programs in the Business portfolio, Ameren Missouri analyzed eleven different load shapes over the 8,760 hours of a year. So the fact Staff alleges that two of those values are unreasonable needs to be understood in the context of how much data is involved (11 end uses x 8,760 hourly values = 96,360 data points). That said, even the two examples that Staff cited are not actually reasonable criticisms that should cast doubt on the underlying analysis or integrity of the load shapes used to develop the proposed MEEIA 2019-24 margin rates.

Q. Please describe the two issues raised by Staff with specific load shape values.

A. First, Staff questioned a value contained in the cooling load shape (the same end use shape that is shown above in Figure 1). Staff claims that, "[f]or example, the end use hourly load shape used by Ameren Missouri for the cooling measure shows a random level of usage for January but only at 3:00 in the morning." (Staff Report, page 71, lines 5-7).

To understand how trivial this point is – to the point of complete immateriality - it is worthwhile to understand a little more detail about how load shape data is used. Assume for a moment there was a business that participated in Ameren Missouri's program and made an air conditioning efficiency improvement that was estimated to save 10,000 kilowatt-hours ("kWh") per year. In order to assess the throughput disincentive that results from that air conditioning project (i.e. to calculate the reduction in margin derived from the revenues that would otherwise be received from the participating customer), the 10,000 kWh would first be allocated to months of the year using the load shape at issue. Because almost no cooling energy is used in the winter, the load shape shows almost no cooling energy in winter months. The allocation of cooling energy to the months that results from application of the load shape is shown in Table 2 below:

Table 2 - Monthly Cooling Allocation

Month	Monthly Energy Allocation	10,000 kWh Project Allocated
Jan	0.001%	0.07
Feb	0.029%	2.90
Mar	0.662%	66.21
Apr	2.105%	210.51
May	6.300%	629.95
Jun	21.428%	2,142.82
Jul	28.858%	2,885.77
Aug	27.127%	2,712.72
Sep	10.845%	1,084.52
Oct	2.025%	202.51
Nov	0.610%	61.00
Dec	0.010%	1.02
Total	100.000%	10,000.00

So a total of 0.001% of the kWh savings, or less than a tenth of a kWh associated with the project, would be affected by the load shape associated with January. Consequently, whatever is happening in January, it has a completely negligible impact on

the calculated throughput disincentive associated with the project. Yet Staff used its concern about the load shape for January as a basis to argue Ameren Missouri's load shapes are unreliable.

Q. Regardless of the materiality of the impact, does the unusual value appearing at 3 a.m. in January suggest larger problems with the load shapes and/or the process that was used to develop them?

A. No. As should be obvious, there really is no cooling load in January to speak of. As such, there are likely to be no observations of load research data to describe how cooling is used in January. However, an analyst developing these load shapes must account for the possibility that savings will be reported in any month and have a means for analyzing those savings, if for no other reason other than having all zero observations in January would tend to produce formula errors in Excel whenever savings did show up in that month. As a consequence, my educated guess – based on my own several years of load research experience – is that an analyst did in fact put an arbitrary amount of load at an arbitrary time of the month just to get the Excel file to work properly. And, again, this arbitrary value was used because of the lack of available information about energy usage for cooling at that time of the year. The incredibly small amount of usage that was reflected in January (0.001% of total annual usage) assured there would be no perceptible consequence of whatever hour the load was reflected. This does not reflect at all on the process for developing the end use load shapes for months where actual usage and load research representative of that usage exists.

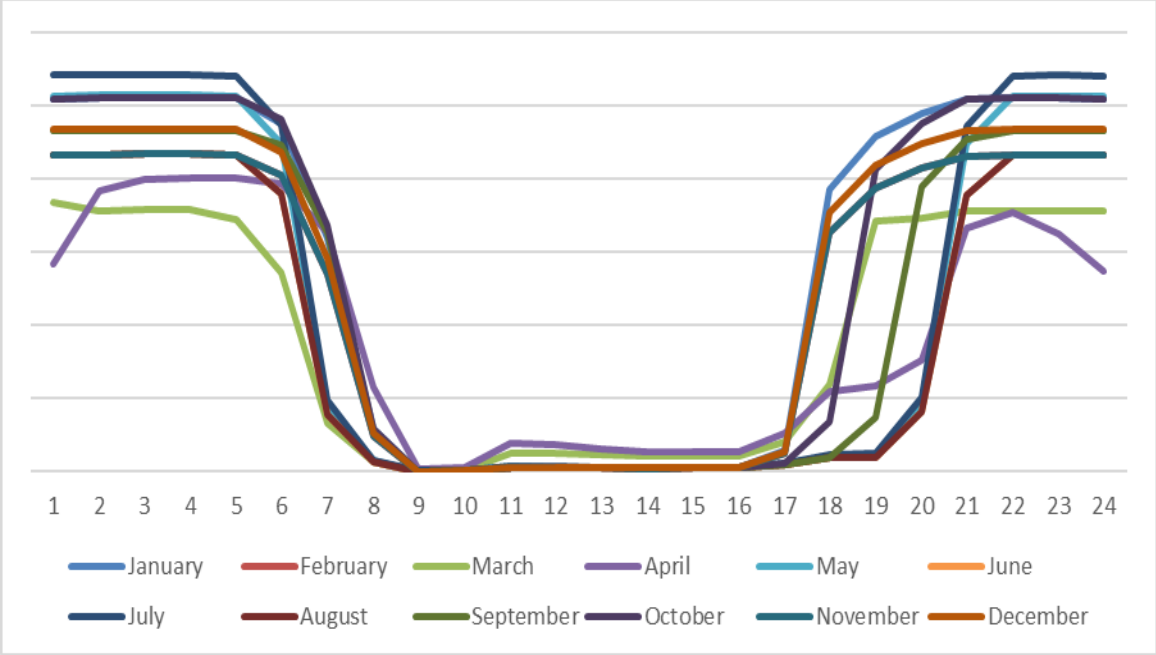
Q. What is the second example that Staff pointed out in order to suggest that the Company's load shapes may be unreliable?

A. Staff also stated that, "[a]nother measure that Staff is reviewing is the hourly load shape for exterior lighting, which shows maximum usage at 9:00 and 10:00 in the morning, where Staff would expect the maximum to occur closer to the evening hours." (Staff Report, page 71, lines 8-10).

Q. Is this concern raised by Staff valid?

A. No, and this one is far easier to explain than the last one because Staff's statement is simply wrong. The exterior lighting load shape does not show a peak at the time Staff suggests in any month of the year.[5] In fact it shows very little or zero usage depending on the month. The average daily load shapes for exterior lighting included in the Company's workpaper are shown, by month, in Figure 2 below:

Figure 2 – Daily Exterior Lighting Load Shape by Month



[5] The Company has an outstanding data request to Staff as of this writing to try to understand how Staff reached the conclusion that it did.

As is clearly evident, these load shapes do not have maximum values occurring at 9:00 or 10:00 am. Staff's concern, as stated in the Staff Report, simply mischaracterized the underlying data.

Q. What is your conclusion regarding the end use load shapes that were utilized in the margin rate analysis?

A. Staff's expressed concerns provide no reasonable basis to call into question the validity of the load shapes used by the Company. In fact, Staff's concerns are either demonstrably wrong or completely trivial, and really should not have warranted the amount of discussion that they generated.

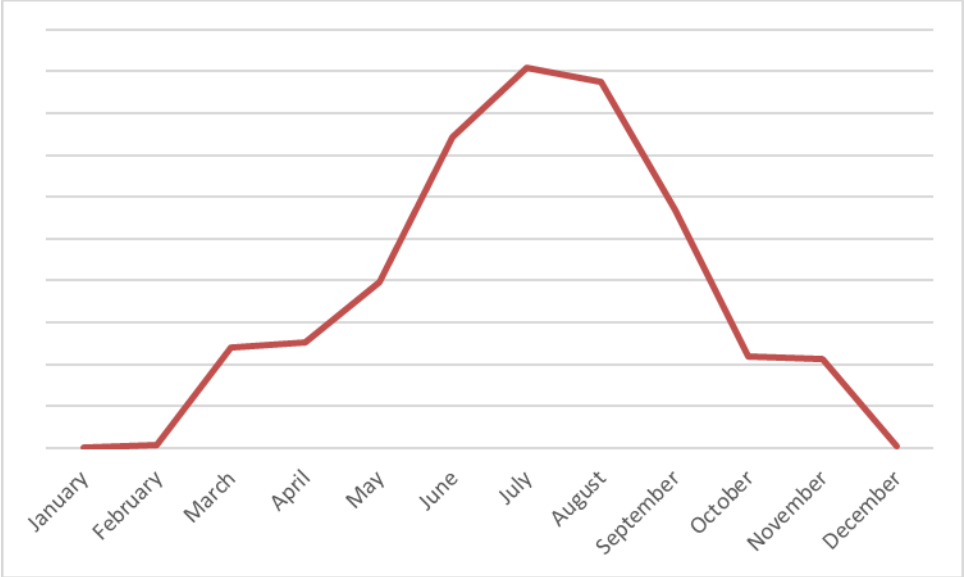
Q. Please move on to the next issue Staff raised with respect to the margin rate calculation – the Staff's concern with the assumptions the Company used to translate the load shapes into demand impacts.

A. Staff claims that, "…Ameren Missouri's method relies on an unsupported and unreasonable assumption that an energy efficiency measure is running at the measure's peak level of operation regardless of the time of year, which greatly overestimates the demand savings that will occur." (Staff Report, page 71, lines 17-19). Staff goes on to repeat this claim multiple times later in its report.

Q. Is Staff's assertion based on an accurate characterization of the Company's analysis?

A. No, and a simple chart, pulled directly from data in the Company's workpaper, of the relative demand impacts, by month, of a measure associated with cooling (air conditioning) end use clearly demonstrates this. Figure 3 below shows the relative monthly demands implied by the Company's cooling load shape by month:

Figure 3 – Cooling Load Shape Monthly Peak Hour Demand



If Staff's assertion were true – that the Company unreasonably assumed that the end use impacted by the program measure ran at its maximum level for the determination of demand in each month – then the monthly demands derived from the load shape would have to be represented in Figure 3 by a flat line, where the demand each month was constant and represented the maximum level of the operation of the end use in each and every month. However, the Company's workpaper, as summarized in Figure 3, clearly shows that the demand impact implied by the Company's load shape in January is 0.16% of the level of the demand impact of the same end use in July. That said, it is ***impossible*** for the demand impact in all months of the year to be based on the maximum operation of the end use in question. To clarify, the demand impact Ameren Missouri used is based on the end use load research described briefly above and much more thoroughly in the Company's 2017 IRP, which accounts for utilization patterns of customers, including significant variations in seasonal utilization (that are reflected as variation in seasonal peak demands).

Q. What is the third criticism Staff raises with respect to the process for reflecting the impact of savings on the billing demand for the margin rate determination?

A. Staff criticizes the Company essentially for coming up with a general relationship between energy and demand for all measures in the portfolio rather than end use specific relationships that would presumably be applied to the throughput disincentive calculations at an extremely granular and complicated level on an ongoing basis. But in the context of levying this criticism, Staff provides examples of the impact of increasing the granularity of the analysis that are severely flawed and which, if followed, would have serious unintended and negative consequences on customers.

Q. Please describe the issue in more detail.

A. As I mentioned in my introduction to this topic, the entire point of this analysis is to estimate the billing demand savings, and resultant throughput disincentive, associated with a given level of energy savings. The analysis is premised on establishing a relationship between energy savings and demand savings, because energy savings will be understood and analyzed in detail as a part of the EM&V process. If we can establish a general relationship between energy savings and demand savings, the demand impacts can reasonably be extrapolated from the reported energy savings.

For example, consider one more time, the cooling end use. Based on the application of our end use load shape to an assumed level of cooling savings, we can see that the demand impacts of air conditioning measures are proportionally larger than the energy impacts. This is what we expected, since, as discussed earlier, cooling use is significant

during both system and customer peak demand periods. Table 3 below demonstrates this dynamic:

Table 3 –Cooling Efficiency Impacts on Energy vs. Demand (4M Class Analysis)

Month	kWh Savings	KW Savings	4M Class Energy	4M Class Demand	% Reduction (energy)	% Reduction (demand)	Ratio of Demand vs. Energy Savings
January	22	4	313,799,795	640,358	0.00001%	0.00069%	98.01
February	854	24	291,669,633	642,009	0.0003%	0.0038%	12.84
March	24,969	909	314,375,711	668,927	0.008%	0.136%	17.12
April	74,844	900	301,506,792	658,057	0.02%	0.14%	5.51
May	217,310	1,364	316,271,914	672,632	0.07%	0.20%	2.95
June	735,531	2,551	347,259,657	730,770	0.21%	0.35%	1.65
July	1,000,730	3,153	366,889,225	774,045	0.27%	0.41%	1.49
August	932,332	3,003	359,917,271	756,897	0.26%	0.40%	1.53
September	375,046	1,969	340,223,897	752,897	0.11%	0.26%	2.37
October	67,778	728	315,121,935	690,564	0.022%	0.105%	4.90
November	20,806	728	289,117,999	664,916	0.007%	0.110%	15.22
December	221	9	294,444,113	646,122	0.00007%	0.00132%	17.67
Total	3,450,443	15,341	3,850,597,941	8,298,194	0.08961%	0.18487%	2.06

Table 3 shows illustrative energy savings by month associated with air conditioning efficiency measures and the demand savings that would be inferred from those energy savings using the Company's cooling end use load shape analysis in the first two columns (after the month column). The next two columns show the monthly energy and demand for an historical year for the 4M rate class. The next two columns show the percentage savings by month that the cooling efficiency measures at the illustrative level would create for the class energy and the class demand (calculated by taking the monthly value from the kWh savings column and dividing by the value from the 4M Class Energy column to determine the percent of energy saved, and similarly calculating the percent of demand saved from the kW savings and 4M Class Demand columns). The ratio in the far right column – the

total percent savings in demand versus the percent savings in energy - is the ratio that is used to extrapolate in the Company's marginal rate analysis from a given energy savings level to infer the demand savings level. This value (2.06 - from the bottom row of the far right column in Table 3) suggests that over the course of the year, the monthly demand savings are about twice the monthly energy savings for measures associated with the cooling end use.

The Company came up with a relationship between energy and demand similar to that shown for the cooling end use in Table 3 for each end use. Then a similar relationship was developed for the entire Business portfolio by essentially calculating a weighted average of those end use specific analyses, with the weighting based on the mix of measures that are expected to result from the MEEIA 2019-24 programs. Table 4 below shows for the 4M class the aggregate analysis that includes all of the end uses and measures:

Table 4 – Portfolio-Wide Efficiency Impacts on Energy vs. Demand (4M Class)

Month	kWh Savings	KW Savings	4M Class Energy	4M Class Demand	% Reduction (energy)	% Reduction (demand)	Ratio of Demand vs. Energy Savings
January	2,786,121	6,254	313,799,795	640,358	0.89%	0.98%	1.10
February	2,199,891	5,211	291,669,633	642,009	0.75%	0.81%	1.08
March	2,354,282	5,672	314,375,711	668,927	0.75%	0.85%	1.13
April	2,289,781	5,738	301,506,792	658,057	0.76%	0.87%	1.15
May	2,892,507	7,407	316,271,914	672,632	0.91%	1.10%	1.20
June	3,037,584	7,712	347,259,657	730,770	0.87%	1.06%	1.21
July	3,881,279	9,435	366,889,225	774,045	1.06%	1.22%	1.15
August	3,322,651	8,194	359,917,271	756,897	0.92%	1.08%	1.17
September	2,756,645	7,143	340,223,897	752,897	0.81%	0.95%	1.17
October	2,748,795	6,829	315,121,935	690,564	0.87%	0.99%	1.13
November	2,302,830	5,787	289,117,999	664,916	0.80%	0.87%	1.09
December	2,543,877	5,224	294,444,113	646,122	0.86%	0.81%	0.94
Total	33,116,242	80,606	3,850,597,941	8,298,194	0.86%	0.97%	1.13

The total ratio of demand versus energy that was calculated, the 1.13 from the bottom row of the farthest right column in Table 4 above, is then used when analyzing customer bills in the marginal rate study. Specifically, that study is designed to estimate the lost margin revenue for each class associated with a given level of load reduction. Scenarios are analyzed simulating energy reductions of 1%, 5%, and 10%. When the Company analyzes the reduction in a customer's bill due to a 1% assumed energy saving, the application of the 1.13 value from the table above results in an assumption in the billing analysis that the customer's billing demand will go down by 1.13% (1% energy reduction x 1.13 demand versus energy savings ratio).

Staff suggests that instead of using the class level value (e.g., 1.13 shown above for the 4M class), that the separate energy versus demand relationship that was calculated for each end use load shape be applied directly for measures associated with each end use type, or in small groupings of related end uses. The result of this approach would be to replace the table of margin rates reflected in Rider EEIC that are used to calculate the throughput disincentive with up to eleven different tables of different margin rates, each applicable to a different end use (or end use grouping), and each requiring up to eleven replications of the rest of the full marginal rate study that was described in the Company's original MEEIA filing for each rate class. The value of this increased granularity is likely to be small. This is true because the class level analysis in Table 4 above includes demands that are based on a mix of end use specific savings that is representative of what is likely to occur in MEEIA 2019-24. Therefore, the weighted average already appropriately balances the demand impacts of the various measures to create a demand impact for use in the marginal

rate billing analysis that reasonably reflects appropriate demand savings for a given level and mix of energy savings at the portfolio level.

Q. You mentioned previously that the example in the Staff Report pertaining to this issue was flawed and could have the potential for unintended consequences if it were used to establish the margin rates for calculating MEEIA 2019-24 throughput disincentive. Please explain the flaw and its implication.

A. Staff compares the relationship of demand and energy for the cooling end use (as shown in Table 3) and the lighting end use (not shown in this testimony), and purports to show that they are radically different. The implication Staff seems to be suggesting is that using a single relationship to apply to the marginal rate analysis for all measures will result in either greatly over- or under-stating demand impacts of some end uses. This concern ignores the point I made previously about how the appropriate weighting of the end uses in the class level analysis makes the portfolio-level relationship that was calculated reasonable to use for this purpose. To that end, I do not agree with Staff's conclusion – that differences in the characteristics of different end uses require the analysis to be done at a very granular level.

However, in order to show the purported extreme disparity in the metric between cooling and lighting, Staff takes a simple average of the value of the demand versus energy ratio for each month of the year. Table 5 below replicates Table 3 above, except takes a simple average of the monthly values in the far right column instead of a weighted average:

Table 5 – Table 3 Replicated with Staff's Simple Average

Month	kWh Savings	KW Savings	4M Class Energy	4M Class Demand	% Reduction (energy)	% Reduction (demand)	Ratio of Demand vs. Energy Savings
January	22	4	313,799,795	640,358	0.00001%	0.00069%	98.01
February	854	24	291,669,633	642,009	0.0003%	0.0038%	12.84
March	24,969	909	314,375,711	668,927	0.008%	0.136%	17.12
April	74,844	900	301,506,792	658,057	0.02%	0.14%	5.51
May	217,310	1,364	316,271,914	672,632	0.07%	0.20%	2.95
June	735,531	2,551	347,259,657	730,770	0.21%	0.35%	1.65
July	1,000,730	3,153	366,889,225	774,045	0.27%	0.41%	1.49
August	932,332	3,003	359,917,271	756,897	0.26%	0.40%	1.53
September	375,046	1,969	340,223,897	752,897	0.11%	0.26%	2.37
October	67,778	728	315,121,935	690,564	0.022%	0.105%	4.90
November	20,806	728	289,117,999	664,916	0.007%	0.110%	15.22
December	221	9	294,444,113	646,122	0.00007%	0.00132%	17.67
Total	3,450,443	15,341	3,850,597,941	8,298,194	0.08961%	0.18487%	**15.1**

Based on this simple average Staff concludes that cooling savings have fifteen times more impact on demand than they do on energy (see the bolded value in the last row of the farthest right column). This is obviously heavily influenced by the January value of 98.01 – however we know from the earlier discussion that the impact of January savings for the cooling end use are completely negligible. The simple average gives the January value equal importance with the July value, when cooling use is heaviest, which is clearly wrong and makes no sense: cooling in January in Missouri is far less than in July.

Staff's assertion that the kW-kWh hour ratio for cooling is 15, if used in the marginal rate analysis, would imply that for a scenario with a 1% energy reduction, the billing demands should be reduced by 15%. The implications of this in the marginal rate analysis would be the calculation of huge lost margins and very high margin rates reflected in Rider EEIC. Because from Table 3 above we know the cooling end use has an

approximate demand savings to energy savings ratio of 2 when the monthly values are given their proper weighting, it is clear that margin rates based on the calculation reflected in the Staff Report would be excessive and if used would ultimately grossly *overcharge* customers for the true impact of the throughput disincentive.

The reason for pointing this out is simply to observe that increasing the granularity of the analysis, as Staff suggested, could have very negative consequences if not executed properly. That said, the additional complication of applying different margin rates to each end use of savings is reason enough to prefer the Company's approach over what the Staff recommended.

Q. Please explain Staff's final criticism of the Company's billing demand analysis.

A. Staff claims that the Company failed to account for the fact that customers in the 3M, 4M, and 11M classes are billed for a minimum level of demand each month even if energy efficiency reduces their demand below that level. Once again, Staff is simply and demonstrably wrong on this point. The Company's analysis to calculate the marginal rate associated with energy savings from the program includes a review of every single bill of every customer in the LGS, SPS, and LPS classes for 12 billing months. When these bills are analyzed, the Company's analysis enforces the minimum billing demand on each customer bill. The Company supplied Staff with workpapers showing this calculation for each rate class. The formulas used in those workpapers calculate the demand the customer would have been billed assuming a reduction in usage associated with an energy efficiency measure. But the formulas also impose a minimum value for the resulting demand consistent with the minimum demand stated in the relevant rate class tariff. This fact

objectively refutes Staff's claim that minimum demands were not factored into the marginal rate analysis. The formulas included in the workpapers ensure that there is *never* a situation in the analysis where throughput disincentive is estimated for any portions of demand reductions from energy efficiency measures that cause the customer's demand to fall below the minimum billing demand.

Q. Does Staff recommend any alternative methods to calculate the margin rates for MEEIA 2019-24 throughput disincentive calculations?

A. Staff proposes an alternative method that *could* be used, although Staff does not explicitly recommend that it *should* be used.

Q. Is Staff's alternative method reasonable?

A. No. Staff's alternative avoids all analysis of demand and energy impacts of measures and end uses and instead simply spreads the demand charge evenly over all hours of the month and adds that amount to the energy charge. The implicit assumption in that approach is that each end use affected by an energy efficiency measure reduces energy usage by *exactly the same amount every hour of the month*. That is clearly not the case with most, or probably any, measures. Load research demonstrates that most measures tend to have proportionally larger demand impacts than energy impacts. Staff's alternative method, if applied for the LPS class, would reduce the margin rates used for throughput disincentive calculations by a range of 21% to 48%, depending on the month. Given the unrealistic assumption underlying Staff's method, the result would simply be lost margins for the Company resulting from implementation of energy efficiency measures, meaning Commission approval of a plan using this approach would not align the Company's incentive with helping customers use less energy because doing so would simply cause the

Company to lose money. That result – lost margins and failure to align incentives - is exactly what the Demand Side Investment Mechanism is designed – and in fact required by the MEEIA law – to prevent.

Q. Please summarize your response to the comments included in the Staff Report related to the margin rate calculations.

A. The Staff Report includes a number of criticisms of the Company's analysis of margin rates for the throughput disincentive calculations for Ameren Missouri's MEEIA 2019-24 proposal. But none of Staff's criticisms withstand scrutiny when actual data – the evidence in the workpapers and in the record – is reviewed, analyzed, and interpreted. The Company followed an extremely robust analytical process using detailed load research data in order to come up with a very reasonable estimate of the impacts that MEEIA energy and demand reductions will have on the revenues that the Company relies on to cover its largely fixed costs of providing utility service to its customers. Staff's criticisms do not warrant any changes to the margin rates included in the Company's original MEEIA filing.

Q. Are there any other issues that do warrant any changes to the margin rates?

A. Yes, there is one, and I will provide that update here. The Company's rates for electric service changed effective August 1, 2018, as a result of the change in federal income tax laws that were passed in December 2017. This rate change reduced the rates the Company charges its customers relative to those rates that were in effect at the time the Company prepared its MEEIA 2019-24 filing. As a result, the lost margins that arise from the throughput disincentive are lower now than they would have been at the previous, higher, rate levels. Because the rate reduction took the form of a simple cent/kWh credit,

it is very easy to determine the marginal impact of the rate change. The margin rates for each rate class reported in the Company's initial filing need to simply be reduced by the amount of the credit that went into effect August 1st. Updated margin rates that reflect the credit related to tax savings are shown below in Table 6:

Table 6 – Margin Loss per kWh of EE @ Present Rates with Tax Reduction

Month	Res	SGS	LGS	SPS	LPS
Jan	0.041722	0.049655	0.035957	0.033894	0.031662
Feb	0.043065	0.051335	0.037484	0.034425	0.035164
Mar	0.044826	0.054065	0.035482	0.035176	0.033500
Apr	0.048090	0.057686	0.040048	0.036232	0.034342
May	0.049479	0.058915	0.040552	0.036996	0.032405
Jun	0.103906	0.090506	0.080066	0.073295	0.064812
Jul	0.103906	0.090506	0.077784	0.072534	0.066090
Aug	0.103906	0.090506	0.078105	0.072723	0.066259
Sep	0.103906	0.090506	0.079336	0.072726	0.067806
Oct	0.045014	0.055424	0.038609	0.035441	0.034113
Nov	0.048430	0.057581	0.039616	0.035640	0.034137
Dec	0.045034	0.054993	0.038205	0.035043	0.033175

Q. Does this conclude your surrebuttal 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 3rd Filing to Implement Regulatory Changes in Furtherance of Energy Efficiency as allowed by MEEIA.	))))	File No. EO-2018-0211

AFFIDAVIT OF STEVEN M. WILLS

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

Steven M. Wills, being first duly sworn on his oath, states:

1. My name is Steven M. Wills. I work in the City of St. Louis, Missouri, and I am employed by Union Electric Company d/b/a Ameren Missouri as the Director of Rates & Analysis.

2. Attached hereto and made a part hereof for all purposes is my Surrebuttal Testimony on behalf of Union Electric Company d/b/a Ameren Missouri consisting of 28 pages and Schedule(s) N/A, all of which have been prepared in written form for introduction into evidence in the above-referenced docket.

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

Steven M. Wills
STEVEN M. WILLS

Subscribed and sworn to before me this 14th day of September, 2018.

Cathleen A. Dehne
Notary Public

My commission expires
March 7, 2021

CATHLEEN A DEHNE
Notary Public – Notary Seal
St. Louis City – State of Missouri
Commission Number 17119727
My Commission Expires Mar 7, 2021