Exhibit No.: 007
Issue(s): Charge Ahead – Electric Vehicles & Business Solutions
Witness: Steven M. Wills
Type of Exhibit: Surrebuttal Testimony
Sponsoring Party: Union Electric Company
File No.: ET-2018-0132
Date Testimony Prepared: November 16, 2018

MISSOURI PUBLIC SERVICE COMMISSION

FILE NO.

ET-2018-0132

SURREBUTTAL TESTIMONY

OF

STEVEN M. WILLS

ON

BEHALF OF

UNION ELECTRIC COMPANY

d/b/a AMEREN MISSOURI

P. 35

CORRECTION MARKED BY NANCY DIPPELL, SENIOR REGULATORY LAW JUDGE

St. Louis, Missouri
November, 2018

UE/Ameren Exhibit No. 7
Date 12-4-18 Reporter JT
File No. ET-2018-0132

TABLE OF CONTENTS

SURREBUTTAL TESTIMONY

OF

STEVEN M. WILLS

FILE NO. ET-2018-0132

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. Are you the same Steven M. Wills that filed direct testimony in this proceeding?

A. Yes, I am.

II. PURPOSE OF TESTIMONY

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

A. My surrebuttal testimony in this proceeding addresses issues raised about the Company's proposed Electric Vehicle ("EV") Charging Infrastructure Incentive Program ("Charge Ahead – Electric Vehicles") and the Business Solutions program ("Charge Ahead – Business Solutions") programs in the rebuttal testimonies of Staff witnesses Sarah Lange, Mark Oligschlaeger, and Byron Murray, as well as in the rebuttal and supplemental rebuttal testimony of Office of the Public Counsel ("OPC") witness Dr. Geoff Marke. For a variety of reasons, Staff has recommended rejection of both Charge Ahead programs and OPC has recommended rejection of one program (Charge Ahead – Business Solutions) and that significant conditions be placed on the other program (Charge

Ahead – Electric Vehicles). I will – with some help from Company witnesses Patrick Justis, Tom Byrne, and David Pickles – respond to the specific points raised by these parties. But more importantly, I will show that these parties' arguments reflect an unwarranted skepticism of technology and innovation and are overly defensive of the status quo as a result of a reliance on hyper- and overly-technical analyses, which are based on unsupported and unreasonable assumptions. While OPC and, to a lesser extent, Staff, are quick to point out potential risks associated with the proposed programs, they ignore the programs' benefits and the much greater risk posed by their positions which would lead to inaction in Missouri while technology advances and energy systems in other states and regions evolve to provide cleaner energy, greater consumer choice, and that will advance the myriad of benefits that such innovation could be bringing to the lives of Missourians.

Q. What issues are each of Ameren Missouri's surrebuttal witnesses addressing?

A. Mr. Justis' surrebuttal testimony responds primarily to issues raised by Dr. Marke and Mr. Murray regarding programmatic details of the Charge Ahead – Electric Vehicles program and regarding EV technology and markets generally. He also discusses the issue raised by Division of Energy witness Cherylyn Kelley regarding inclusion of a focus on disadvantaged communities served by the Company. Mr. Byrne's surrebuttal testimony responds to issues raised by Ms. Lange and Mr. Murray, as well as Dr. Marke, regarding policy. Mr. Pickles' surrebuttal testimony responds to issues raised by Dr. Marke and Mr. Murray regarding programmatic details related to the Charge Ahead – Business Solutions program and regarding the technology and markets related to the efficient electrification measures that are included in that program. I will address the testimony of

Dr. Marke, Ms. Lange, and Messrs. Oligschlaeger and Murray regarding the economic analysis that underlies both of the proposed programs, risks associated with the programs, the cost recovery proposal for the programs, the juxtaposition of the programs against the Company's energy efficiency programs under the Missouri Energy Efficiency Investment Act ("MEEIA"), and a few other miscellaneous issues.

Q. How is your testimony organized?

A. I will begin by addressing the overarching issue raised by this case that I mentioned at the outset of my testimony. I will then address the detailed claims raised by each witness to whom I am responding in turn. Where issues overlap between witnesses, I will respond to arguments raised by multiple witnesses at the same time.

Q. Please summarize the key points that you will be addressing as a part of your overall response to the Staff and OPC's testimony.

A. Key takeaways from my testimony in response to Staff and OPC include:

- There is a risk from inaction on these innovative and forward-thinking programs. Inaction would delay the creation of significant benefits for all customers and the environment. Those benefits far outweigh the risks that Staff and OPC suggest may cause the economics of the programs to play out slightly different than the Company has forecast.
- The two Charge Ahead programs and MEEIA energy efficiency programs are highly complementary programs that both seek to develop the type of flexible demand that is foundational to optimizing operations of the electric grid of the future, especially as more intermittent renewable resources are introduced to the grid.

- Neither the Staff nor the OPC challenge the fundamental premise that the loads created by the Charge Ahead programs can and will provide benefits to all customers in the form of lower rates.
- The Company's analyses of the programs' economics in its direct case – along with a few updates to that analysis presented in this surrebuttal testimony -- include reasonable and often times even conservative assumptions, grounded in the best empirical evidence available.
- Staff's hyper-technical analysis of the Charge Ahead – Electric Vehicles program – which itself demonstrates that each EV introduced to the system provides material benefits to all customers in the form of lower rates – is predicated on an attempt to make extremely granular but subjective assumptions about future customer behavior. These assumptions are not based on any empirical evidence and do not produce reasonable results.
- The Company's proposed cost recovery mechanism for the programs fairly considers the benefits that will be created by the programs and apportions them in a manner that aligns the interest of the Company and its customers by encouraging the Company to create the greatest net benefits possible on behalf of customers.

III. THE RISK OF INACTION

Q. You stated in the introduction to your testimony that the risk of inaction on the part of the Missouri Public Service Commission ("Commission") to approve the Charge Ahead programs is a greater risk than the risks that may arise from implementing the programs. What exactly do you mean by that?

A. As discussed in the Company's direct testimony, Charge Ahead includes a pair of thoughtfully designed programs that the Company is excited to propose due to the many customer and environmental benefits that arise from both programs. Such benefits, many of which are explained in more detail in both the direct and surrebuttal testimonies of Mr. Justis and Mr. Pickles, include:

- More efficient utilization of the electric grid that can result in *lower electric rates for all customers* by spreading the fixed costs of the system over more usage;
- *Reduced total energy use and costs* across fuels for participating customers to achieve the same level of end use service;
- Reduced emissions resulting in local and broader *air quality and environmental improvements*;
- *Lower operations and maintenance expenses* for customers adopting electric technologies;
- *Increased consumer choice* and greater practical access to an increasingly robust suite of innovative product offerings; and
- *Improved safety and productivity* in workplaces.

Failure to approve the programs will put all of these benefits further out of reach for Ameren Missouri's customers. Other states are proactively supporting EVs and other efficient electrification technologies and, as a result, are developing cultures of innovation and progress, while reaping the benefits of cleaner air, lower energy costs, and greater productivity. An unwillingness to encourage utility investment in new technologies and supporting infrastructure as a result of an undue aversion to risk will keep Missouri from

capturing similar benefits from electrification for years to come while we fight to catch up with states that had more foresight.

Q. Do Staff's and OPC's positions appropriately prioritize the opportunity to provide these benefits to Ameren Missouri's customers right now?

A. No. It is important to keep in mind the context of this case. Focusing first on the Charge Ahead – Electric Vehicles program, we are now fully two years removed from the Company's first application to the Commission to try to solve barriers associated with EV charging. This case itself will have taken almost a full year to proceed from the Company's original filing through a Commission decision, and that does not even consider the many months the Company spent developing the proposal and preparing the filing and the time it will take to implement the program and for charging stations to materialize. The evidence in the Company's direct testimony and this surrebuttal testimony demonstrates that Ameren Missouri has performed thorough research on the market for both EVs and charging equipment. We have put forth a thoughtful and innovative program design that partners with customers to leverage private investment in order to accelerate infrastructure deployment, and provided rigorous analysis of the impacts – i.e., strong net benefits – from the program. The logical conclusion is that it is now time for action. And yet, with respect to Charge Ahead – Electric Vehicles, Staff recommends that Ameren Missouri go back and perform *more* analysis and redesign the program yet *again*. More broadly, not only does the Company's evidence show that additional analysis and another new EV program design are not needed, but the Charge Ahead – Electric Vehicles program stands on its own merits as a truly innovative approach for working with the Company's customers to create significant benefits across a broad array of impacted stakeholders. Spending more time on

unneeded analysis is simply a lost opportunity to move Missouri forward. Our industry is transforming today. The transportation sector is transforming today. Missouri should join in those transformations today.

The Charge Ahead – Business Solutions program does not have the same history of proceedings in front of the Commission that the Charge Ahead – Electric Vehicles program does, yet a similar opportunity exists to create meaningful benefits in the near term for all customers. Despite that opportunity, Staff recommends rejection of Charge Ahead – Business Solutions with little thought, analysis, or evidence presented regarding its rationale. Like the Charge Ahead – Electric Vehicles program, Staff's approach to Charge Ahead – Business Solutions fails to create a bias for action when the case for action now is compelling.

OPC, in its testimony, openly acknowledges that they are "largely risk averse" regarding these types of programs. A word search on Dr. Marke's rebuttal testimony finds 19 occurrences of the word "risk." As a result of this risk aversion, it appears that OPC has searched hard to come up with reasons not to undertake the programs. The Company will respond to all of those reasons in turn. It is OPC's prerogative to have this perspective on risk, but the Commission need not share in that view. If the Commission seeks utility innovation and creative solutions to improve customer and environmental outcomes, then the perfect time for the Commission to take the opportunity is this case.

Q. Despite OPC's search for reasons not to do these programs, Dr. Marke ultimately recommends that the Commission consider approving the Charge Ahead – Electric Vehicles program, but with additional provisions which require the

Company to guarantee certain outcomes. Is this a reasonable path to achieving forward-thinking energy solutions for Missouri?

A. No. OPC's EV proposal essentially seeks to create a guarantee of future economic outcomes, backstopped by the Company. Beyond the fact that requiring such a guarantee is unreasonable, the Company has presented compelling evidence that the proposed investments in both Charge Ahead programs are prudent and in the best interest of its customers for many reasons based on what is known right now – the lens through which the Commission should review these programs. There is really no credible evidence to the contrary. My direct testimony provides the reasons why the Company's investment in the development of a distributed network of charging infrastructure to serve emerging EV technology – a technology that cannot be utilized to its greatest affect when the customer can only access electricity with a single static service connection to the system at its premises – is really just an extension of the traditional role that utilities play in facilitating the development of infrastructure to meet the energy needs of its customers. To that end, the Charge Ahead – Electric Vehicles program is a prudent investment that meets a growing need of customers and provides numerous benefits. Dr. Marke's EV proposal fails to provide that opportunity for cost recovery unless a specific set of outcomes occur in the future, and perhaps far in the future. To the extent that the Commission is interested in utilities providing innovative solutions like the Charge Ahead programs in order to capitalize on tremendously beneficial opportunities, it makes no sense to set up a system that raises the bar for recovery of the investment far higher than it would be for almost any other utility investment, which is exactly what OPC seeks to do with the conditions it proposes for the Charge Ahead – Electric Vehicles program. And adoption of OPC's

outright opposition to the prudent investments in the Charge Ahead – Business Solutions program that creates numerous benefits for all customers would further discourage new and innovative utility offerings. These observations are especially relevant in a case where the utility has made significant effort to identify meaningful opportunities, craft and file innovative programs, thoroughly research and analyze the likely economic impacts of the programs, and provide the capital to execute them. If that utility stands to potentially lose some, most, or all of that investment despite no imprudence of its own, it would send a message to the utility to place little value on innovation and to continue to stick with "the way we've always done it." It would discourage the utility from actively engaging in the transformation of the energy system to help it become cleaner and more customer-outcome focused, while increasing affordability. I do not believe that is the right message in an environment as dynamic as today's energy industry, with new and exciting technological innovations rapidly emerging, each with potential customer benefits.

Q. How do the technologies supported by the Charge Ahead programs interact with some of these other energy-related innovations that you reference and how does that factor into the balance of risks surrounding both programs proposed in this docket?

A. I would echo comments that I made in testimony supporting the Company's recent MEEIA application, where I discussed the reasons MEEIA and Charge Ahead are very complementary programs. In that testimony, I stated:

> 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.

The sentiment is equally true in this case. EV and electrified end use loads are the types of loads that can be flexible in terms of when charging is performed. They also tend to have significant opportunities to be used during the off-peak periods when wind generation is generally expected to be strong. These technologies therefore go hand in hand with investments made by both the Company and its customers in increasing the amount of renewable resources on the system. Once again, failure to approve the Charge Ahead programs and support these beneficial loads would be a lost opportunity to strategically fit an important piece of the clean energy puzzle into place.

Q. Do you have any final observations about the balance of risks that is presented by the proposed programs?

A. Yes. Many of the risks highlighted by OPC and also Staff suggest that the net benefits of the programs may be less than the Company's modeling shows if some uncertain factors play out differently than the Company has assumed for its analysis. While benefits could vary from those reflected in the Company's analyses – which is always the case when any decision must be made about an investment or program that will operate in the future – the risk is bidirectional, in that uncertainties could also cause benefits to be even greater than what the Company modeled. In my opinion, the most likely outcome is

that the Charge Ahead – Electric Vehicles program will create *much greater* benefits than those modeled by the Company. The upside surrounding the Charge Ahead – Electric Vehicles program that is ignored by Staff and OPC is the very significant magnitude of benefits that would arise as a result of the combined impact of the Charge Ahead – Electric Vehicles program and a maturing line of EV product offerings, which may produce levels of EV adoption that approach or even exceed the high case in the Company's forecast. More EVs than the base adoption case on which we predicated our analysis would create substantially more benefits, and this outcome appears increasingly likely as vehicle manufacturers scale up massive investment in EVs and roll out large numbers of new EV product lines. Approval of the Charge Ahead – Business Solutions program could also result in a considerable upside beyond what we've modeled.

The fact that the future is uncertain does not mean that we should not invest proactively in technologies that are rapidly maturing and are expected to be economically net beneficial as a base expectation just because that outcome is not guaranteed – especially when the other benefits of – and the upside potential associated with – those technologies are substantial.

IV. RESPONSE TO STAFF WITNESS LANGE

Q. Are there any overarching observations that you would start out making regarding Ms. Lange's testimony?

A. First, I should note that Ms. Lange only addressed the Charge Ahead – Electric Vehicles program, so my comments here will focus only on that program. Second, it is very important to recognize that Ms. Lange's testimony does not question the existence of net benefits to existing customers from the addition of new EVs that charge on the

Company's system, nor does she question the appropriateness of reinvesting some of those benefits in EV infrastructure in order to serve those EVs that do arrive and to accelerate additional EV adoption in order to maximize the total benefits. The only real differences between the analysis in my direct testimony and Ms. Lange's rebuttal testimony is the magnitude of the calculated benefits and the way we view the process of apportioning the value created by those benefits into a program. I will discuss those differences and the specific criticisms she levels at the Company's analysis point by point in more detail below. But I would also observe that Ms. Lange's approach to analyzing the program obscures the discussion of the true drivers of the program's economic value by delving into an overly- and hyper-technical exercise that attempts to parse out costs and benefits in increasingly granular ways, but which does nothing to fundamentally add to our understanding of the economic proposition associated with the Charge Ahead – Electric Vehicles program, and the EVs it will help serve. While I state that her analysis is overly complex that does not mean by implication that the Company has oversimplified the issue. My discussion will clearly demonstrate that we have thoroughly researched and analyzed our proposal. My point is that when deciding on what issues to explore in detail, it is also very important to keep the big picture in mind and understand that more granular assumptions are not always better ones. In fact, in most cases, the extremely granular assumptions made by Ms. Lange have *far* less empirical support than the Company's analysis and I will demonstrate how Ms. Lange's assumptions produce unreasonable results. It remains important to consider both the accuracy and the magnitude of the impact of increasingly granular assumptions on the big picture. Consequently, I will discuss a lot of analytical details throughout the coming pages, but will also attempt to clarify results and simplify conclusions.

Q. Please elaborate on the issue of how Ms. Lange approaches analysis of the Charge Ahead – Electric Vehicles program.

A. This discussion must be framed by revisiting what the Company discussed in its direct case about the purpose of the program design - the importance of addressing the EV charging problem from a holistic point of view (see the direct testimony of Patrick Justis). Mr. Justis described the research that the Company conducted through a Request for Information ("RFI") process, wherein Ameren Missouri took input from and had discussions with market actors that are very familiar with the barriers to EV adoption and EV charging markets. This market intelligence significantly informed our approach to trying to create the greatest impact in addressing barriers to EV adoption. The result was a focus on four segments that are all integral to development of a robust and supportive environment for broad EV adoption. Those segments are 1) corridor charging, 2) workplace charging, 3) multi-family dwelling charging, and 4) public around-town charging. Each segment is addressed by the Company's Charge Ahead – Electric Vehicles program.

Our direct case also demonstrated that, while each of these segments of charging was important to address to achieve greater market adoption of EVs, the bulk of actual EV charging that customers would undertake would likely occur at the home of EV owners. The point of building the charging network is to provide a new type of infrastructure needed to serve a new type of load – a load that is not stationary and where customers cannot exclusively count on their home electric service to meet all of their needs. By helping to build this distributed network of charging stations, we help the customer overcome a barrier to adopting EVs. When customers do adopt EVs – at least in part because of the existence

of the charging network that is partly paid for by this program – the incremental retail revenues that the Company will receive from the home charging – even when it does not physically take place on chargers paid for with program incentives – are reasonable to include in the program's economic justification.

Q. Does Ms. Lange dispute that notion?

A. No. In fact, she seems to implicitly endorse the notion by discussing both "direct" and "accretive" revenues from the program chargers. While she does not define these terms, I read them to mean that direct revenues are those that the Company will earn from EV charging that occurs at the specific charging stations that received Charge Ahead program incentive payments, and accretive revenues are those that the Company will earn from EV charging at other locations (e.g., residential home charging), but that exist, at least in part, because the program removed a barrier to the customer purchasing the EV and, therefore, can be viewed as having been enabled by the program. This is exactly the idea that underlies the Company's original analysis. And yet, Ms. Lange is critical of my direct testimony for not "reasonably estimate[ing] the revenues from chargers installed under the[ir] program," and also not "reasonably estimate[ing] the revenues from accretive energy use for EV charging enabled by chargers installed under the[ir] program." (Lange rebuttal, Page 2, lines 8-9 and 14-15).

Q. Does it matter which "bucket" revenues caused by the program fall into?

A. Not at all. Ms. Lange's apparent desire to narrowly parse the benefits of EV charging into these categories or "buckets" does nothing to change the *overall* economics of the total picture. Whether a revenue is direct or accretive, it benefits the system through

its contribution to covering the Company's fixed costs. The exercise she seems to propose would require many additional layers of assumptions about future behaviors and actions of customers that would probably raise additional disputes among parties about whose assumptions were most accurate, without changing the fact that both of these categories of benefits (direct and accretive charging revenues) are – without question – supportive of the program.

Later in her testimony, Ms. Lange states that the Company's direct case "does not actually tie the allowance[1] back to the program design" (Lange rebuttal, Page 5, lines 14-15). I take this to mean that Ms. Lange expected the Company to separately calculate program impacts for each category of charging station that is incentivized and essentially economically justify each individual charger that would be installed based on its unique contribution to achieving the program goals. This argument simply reflects that Ms. Lange does not fully appreciate the program design. The program, once again, is designed to take a holistic approach to addressing barriers across the marketplace in support of a robust and dynamic EV market in the Company's service territory. The important element of this approach is to address as many barriers as possible and raise as much customer awareness as possible across the board to achieve greater levels of EV adoption and maximize benefits to all customers. Narrowly parsing the program in an attempt to track each kilowatt-hour of charging and the associated revenue to either being delivered by or attributed to a specific charger is counter to the concept of the holistic program design and doesn't matter. The point is that the program as a whole is designed to remove barriers to EV adoption,

[1] "Allowance" in this context uses language from the line extension portion of this case, but refers to the amount of program investment that could be economically supported by the EVs expected to use the infrastructure while either keeping customer rates neutral or lowering them.

which will create new load over which fixed costs can be spread to the benefit of all customers.

Q. Beyond this question of how the value of the program should be translated into program details, what other issues does Ms. Lange raise with respect to the economic analysis the Company put forth to justify the third-party incentive payments for the development of EV charging infrastructure?

A. She challenges the Company's analysis regarding how ratemaking will impact customers' realization of value from the program and also challenges a host of assumptions that were used to calculate how much net margin would be provided to the Company with the charging of each new EV. I will address the ratemaking issues later in this testimony. But to clarify the importance of the net margin calculation to the economics of the Charge Ahead – Electric Vehicles program, recall the premise of the Company's analysis which, again, Staff does not challenge. If the incremental revenues that the Company earns from an EV charging on the system as a whole are more than the incremental costs incurred to provide that service, then the difference, or the net margin, contributes toward covering the Company's fixed costs that *otherwise are borne by all customers*. As such, the introduction of a new EV onto the system can and does - even according to Staff's analysis - end up lowering rates for everyone through its contribution to covering fixed costs.

Q. Are Ms. Lange's challenges to the Company's assumptions valid?

A. I would say that they fall into several categories: 1) some where she is simply incorrect; 2) some where there are at least somewhat subjective assumptions that must be made about the future and she has chosen different assumptions, but where

generally the Company has provided more robust and empirical evidence in support of its assumptions; and, 3) a few where she has identified a valid improvement opportunity for the Company's original analysis – but where its incorporation does not change "the answer."

An additional observation I would raise at this point is that several of these assumptions were discussed in three technical conferences that took place over the past summer following the Company's direct filing. In the course of these conferences, the Company, based largely on input from Staff, added additional layers of granularity to its analysis, and provided additional evidence supporting its assumptions. The criticisms discussed in Ms. Lange's testimony are limited to the initial analysis conducted but do not reflect any of this additional information that the Company made available to Staff throughout the workshop process. I recognize that none of that information had been filed with the Company's direct case, but it is clearly information that was responsive to some of Staff's articulated concerns, and I will share some of that information throughout my testimony.

Q. Does Ms. Lange produce her own estimates of the net margin that the Company would realize per EV that charges on its system?

A. Yes, she does for EVs that may charge on several different rate schedules. And again, I would note that in all of her cases, Ms. Lange calculates a significant positive net margin that can financially support investment in EV charging infrastructure and/or lower rates for all customers. This is true even though she calculates these positive net margin contributions using assumptions that are at times suspect, unsupported by evidence, and in some cases, in stark contrast to assumptions Staff has testified to as recently as

August in its rebuttal to the Company's MEEIA 2019-24 proposal. As I work through a discussion that responds to Ms. Lange's criticisms of the Company's assumptions and discusses many of the flaws in Staff's assumptions, I will demonstrate that the net margin calculations performed by Ms. Lange significantly understate the value of EVs to the system. Regardless, even Ms. Lange's calculations support the conclusion that there *are* benefits.

A. Estimates of Incremental Revenue per EV

Q. What is the first analytical assumption for which you will compare the Company's and Staff's positions?

A. I will first discuss the estimate of incremental revenue per EV that charges on the system. This incremental revenue is a very important input to the economic analysis, as this retail revenue represents the primary benefit of added EV load that will contribute to covering the fixed costs of the system, lowering costs for all customers. There are three primary differences between the Staff and Company, with respect to assumptions used to calculate the incremental revenue per EV.

Q. What is the first difference?

A. Staff challenges the Company's assumption regarding the typical mileage an EV would be driven per day. This is important because it partially determines how much energy each vehicle will ultimately require in order to meet the transportation needs of the customer and therefore how much revenue the Company will receive for providing that energy. Ms. Lange states on page 8 of her testimony that the Company provided no support for its assumption that EVs would be driven 40 miles per day, and that the estimate is "unreasonably high." She goes on to assign a value of 30 miles per day per EV. Ironically,

given her criticism of the Company's "unsupported and unreasonable" estimate, she does so without providing any rationale whatsoever in support of her number.

Ms. Lange's criticism ignores the fact that the Company's estimate of 40 miles per day also assumed that some of the EVs in our service territory will use hybrid technology, meaning that they have gasoline backup. The Company's analysis therefore attributed some of the 40 miles per day to being driven on gasoline. In fact, the Company's revenue estimates were only based on an assumption of 33.6 miles of *electric* driving per day, which is not nearly as different from Ms. Lange's 30 mile assumption as she would have the Commission believe. But aside from the fact that Staff has characterized the difference in miles per day as being a larger issue than it is, I would also argue that the Company's estimate is a far more realistic reflection of the driving habits of the residents of our service territory. According to the U.S. Department of Transportation,[2] an average vehicle in the state of Missouri is driven 14,648 miles per year, or 40.1 miles per day. This is right in line with the Company's estimate and more than a third higher than Staff's. Ms. Lange did mention in her testimony that she thought 30 miles per day was more realistic "in the short term," which I presume means that she is thinking that early EV drivers will not drive as far as the average Missouri driver reflected in the DOT report, due largely, I presume, to the lack of available charging infrastructure. The irony of that aside, I would simply point out that Ms. Lange's analysis seems to be focused on EV travel in the short term. But this program is not being designed only for the short term. It is intended to develop long-lived infrastructure that will spur a permanent transformation of the transportation sector that

[2] https://www.fhwa.dot.gov/ohim/onh00/onh2p11.htm

will create benefits for years to come. But even when looking at the short term, as Ms. Lange has done, today's EVs can easily support a range of 40 miles per day,[3] and those EVs that have gasoline backup have no immediate range limitations whatsoever. Vehicle manufacturers are rolling out new, longer range vehicles rapidly and routinely. That fact, paired with the charging infrastructure that will be deployed if Charge Ahead – Electric Vehicles is approved, will make all EVs capable of being used much more like a conventional gasoline engine car during the life of this program. All of this demonstrates that 40 miles per day (with 33.6 of those miles powered by electricity) is an extremely reasonable (albeit conservative) assumption upon which to base this analysis.

Q. What is the second assumption relevant to estimating incremental revenues from charging an EV where the Company and Staff differed?

A. Next, Staff criticized the Company's assumption that EV efficiency would be approximately 3 miles per kWh, stating that the Company only considered the efficiency of existing EVs on its system today. Ms. Lange stated that "based on 2018 EV performance, a usage level of 3.39 kWh per mile[4] is more reasonable" (Lange rebuttal, Page 8, lines 8-9). It is certainly reasonable to believe that the efficiency of EVs may change over time. Improvements in technology may increase efficiency, but vehicle offerings are also likely to start to include larger (less efficient) family vehicles like larger sedans, SUVs, crossovers, and minivans. These models are likely to be less efficient than the current vehicle population (primarily made up of what I'll call commuter cars that tend to be small and on the more efficient side, with a few high performance vehicles like the Tesla Model

[3] I personally easily exceeded this pace of daily miles driven for a year in my 2017 Nissan Leaf with only an approximate 110 mile battery range.
[4] I assume, and review of Ms. Lange's workpaper supports, that she intended to say "miles per kWh" instead of "kWh per mile" in this passage of testimony.

S in the mix today). These trends could play out to increase efficiency, decrease it, or be nearly offsetting. For purposes of reflecting a realistic range of future outcomes, I think it makes the most sense to use the Company's 3 miles per kWh as a low efficiency case, use Staff's 3.39 as a high efficiency case, and test the sensitivity of the program economics to scenarios associated with that assumption. I provide the results of that sensitivity test below.

Q. What is the last difference between Staff and the Company assumptions used to estimate the incremental revenue per EV?

A. Staff criticized the Company for assuming that all EV charging would be done at the residential rate. As I mentioned previously, Ms. Lange calculates a separate revenue estimate for an EV charging on a variety of different rate schedules (although she takes no position on how much EV charging will occur on any of them). In this case Ms. Lange's criticism does correctly describe the approach the Company took in its analysis supporting its direct case – i.e., the Company, as a simplifying assumption– did assume all EV revenue to be at the residential rate. However, this is one of the assumptions that the Company went to lengths to update during the technical conferences at Staff's suggestion. The original assumption used by the Company – that all charging would be at the residential rate – is not materially unreasonable, since there are a number of studies that have shown that a large majority of EV charging – approximately 85% in one prominent study[5] – is done at home. Clearly the other 15% of charging that occurs within the service territory would still produce retail revenues that contribute positive net margin – just at

[5] National Plug-In Electric Vehicle Infrastructure Analysis, U.S. Department of Energy Office of Energy Efficiency and Renewable Energy, September 2017 - identified a range of home charging percentages used in its scenario analysis from 82% to 88% as consistent with early market findings by the EV Project as reported by Idaho National Laboratory.

some slightly different rate – so using residential revenue as a proxy for that relatively small amount of charging revenue at other rates is not particularly problematic. It is very telling, in fact, that Ms. Lange's analysis of charging on different rates shows the *smallest* amount of revenue being produced by charging on the *residential* rate. So despite Ms. Lange's criticism of the Company's simplifying assumption, her own analysis suggests that the Company's assumption *understated* the benefits of charging revenues, relative to assumptions where charging occurs on other non-residential rates. Despite that fact, the Company has made the additional effort to update its revenue estimates, not only for EV charging that will take place on other non-residential rates, but also to incorporate the impact of the base rate reduction that was implemented over the summer to pass the benefits of federal tax reform back to customers. This was not factored into the Company's original analysis because it simply had not occurred yet and it does reduce the incremental revenue realized by the Company per EV. But that reduction is not nearly enough to materially erode the significant value that each new EV brings to the system and to all customers.

Q. Please describe the updated assumptions the Company prepared for the technical workshops regarding the appropriate mix of rate schedules at which to price the incremental revenue from EV charging.

A. Because we have multiple third-party studies[6] that suggest that approximately 85% of charging occurs at home, our updated analysis initially assumes 85% of charging revenue (instead of 100%) will occur on the residential rate. For the

[6] In addition to the DOE study cited earlier on the percentage of charging that occurs at home, a 2018 EPRI study titled "Electric Vehicle Driving, Charging, and Load Shape Analysis: A Deep Dive Into Where, When and How Much Salt River Project (SRP) Electric Vehicle Customers Charge" found that 81% of charging occurs at home.

remaining 15% of charging, we don't have any data or studies on which to base the assignment of charging to the specific non-residential rates offered by the Company. And, because we don't know whether or to what extent the 15% will be high speed or low speed charging (which influences the revenues realized from demand charges included in most of the non-residential rate structures), we performed sensitivity analyses assuming a combination of charging speeds and rate schedules for the remaining 15% of charging.

Q. What is the final revenue the Company estimated per new EV that charges on the system when considering the updates and sensitivities you described above?

A. Using the best assumptions for each key variable and appropriate rate schedules for the scenarios defined, while also incorporating the recent development of the tax-related rate reduction, I have updated the Company's estimate of incremental revenue associated with charging each EV on the system. The result of our updated analysis, as compared to our original analysis and Staff's analysis are shown below in Table 1:

Table 1 – Comparison of Estimates of Revenue per EV

Scenario	Electric Miles Driven per Day	EV Efficiency	Daily kWh	Annual kWh	Rate Class for Charging Revenue	Realized Rate	Revenue/ EV
Company Direct	33.6	3	11.2	4,090	Residential	$0.0830	$339.39
Staff - Residential Rate	30	3.39	8.8	3,230	Residential	$0.0810	$261.77
Staff - SGS Rate	30	3.39	8.8	3,230	SGS	$0.0919	$296.81
Staff - LGS Rate	30	3.39	8.8	3,230	LGS	$0.0853	$275.47
Company Surrebuttal - High Sensitivity	33.6	3	11.2	4,090	85% residential + 15% blend of LGS, SPS, LPS – 6% High speed charging	$0.0802	**$327.97**
Company Surrebuttal - Low Sensitivity	33.6	3.39	9.9	3,619	85% residential + 15% blend of LGS, SPS, LPS – 3% High speed charging	$0.0791	**$286.36**

Q. What conclusions do you draw from Table 1?

A. There is a range of reasonable estimates for the incremental annual revenue per EV that charges on the Company's system that spans from $286 to $328. The Company's original estimate turns out to be just slightly too high, but only due to the fact that the Company's electric rates were lowered after the analysis was prepared and the case filed as a result of federal tax reform. The Staff's estimates are generally too low given a reasonable range of input assumptions, although Staff's revenue per vehicle estimate when charging at the Company's Small General Service ("SGS") rate falls within the reasonable range. Overall, the analysis reveals a clear picture that each new EV added to the system will add significant retail revenue of approximately $300 per year that, after accounting for incremental costs to serve the load, helps to defray fixed costs that otherwise are recovered from all customers.

B. Estimates of Incremental Cost per EV

Q. What is the purpose of the estimation of incremental costs for serving EVs that charge on the Company's system?

A. The incremental cost of serving EV load offsets a portion of the benefits that were discussed above. Recall I estimated that EV charging revenue is approximately $300 per EV per year. This is retail revenue available to the Company to contribute toward covering its revenue requirement. However, the Company will also incur some costs to provide energy and capacity supply for the additional EV load that add to the revenue requirement. The net margin that both Ms. Lange and I discuss is what remains of the incremental revenue after these incremental costs are covered in order to create a net reduction in revenue requirement. A reasonable estimate of the incremental energy and

capacity costs that are incurred to serve an EV is an important component to determining the amount of net margin that can cover program costs and/or reduce rates for all customers.

Q. Does Ms. Lange raise any issues with the Company's estimates of the incremental cost to serve the load associated with a new EV charging on the Company's system?

A. Yes. Ms. Lange questions the level of assumed cost per incremental megawatt-hour ("MWh") of energy and megawatt ("MW") of capacity that the Company used in its calculations, as well as the assumption of how much incremental capacity requirement would be driven by the charging of EVs. Ms. Lange begins by alleging that the Company provides incremental costs of energy and capacity that are inconsistent with the Company's 2019 MEEIA application.

Q. Is she correct about that?

A. No. The Company in fact used forward cost curves that are *identical* to those underlying its MEEIA application for energy, capacity, and transmission and distribution ("T&D") costs in its Rate Impact Measure ("RIM") test that was calculated based on the collective impact of the Charge Ahead – Electric Vehicles program and the EVs that would use the infrastructure. It is ironic, once again, that Ms. Lange would make this erroneous claim, since her insistence on the use of the Company's MEEIA avoided cost of capacity and T&D *is* a radical departure from the position that *her colleagues with Staff* took just two months ago in rebuttal testimony in the Company's MEEIA case.

Q. What was Staff's position on avoided capacity costs in that case?

A. It is best summarized in a quote that opens a section of the Staff rebuttal report in that case. Staff asserted:

> Ameren contends that there is an avoided capacity cost associated with each kW saved by MEEIA Programs. However, a cost cannot be avoided if an investment is not necessary. Ameren should not have included any avoided capacity costs associated with demand side resources prior to 2034 when the utility would actually need additional capacity to meet the needs of its customers' and the MISO capacity reserve margin requirement. (File No. EO-2018-0211, Staff Rebuttal Report, Page 23, Lines 2-6).

When it came to capacity savings in the MEEIA context, Staff refused to recognize there were *any* avoided costs associated with a reduction in demand unless construction of new generation were otherwise required to serve the demand. Application of the same logic must dictate that an increase in demand – such as may be experienced when serving a new EV that charges during peak periods – would not cause *any* incremental capacity costs unless new construction were similarly required to meet that demand. Had Ms. Lange applied Staff's MEEIA standard, her analysis would have demonstrated a far greater economic benefit from each EV than even the Company's direct case analysis showed.

To be fair to Ms. Lange, it is actually her colleagues' position in the MEEIA case that was objectively and demonstrably wrong on this point. Incremental demand savings or demand additions both carry (or avoid) a very real cost – the market value of capacity in the Midcontinent Independent System Operator, Inc. ("MISO") marketplace. However, the outcome of Staff's lack of coordination of positions in two different cases resulted in them casting both of the Company programs in the most unfavorable light possible. Their application of contradictory positions served to artificially and inappropriately minimize Staff's assessment of the combined economic value of the two programs.

Q. Returning to Staff's criticism of the incremental costs used by the Company, can you please provide any insights on what may have led Ms. Lange to

the conclusion that the Company used inconsistent cost estimates for Charge Ahead and MEEIA?

A. Yes. I believe her confusion arises from the fact that I analyzed the Charge Ahead – Electric Vehicles program's economics from two distinct perspectives – both of which are valid ways to think about the program and give rise to different insights about it. First, I related the Charge Ahead – Electric Vehicles program to the line extension policy change that the Company also proposed in this proceeding. For that analysis, I did not use the same cost of capacity as the MEEIA filing. I instead used the *same cost of capacity as is used in the application of the line extension formula*. In fact, I made it very clear in that testimony that one valid way of viewing the Charge Ahead – Electric Vehicles program is as a logical extension of the line extension policy. The line extension framework recommended by the Staff in File No. EW-2016-0041 was also proposed by the Company in this case, and has resulted in a Non-Unanimous Stipulation and Agreement ("Stipulation") in this case supported by the Company and Staff, among other parties. The framework includes a formula to determine how much money the Company can invest in infrastructure to serve a new load and still have the revenues from that new load cover the cost of the investment along with any marginal costs of energy and capacity needed to serve the load. While this formula is generally used to assess the economics of the addition of a discrete customer with a discrete new service connection to the system, in principle, the exact same logic can be extended to infer how much investment in a distributed charging network can be paid for by the addition of a large number of EVs that will use it to receive energy services from the Company. The logic and the math for the EV infrastructure is the same as for the construction of a new service connection to a new

customer. For purposes of illustrating that analytical perspective, I used an estimate of current marginal costs of energy and capacity – the *exact same estimate that was included in the line extension analysis* provided in this case. Use of this logic suggests that the economic terms under which the Company would contribute to the development of EV infrastructure that will provide energy services to its customers ought to be exactly the same as the economic terms under which the Company will build a new electric service connection and supporting infrastructure for its customers.

However, because I have also characterized the Charge Ahead – Electric Vehicles program as having the same goals, look, and feel as an energy efficiency program, I chose to also replicate the type of economic analysis that would be done for an energy efficiency program – namely I calculated the RIM test for the impact of the combination of the Charge Ahead – Electric Vehicles program and the EVs that will be served by it. To be clear, the fundamental goal of these economic analyses, the line extension formula and the RIM test, is the same – to determine if the impact of an investment will increase or decrease other customers' rates – but they look at different time horizons. They are essentially different "flavors" of the same analysis. In fact, footnote 13 on page 34 of my direct testimony, replicated below, explain exactly what I was doing:

> I drew the analogy between the line extension methodology and the RIM test, but for this comparison, I will clarify notable differences between these two calculations. The line extension policy incorporates an estimate of *current incremental energy and capacity costs*. The RIM test incorporates *forward curves that forecast future levels of energy and capacity costs*, and also applies discount rates to all of the future costs and revenues, which makes the timing of vehicle additions relevant to the RIM calculation. As such, the favorable RIM result of EVs tests additional sensitivities to those factors (emphasis added).

To be one hundred percent clear, the forward curves for energy, capacity and T&D costs used for the EV RIM analysis in my direct testimony were *identical* to the forward curves used in the Company's MEEIA analysis. Staff's assertion that my EV analysis conflicts with the Company's MEEIA analysis is incorrect.[7] As described previously, it is Staff that departed severely from its positions in the MEEIA case.

Q. Did the combination of the Charge Ahead – Electric Vehicles program and the EVs that may be served by it pass the RIM test (meaning the benefits exceeded the costs) using the *same forward curve as* the Company's *MEEIA* filing?

A. Yes.

Q. Please turn to discuss the other impactful assumption regarding the incremental costs of serving an EV – the incremental amount of capacity required per new EV.

A. The Company incurs incremental capacity costs to serve an EV if and only if that EV charges at a time that drives up peak loads. Capacity is generally designed to meet expected peak loads plus a reserve margin to help ensure reliability. Charging during a time that doesn't have the potential to be a period of peak demand has no impact on capacity costs. So the critical question to ask regarding the EV's impact on capacity costs is, when do they charge?

Q. How did the Company address that question in its direct case?

A. We relied on a study performed at Indianapolis Power and Light ("IPL") in collaboration with the U.S. Department of Energy (cited in my direct testimony), which

[7] Ms. Lange also claimed that the Company did not reflect T&D costs at any level in its Charge Ahead analysis, which is similarly incorrect based on the same discussion as the capacity costs. The T&D costs were reflected in the RIM calculations in a manner that is 100% consistent with their application to the Company's MEEIA analysis.

found that 20% of EV charging occurred during peak periods. While, as I will explain below, we believed that direct application of 20% from this study to determine an EVs impact on the system peak load to be overly conservative (i.e., likely to overestimate the peak impact of EV charging) we used it nonetheless, and even tested sensitivities where on-peak charging was up to *40% more* than what this study suggested.

Q. Why did you believe that using the 20% from this study likely overstated the impact of EVs on peak demand, and why didn't you make an adjustment for that fact?

A. The IPL study indicated that 20% of the energy consumption that arose from EV charging occurred during peak times. That is a different thing than concluding that 20% of all EVs charge simultaneously in *each* peak period. However, we *conservatively* applied it to our initial study assuming that 20% of all EVs would be charging simultaneously during peak times. In reality, not every vehicle will charge every day. On any given day, if for example 80% of vehicles do some charging during the day, and 20% of the energy consumed by those vehicles is during peak periods, then only 16% (80% x 20%) of vehicles will be physically connected to active chargers during the peak period. Further, a vehicle that does charge every day may not need a lot of energy with each charge due to the frequent refilling, and therefore, even if it charges during the peak time, may not be drawing energy throughout the entire peak period. While day to day, the number of vehicles that charge may vary and the durations of charges may vary, it would almost certainly be true that less than 100% of vehicles will charge and that for those that charge during peak times, that charging will still encompass less than 100% of the peak period on the day when the system peaks. However, my example above is only hypothetical. Since I did not have any

evidence at that time to inform the appropriate amount of an adjustment to the number of vehicles that would be actively charging – and since the economics of the Charge Ahead – Electric Vehicles program were so compelling despite this likely overstated demand impact – I simply used this conservative assumption, and even stress tested it with an even worse case sensitivity, to demonstrate the compelling economics of EVs.

Q. What was Ms. Lange's response to this approach?

A. She simply states that it is an unreasonable assumption, with no other rationale given. She then goes on to determine what she thinks is a more reasonable capacity impact based on her subjective expectation of EV consumer behavior.

Q. Please describe that expectation.

A. Ms. Lange concludes that for a workplace charger to have "reasonable utilization," one would have to assume that two vehicles would charge at each port per day. She goes on to assume that a second EV would still be plugged in at each charger during the late afternoon when the system peaks 100% of the time.

Q. Do you agree that this is a realistic assumption about how workplace charging utilization will play out?

A. No, for a couple of reasons. First, Ms. Lange's hypothetical does not reflect the reality of how people tend to adopt new technologies. Customers tend to purchase a new technology – like an EV – when that technology can make their life better – when the adoption is easy and adds convenience to their life. If drivers are going to be required to move their cars around at lunch to share a charger, they probably will either not buy the car, or will simply fail to take the action that would otherwise ensure Ms. Lange's idea of "reasonable utilization" of the workplace charging is met. Ameren's own experience, while

still anecdotal – but one based on observation rather than speculation - bears this out. Ameren's headquarters has quite a number of EV charging stations installed and there are numerous EV drivers that work in the building – more than the number of available chargers on a given day. Ameren did initially try to encourage this plug sharing approach that Ms. Lange suggests will be commonplace, but in practice the vehicle movement simply did not occur. There may be a few opportunities at Ameren's office for a second car to charge in the afternoon when a driver that charged in the morning perhaps left campus to go out to lunch and another driver opportunistically found that spot. But by and large the overwhelming majority of chargers see one car per day: the EV that got to the charger first in the morning when the employee came to work. That EV is fully charged before the peak occurs in the afternoon; a second car that needs to be charged is simply not plugged in during the peak a large majority of the time.

A second reason that Ms. Lange's expectation is not reasonable is that, even if plug sharing were commonplace, it's almost impossible that it would be executed perfectly enough to result in the 100% charger utilization during the peak that she has assumed.

An even more significant point though, is that, regardless of what our expectation of EV drivers' behavior is, or what an anecdote suggests they will do, it is simply speculation without data that provides empirical evidence of what actual EV drivers will do. I will return to this point later when I further discuss the type of evidence that the Company is relying on for its analysis.

Q. Before turning to the Company's additional evidence on charging behavior, what other assumptions does Ms. Lange make about the peak impact of charging beyond this workplace example?

A. The workplace anecdote is the only discussion of any peak assumptions that she includes in her written testimony. In fact, she does not mention at all what she thinks would be a reasonable assumption for the amount of home charging at peak times.

However, a review of the workpapers she provided in support of the net margin estimates contained in her testimony reveals that she has gone extremely deep into the weeds in a hyper-complex analysis, which is full of a variety of subjective scenarios of charger utilization at various charging speeds. There is no reference in these scenarios to a source that provides evidence of why they are the right scenarios to analyze. She then, again with no stated rationale, equally weights all of these subjective scenarios into an average peak charging impact per vehicle. There is no evidence whatsoever that any of these scenarios or the equal weighting of them into an average are realistic. The result is a complex web of calculations with absolutely no empirical support that results in a significantly overstated peak charging impact of EVs.

Q. What evidence are you relying on to suggest that Staff's peak impact is significantly overstated?

A. I am relying on actual studies of actual EV driver charging behavior. And frankly, this is consistent with how the peak load of any group of customers is generally measured when determining the cost of service for that type of customer. In every rate case, the Commission's decision on just and reasonable rates for the various classes of service is informed by a class cost of service study that allocates demand-related costs based on the usage patterns of those customer classes when the system peaks. Those usage patterns – the class peak loads - are determined by load research, where the Company meters samples of customers on an hourly basis and uses those actual observations to understand the

dynamics of customer usage patterns. The studies I am relying on for EV analysis are of the same nature, where samples of EV drivers were created and meters tracked customer usage to identify the utilization patterns of EV charging. This is the type of information on which peak demand should be measured when possible, and on which capacity (or demand-related) costs should be allocated or estimated.

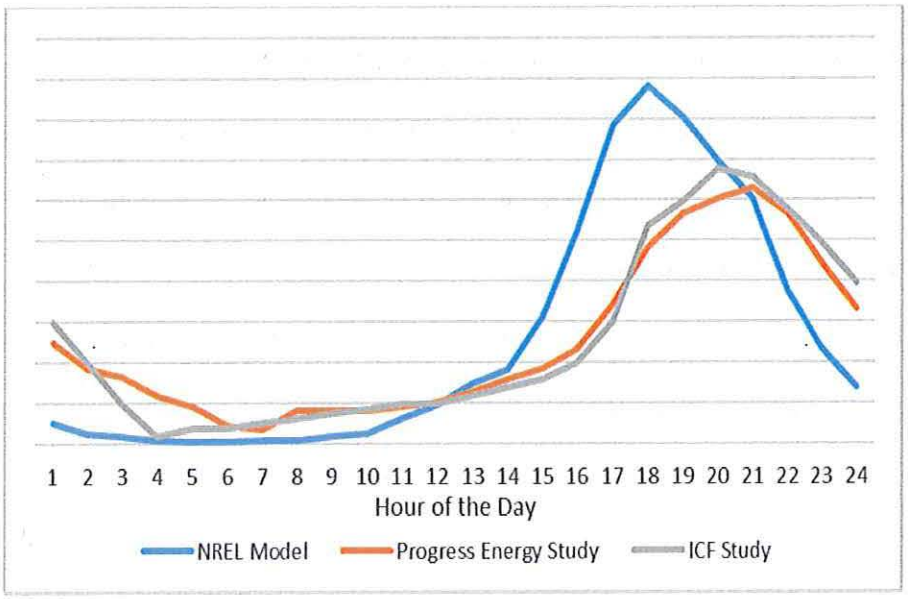
Q. Please describe the studies that you relied on.

A. Recall in my direct testimony that I used a study of actual customer behavior in the IPL service territory to inform the Company's peak estimates for residential charging (20% of charging-related energy being consumed during peak periods). That is the first study – based on actual meter data of real customers – that informed our analysis. However, during the technical workshops held this summer related to Charge Ahead, and based on questions raised by Staff on this very topic, the Company did additional research to find additional studies to both corroborate the IPL study's conclusion and to find new information, such as how workplace charging is utilized in practice.

A very helpful source for this information was ICF Resources, LLC ("ICF"), the firm that conducted the market research for the Charge Ahead – Business Solutions program. Mr. Pickles, who works for ICF and is testifying on behalf of the Company in support of the Charge Ahead – Business Solutions program, was participating in the technical conferences and heard the questions raised by Staff. He reached out to the Company to offer the results of both residential and workplace charging metering studies associated with Southern California Edison's Charge Ready program in which ICF had been involved. Each of these studies provided extremely useful information for determining the peak impact of EV charging.

In addition, our internal research identified additional studies that have been conducted by various entities, including a study of charging at Salt River Project in Arizona that provided information about weekday vs. weekend home charging utilization, a metering study at Progress Energy in North and South Carolina and Florida, and a U.S. Department of Energy study that utilized a National Renewable Energy Laboratory ("NREL") simulation of charging behavior across a variety of market segments.[8, 9] The residential daily charging patterns from each of these studies is shown in Figure 1 below, and the workplace charging pattern from the ICF study is shown below in Figure 2:

Figure 1 – Residential Charging Patterns

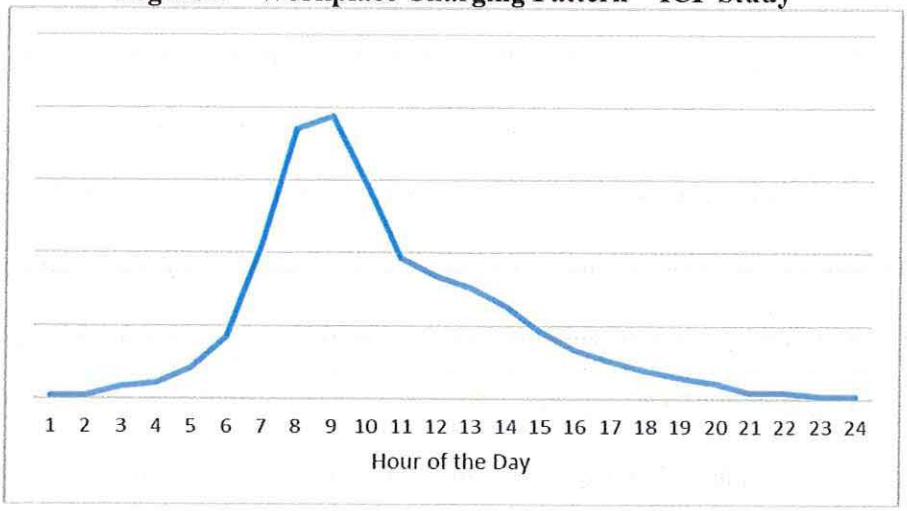


[8] This is the only load shape information included in the Company analysis that is not strictly based on meter data, but it is based on a robust analytical engine developed by NREL that was informed by "real-world travel data."

[9] The Salt River Project information is derived from the report referenced in footnote 6. The Progress Energy study was from the report referenced in footnote 8 of my direct testimony, and the DOE load shape was from the report referenced in footnote 8 above.

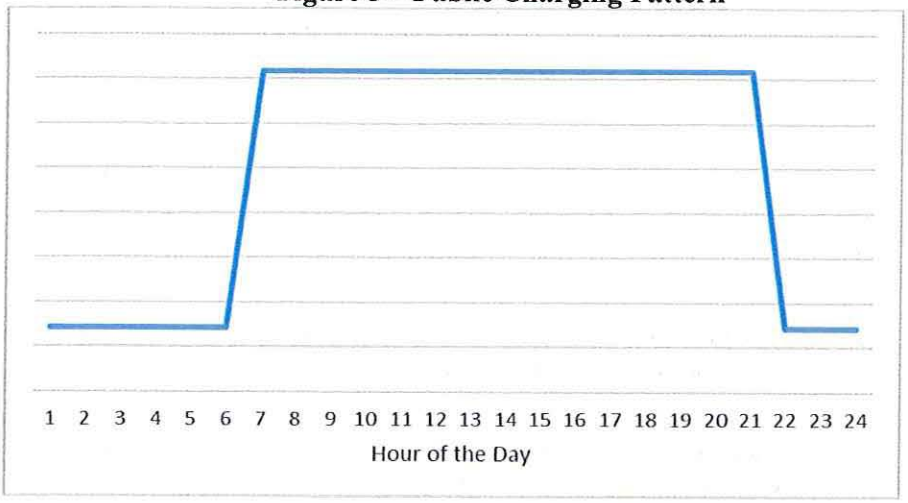
corrected 5

Figure 2 – Workplace Charging Pattern – ICF Study



Because we simply were unable to identify any studies that had a metering study associated with public charging that was not at workplace locations, we did end up developing a public charging profile based on subjective assumptions. The impact of this curve - which does have subjectivity - to our net margin analysis is quite small, as just a small fraction of charging is expected to be done in these locations. The logic we used to develop this charging profile is that public locations would be utilized fairly steadily between the morning and evening rush hours, but on a very limited basis overnight. The public charging utilization pattern we developed is shown in Figure 3 below:

Figure 3 – Public Charging Pattern



Q. What do you conclude from review of these studies (and assumptions) on EV charging behaviors?

A. When we apply these charging utilization patterns to the amount of energy that we expect to be consumed by EVs (as discussed above in the section discussing estimating incremental EV revenues), we get an estimate of the total hourly load that arises from EV charging. From those hourly loads, we can identify an estimate of the peak impact of EV charging expected to occur in our service territory - based almost entirely on empirical observation of how EV owners are actually charging their cars.

Based on the previous assumption that EV owners charge approximately 85% at home, and testing sensitivities considering non-residential charging occurring mostly at workplaces (using the utilization pattern in Figure 2), or mostly in other public places (using the utilization pattern in Figure 3), an average EV is expected to place from approximately 0.62 to 0.66 kW of demand on the system at the time of peak. Notably, this validates my expectation that the 20% used in our direct case – which when applied to a 6.6 kW Level 2 home charger implies a peak demand impact of 1.32 kW per EV - likely materially overstated (by about two times) the peak charging impact of EVs.

Q. Can you infer a similar number from Staff's analysis to compare on an "apples to apples" basis the result of Ms. Lange's assumptions to this empirically supported peak demand per EV estimate?

A. Yes. The incremental peak demand arising from each new EV implied from Ms. Lange's complex web of assumed charging scenarios is 2.05 kW for her residential and SGS margin analysis and 1.54 kW for her LGS margin analysis. Given that a typical Level 2 charger operates at about 6.6 kW, her residential analysis implies that a staggering

31% (2.05 kW/6.6 kW) of vehicles must happen to be charging simultaneously during the system peak – nearly a third of all EVs in the service territory! This is clearly well outside the realm of both what empirical evidence demonstrates and logic would dictate.

Q. Based on all of the foregoing discussion and analysis, what is a reasonable estimate of the net margin per EV on the system?

A. EVs that charge on the system are likely to generate an average margin in a range of approximately $207 to $221, depending on where the non-residential charging occurs. Recall my direct testimony contained an estimate of $249 per EV. By far the biggest factor in the reduction of my estimate since preparing my direct testimony is the revenue impact of federal tax reform, which was not known at that time. The other updates I made to my analysis in response to Staff's questions and testimony generally reinforced the reasonableness of the Company's original assumptions or showed that a number of them were even overly conservative.

Q. With the tax reform rate reduction in place, which reduces the expected margin per EV relative to the value reported in your direct testimony, is the Company's proposed EV budget still reasonable?

A. Absolutely. Recall the line extension formula methodology that has been the subject of a Stipulation and Agreement not opposed by any party in this case and that has been broadly endorsed in a number of settings in front of this Commission. It can be used as a reasonable method for determining the investment that can be made to serve new load given this annual margin per EV. The result of its application is an investment level that will be fully paid for by that load. The application of that formula as I described in direct testimony to the new net margin estimate suggests that the net margin from each EV

will support investment levels of approximately $1,237 to $1,319. Using the conservative end of that range, the $11 million Charge Ahead – Electric Vehicles budget can be expected to be covered by the net margin arising from 8,890 EVs ($11 million / $1,237/EV). Considering the Company's base forecast of EV adoption in the service territory that was discussed further in my direct testimony suggests that almost 25,000 EVs can be expected in the next 10 years - well within the life of the infrastructure that will be developed as a result of the program – and that market trends continue to advance rapidly, suggesting a reasonable likelihood of actual adoption being closer to the Company's high EV scenario rather than the base scenario when enabled by the Charge Ahead – Electric Vehicles program - there should be little doubt that EV charging will still create benefits for all customers in the form of lower rates, even with a portion of those benefits being reinvested in infrastructure to support those EV-owning customers that are creating the benefit.

Q. Ms. Lange also discusses the possibility of Time of Use ("TOU") rates influencing the level of net revenue received by each charger. Is the potential for future rate design changes a good reason to delay the benefits EVs can bring to Ameren Missouri's customers?

A. No. The TOU rates that Ms. Lange discusses are generally implemented with a goal of changing customer behavior and altering usage patterns in a way that reduces the cost to serve those customers' load. To the extent that customers are able to charge at a cheaper rate (and therefore provide less revenue to the utility), it should be because the incremental cost of serving them is also going down as a result of the actions that they are taking to do additional off-peak charging. My expectation is that no TOU rate is likely to be established that doesn't fully cover the marginal cost of service and make a contribution

to covering the Company's fixed costs, so those customers that do charge during off-peak times will still provide positive margin when netting the reduced revenues with the reduced incremental costs of serving the EVs.

Q. Ms. Lange argues that the Company did not consider the cost of Renewable Energy Standard ("RES") compliance associated with a program that grows load. Is she correct?

A. She is correct that we did not explicitly factor that into our analysis, but I am confident that doing so would not change the outcome. The wind generation projects that the Company is currently pursuing for purposes of complying with the RES are expected to be economically beneficial in the majority of future scenarios outlined in the Company's Integrated Resource Plan ("IRP") – meaning that additional RES compliance obligations would not necessarily result in a net cost. The few IRP scenarios where additional renewables are not shown to be economically beneficial (i.e. where there could be a net cost of incremental RES compliance to customers, subject to the statutory 1% limitation) tend to be IRP scenarios characterized by low future energy and/or capacity prices. Since the EV economic analysis that I've been discussing is based on the IRP base case assumptions for those variables, the low energy and capacity prices in the more costly RES compliance scenarios would also materially *reduce* the costs of serving the incremental energy and capacity needs of new EV load. So regardless of the future scenario, I am confident that either the RES compliance costs would be negligible or other cost savings associated with low capacity and energy markets would more than make up for any incremental RES compliance costs driven by the new EV load.

I would also note that the fact that the RES applies to the load that would be added by the Charge Ahead – Electric Vehicles program means that Charge Ahead would drive incremental renewable energy to be generated, ensuring that the electrified loads' emissions profiles will be even better than they are with today's fuel mix which, as Mr. Justis discussed in direct testimony, already results in fewer emissions than gasoline powered vehicles.

C. Ratemaking Impacts on Charge Ahead Customer Benefits

Q. How does Ms. Lange suggest that the nature of the ratemaking process will impact customers' receipt of benefits from Charge Ahead?

A. Ms. Lange indicates in response to a question about whether EV charging revenues benefit all customers:

> In the near term, they do not. For example, for Mr. Will's [sic] assumption that a $1,500 "construction allowance" per EV will pay for itself in five years, Ameren Missouri would need to file a rate case at the end of year 1, to take effect at essentially the end of year 2, to incorporate those additional revenues into the billing determinants used to calculate rates. Even then, it would take until just before the end of year 7 for the calculation Mr. Will's [sic] provides to carry through. Meanwhile, shareholders would have received the benefit of 23 months of additional revenues even under the most customer-friendly example. This in addition to the immediate relative increase to FAC rates that results from an increase in energy sales. And finally, Mr. Will's [sic] assumption fails to consider that Ameren Missouri's September 1, 2018 election of Plant in Service Accounting (PISA) in File No. EO-2019-0044 means Ameren cannot change rates before April 1, 2020. (Lange Rebuttal, Page 4, Lines 1-11)

The picture Ms. Lange paints is very inaccurate however, and also fails to consider key additional customer benefits built in to the Company's proposal for recovering costs associated with the Charge Ahead – Electric Vehicles proposal. There's a lot in her statement, but I will break down my response as clearly as I can. I would also note that,

while Ms. Lange's comments on this topic were focused on the Charge Ahead – Electric Vehicles program, the cost recovery provisions and rate impact discussion are equally applicable to both Charge Ahead programs – Electric Vehicles and Business Solutions, and when I turn to discuss the rate modeling that I have done, I will discuss them both together.

Q. What is inaccurate about Ms. Lange's characterization of the impact on customers of the ratemaking treatment of Charge Ahead – Electric Vehicles?

A. Ms. Lange suggests that the use of the "construction allowance" calculation to determine the appropriate amount of investment the Company could make to serve a new load is designed to determine how much investment can pay for itself "within five years." By this she seems to imply it will take this long for rate benefits to materialize, or worse, perhaps that there would be an upfront negative impact prior to some payback with benefits that occur five years in the future. This is a mischaracterization of the construction allowance concept. Investments that are economically justified by the construction allowance calculation pay for themselves over their useful lives – in some cases over a period that spans decades. They do this, however, in a manner that generally balances the upfront rate impacts that arise from the costs of the new investment that will be included in the Company's revenue requirement with the new revenues that will be generated by the load addition, which will offset that revenue requirement. There is no "five year payback" during which customers are waiting for benefits to materialize. The construction allowance generally suggests that any investment less than or equal to the amount justified by that calculation will have a neutral or favorable impact *immediately or nearly immediately* after the investment is made and the new load comes online. By just looking at the fact that the Company's proposed investment in the Charge Ahead – Electric Vehicles program is much

less than the level that this calculation suggests could be justified by the EVs that will use it, the calculation suggests that the near term rate impacts will be favorable.

However, I will acknowledge that, while this construction allowance methodology is an effective and useful tool for determining the amount of investment that is economically justified in support of providing service to a new load, it is an imperfect tool for determining short-term vs. longer-term rate impacts with a great deal of precision – especially for an investment and load addition that will play out over a period of years, as will the Charge Ahead – Electric Vehicles program costs and addition of new EVs charging on the system.

Q. Even if it is an imperfect tool, is there other evidence that supports the conclusion that there will be benefits immediately?

A. Yes. Recognizing the imperfection of the construction allowance tool in this context is one of the key reasons the Company also performed the RIM test in support of its direct testimony. The RIM test considers the *timing* of costs and benefits in its calculation. The traditional RIM test used to analyze energy efficiency programs, though, does not typically factor in regulatory lag – it generally assumes perfect ratemaking. The RIM calculation in my direct testimony was consistent with this typical practice. However, I have developed a very detailed model based on the RIM calculation, but that accounts for the elements of regulatory lag to demonstrate a realistic picture of the magnitude and timing of expected rate impacts from the Charge Ahead program and the EVs it will serve. I will return to a discussion of that model in a moment, after I address a couple of more statements in the quote above from Ms. Lange's testimony.

Q. Ms. Lange suggests that costs arising from Charge Ahead - will impact customers before they realize any benefits due to the Fuel Adjustment Clause ("FAC"). What is your response to this?

A. While this is technically true, it is also true of load additions that result from application of the line extension policy that Staff and others have already agreed to in this case. And there have been no concerns expressed in any of the regulatory discussions that have taken place on the topic at the Commission in recent years that I am aware of that suggest we should not be doing economically beneficial line extensions because there is a very small upfront impact resulting from the recovery afforded to net energy costs through the FAC. The impact of this is also relatively small in the overall picture of this program, and I have included these impacts in the rate impact modeling that I will be discussing shortly to demonstrate that it should not be a material consideration in the evaluation of the Charge Ahead proposal.

Q. Ms. Lange suggests that the Company's shareholders will benefit from the revenues resulting from new EV load for a period of time before customers see any benefit. Please respond.

A. First, I would point out again that this is true of any load added to the system. But more importantly, this is where Ms. Lange ignores a very important element of the cost recovery design that the Company has proposed for the Charge Ahead program. This benefit to shareholders that Ms. Lange observes in the form of regulatory lag on increasing revenues is explicitly factored into the program cost recovery and a commensurate offsetting benefit *to customers* is provided *by shareholders*. Recall from my direct testimony that I stated that the Company would ask to defer the program costs and proposes

to recover them over a period of seven years *without inclusion of the unamortized balance in rate base*. For essentially any other cost that the Company would finance on behalf of its customers, the unamortized or undepreciated balance would be included in rate base in a manner that increases revenue requirement – i.e., adds cost to the customer. The Company was fully cognizant and transparent going into this proposal that it stood to gain from regulatory lag on increasing retail revenues until base rates were reset, and crafted a balanced proposal that used those incremental shareholder benefits to offset the cost of the capital that it was deploying and for which it would not receive a return, which would have been a real cost for customers. My direct testimony further explains how the lag on revenues from the program and the financing costs absorbed by the Company are fairly balanced in this proposal. If what Ms. Lange said about shareholders benefiting from the revenue growth for a period of time were not true, it would be necessary to revisit the cost recovery model and reflect additional costs to customers by including the unamortized balance of the regulatory asset in rate base.

Q. Please provide an example of the real financing costs the Company will bear on behalf of customers without seeking rate base treatment for the underlying investment if the proposal is approved.

A. I've replicated a subset of the financial model shown in Table 10 of my direct testimony and just calculated the real financing costs (and associated income taxes) that are incurred by the Company and would be reflected in the revenue requirement if the unamortized regulatory asset balance were included in rate base. The result is shown in Table 2 below:

Table 2: Financing Costs and Taxes Associated with Deferral of Program Costs

($ in Millions)	2019	2020	2021	2022	2023	2024	2025	2026
Program Budget (Incentives + Admin)	$4.4	$4.2	$3.1	$3.4	$2.8	$0.0	$0.0	$0.0
Regulatory Asset Balance	$4.4	$8.6	$10.9	$13.1	$14.0	$11.9	$9.4	$6.9
Amortization Expense	$0.0	$0.0	$0.8	$1.2	$1.8	$2.2	$2.4	$2.6
Financing Costs and Taxes at Pre-Tax WACC of 8.29%	$0.4	$0.7	$0.9	$1.1	$1.2	$1.0	$0.8	$0.6

	2027	2028	2029	2030	2031	2032	2033	Total
Program Budget (Incentives + Admin)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	
Regulatory Asset Balance	$4.3	$2.6	$1.3	$0.5	$0.1	($0.0)	($0.0)	
Amortization Expense	$2.6	$1.8	$1.3	$0.7	$0.4	$0.1	$0.0	
Financing Costs and Taxes at Pre-Tax WACC of 8.29%	$0.4	$0.2	$0.1	$0.0	$0.0	($0.0)	($0.0)	**$7.3**

If it weren't for the revenues that Ms. Lange pointed out as accruing to shareholders until base rates are reset, this additional $7.3 million of financing costs (and associated taxes) would require a new cost recovery solution (like rate base treatment for the unamortized regulatory asset balance).

Q. Ms. Lange also brings up the rate moratorium through April 1, 2020 associated with the Company's plant-in-service accounting ("PISA") election. Is that relevant?

A. Certainly not in the way Ms. Lange brings it up. It is in fact a red herring. She seems to imply that this moratorium would cause an even greater delay in delivering rate benefits from Charge Ahead to customers. However, based on the procedural schedule in this case, Charge Ahead could not possibly begin until a few months into 2019 and program benefits will take time to accumulate from that point. Under the rate moratorium that does not allow rates to be changed until April 1, 2020, considering the eleven-month process that must be undertaken, a rate filing is possible as early as May 2019, just a couple of months into the potential initiation of Charge Ahead . That is not to say that there is any certainty when the Company will choose to file for a rate change, but the moratorium is

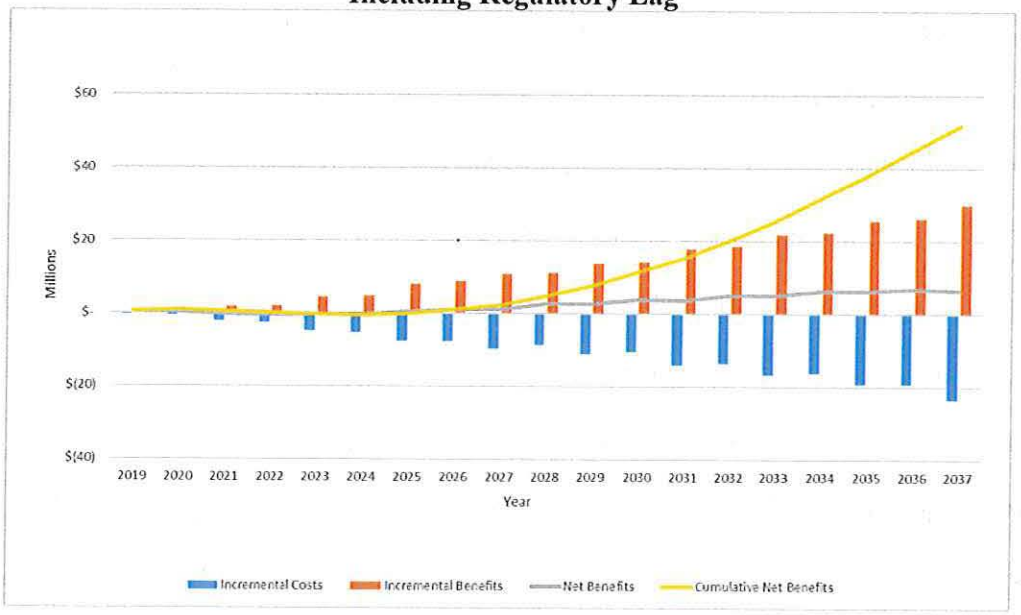
not a material limiting factor on rate case timing that would be relevant to the delivery of benefits from Charge Ahead.

Q. Please turn to discuss the more detailed rate impact modeling that you undertook to demonstrate the timing and magnitude of expected rate impacts of Charge Ahead including the impacts of regulatory lag, the FAC, and rate case timing.

A. I described the calculation of the RIM test for the combination of the Charge Ahead – Electric Vehicles program and the load added to the system associated with EVs in my direct testimony. The RIM test compares those costs and benefits that will ultimately impact customer rates, hence the name Rate Impact Measure. RIM benefits in the EV analysis include retail revenues that arise from serving EV loads that contribute toward covering the Company's revenue requirement. RIM costs include incremental costs of energy, capacity, and T&D required to serve the new load, as well as Charge Ahead – Electric Vehicles program costs – those impacts of the program that will add to the Company's revenue requirement. Mr. Pickles' direct testimony included a similar analysis of the Charge Ahead – Business Solutions program. Figure 4 from my direct testimony showed how the net RIM benefits of both Charge Ahead programs combined would play out in rates over time. However, as Ms. Lange pointed out and I discussed above, this analysis really showed the impact of the programs on revenue requirement over time – which becomes a rate impact only when a general rate proceeding concludes and reflects those changes in revenue requirement in rates. I have updated the modeling from Figure 4 in my direct testimony, however, to recognize, based on assumed rate case timing and fully considering the mechanics of net energy cost recovery that occurs outside of rate cases through the FAC, when each change in revenue requirement would be reflected in the rates

used for customer billing. I have also updated this analysis to incorporate all of the other updates I discussed above regarding the net margin calculations, such as reducing the retail revenues for the impact of the rate change that occurred to reflect federal tax reform. For a base assumption regarding rate case timing, I assumed that the first rate case would occur when first allowed due to the expiration of the moratorium associated with the Company's PISA election. After that, I assumed a rate case every two years, which is slightly longer than the past decade of history would indicate. Net energy cost changes are assumed to occur routinely, per the schedule of accumulation periods and recovery periods defined in the FAC. The result of the modeling, reflecting only those costs and benefits *included in rates* at any given time are shown below in Figure 4:

Figure 4 – Charge Ahead (EV and Business Solutions) Rate Impacts by Year Including Regulatory Lag



Q. Please describe the implications of Figure 4.

A. In the early years, the rate impacts reflect that there is a very small amount of EV-related benefit in rates today that create an initial base of existing benefits from

existing EVs that the program would reinvest to serve those EV drivers and help grow more total benefits over time. Next, net energy costs begin to slowly accumulate through the FAC associated with new Charge Ahead – Electric Vehicles and Charge Ahead – Business Solutions loads prior to any additional benefits being reflected in a rate case (as Ms. Lange observed). I estimate that the negative annual impact of these net energy costs that customers experience through the FAC prior to a rate case would be less than $200,000. The net effect of those items and the small amount of program costs and new Charge Ahead – Electric Vehicles/Charge Ahead – Business Solutions benefits that make it into the first assumed rate case, end up producing almost a completely negligible impact – either positive or negative - for the first several years. The annual rate impact stays within a range of plus or minus $1 million (less than 0.1% favorable or unfavorable rate impact) for about seven years. As Charge Ahead – Electric Vehicles and Charge Ahead – Business Solutions load continues to grow, though, benefits soon overwhelm the costs and accumulate to well over $40 million in time.

Q. Have you tested the sensitivity of this model to changes in rate case frequency?

A. Yes. While recent history would suggest that two year filings following the rate moratorium are a reasonable interval for rate proceedings, I ran the model assuming that the Company is able to stay out of rate cases for three years at a time. Figure 5 below is a reproduction of Figure 4, but with three-year rate case intervals assumed:

Figure 5 - Charge Ahead (EV and Business Solutions) Rate Impacts by Year Including Regulatory Lag with 3 Year Rate Case Intervals

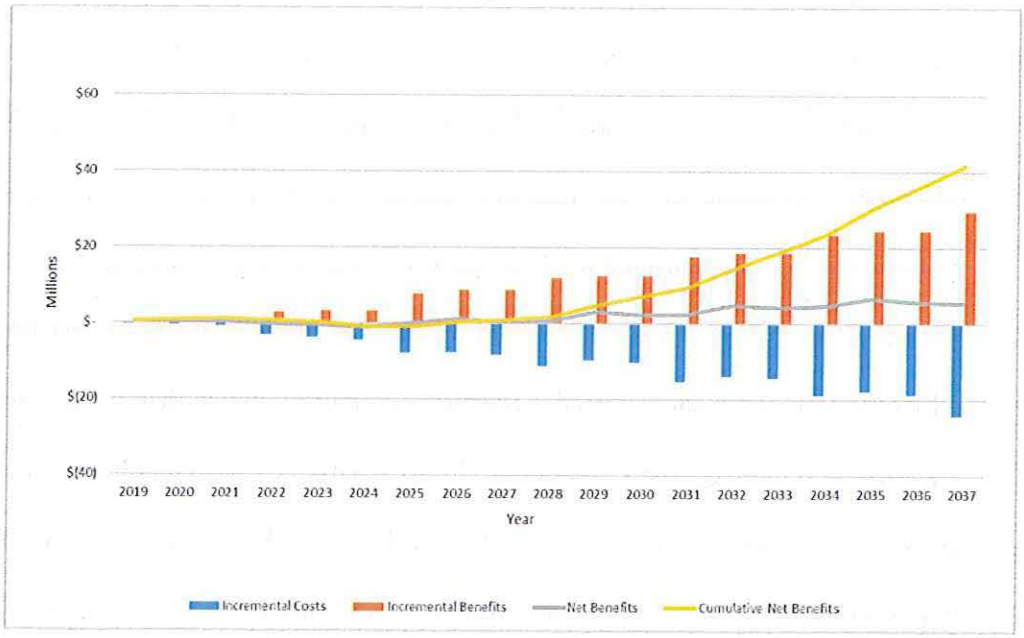


Figure 5 shows that under the three-year rate case interval assumption, the change in net benefits is a little choppier, but the overall impact is similar. There is minimal positive or negative impact in the earlier years, and a steady accumulation of significant net benefits over time.

D. Make-Ready Model

Q. Ms. Lange suggests that Staff would support a make-ready tariff to subsidize the line extension costs associated with EV charging. Is this a better alternative to the Company's proposal?

A. No. I recognize that Staff was directed to look at this by the Commission and appreciate that Staff made the effort to analyze this approach. The finding that this would be cost-effective is not surprising. Since this approach represents, essentially, a small subset of the Charge Ahead – Electric Vehicles program, and the entire Charge

Ahead program is cost effective, it should easily be cost effective if we could achieve similar results with an approach that involves scaled down utility investment. The problem lies with caveat in the previous sentence, "if we could achieve results." I would submit that simply offsetting line extension costs will have a minimal discernable impact on moving the market to develop EV charging infrastructure and that the Company's holistic approach is necessary to achieve meaningful gains in deployed infrastructure. In this case, I use the word holistic not in the sense of addressing all key market segments that create barriers to EV adoption, but in the sense of addressing all sources of cost that act as barriers to the investment in infrastructure. Any third-party entity considering investing in EV charging is likely to decide whether to go forward or not based on the total cost of installing and operating the equipment. They are unlikely to differentiate the types of costs and have a greater willingness to pay for charging equipment than utility system extension costs, or vice versa. So the approach of subsidizing line extension will only move the needle on EV charging investment if the subsidization makes enough financial difference to make the *total cost* of installation and operation palatable to the customer.

Q. Why would subsidizing line extensions for EV charging not affect the total cost of setting up charging enough to help develop infrastructure?

A. It's not that it's not helpful, directionally. But it simply doesn't cover enough costs to change the economics for those developing it. For example, I'd suggest that, depending on the current electrical configuration of the customer's service and the layout of the premises, many Level 2 chargers for multi-family dwellings, workplaces, and around town locations may not even require line extension. In these circumstances, the proposed make-ready approach would not even be directionally helpful – it would not offset any of

the costs of installing EV charging. But let's consider more closely the critical category of corridor charging that is needed to enable long distance travel in the state, and assume that such locations would require line extensions.

The Missouri EV Collaborative corridor charging proposal that Mr. Justis attached as Schedule 4 to his direct testimony estimated that a corridor charging island using 150 kW chargers could require an investment of up to $360,000 to develop, $45,000 of which is estimated to arise from line extension costs.

Now consider a private third-party business that was considering establishing this service to provide to the public. They would be looking at an investment of up to $360,000, and would want to understand the return that they would expect to realize on that investment. I've assembled a very simple financial analysis that might be used to analyze such a business case based on a set of assumptions that demonstrates the type of return on investment this third-party business might expect to make on that investment. Table 3 summarizes some of the key assumptions of my analysis, as well as the resulting internal rate of return of the corridor charging project, both with no incentives and with an incentive that just covered the line extension portion of the costs to establish the service:

Table 3 – Illustrative Business Case for Establishing Corridor Charging Islands

	Key Assumptions
Gross Investment	$360,000
Ameren Missouri Incentive (Covering Line Extension Only)	$45,000
Chargers Installed	2 - 150 kW units, 2 - 6.6 kW units
Annual O&M	$5,000
Charging station utilization	2% yr 1 increasing up to 10% from yr 7 on
Charging coincidence (for calculating billing demand)	60% in yr 1 increasing up to 100% from yr 7 on
Rate charged to EV drivers for charging service	$0.30/kWh increasing by $0.01 per year
	Result of Analysis
Internal Rate of Return on Investment w/no incentive	-2%
IRR w/"make-ready" line extension incentive only	0%

I believe that the assumptions reflected in Table 3 are particularly conservative, meaning that things like annual operations and maintenance are on the low side of what those costs would likely be in reality and utilization is probably on the high side, particularly in the earlier years depending on where the charging is located. Less conservative assumptions would further reduce the estimated rate of return for both scenarios. Even given my conservative assumptions, the upshot is that developing the charging infrastructure without incentives would reasonably be expected to yield a negative return, meaning the business would lose money. With incentives just covering line extension, the case moves up to a zero return – a business venture without any profit to cover the cost of the capital deployed. I struggle to imagine a business investing in the charging corridor in order to realize a zero return on investment. And they would really only do that well if some pretty aggressive assumptions (where I previously characterized the assumptions as conservative, they would be aggressive from the perspective of the business using them to justify an investment) turned out to be correct.

Q. What do you conclude from this analysis?

A. It is highly unlikely that just subsidizing line extensions will result in meaningful EV charging infrastructure investment in Missouri any time soon.

Q. Is this consistent with the message that you heard from the market during the RFI discussions that you mentioned previously?

A. Yes. Mr. Justis elaborates on these findings in his surrebuttal testimony.

Q. Are there any particular features of the Company's proposal that you think help reduce the risk that the program could end up paying more subsidies than

necessary for corridor charging, if third parties are more willing than you anticipate to invest in Missouri already?

A. Yes. We have proposed to structure the corridor incentives as a reverse auction, meaning that the bidder who requires the smallest amount of subsidy to set up the corridor charging would be selected to develop the sites and receive the incentives. If there is a competitive bidding process where charging providers see a better opportunity for profit than what my illustrative business case demonstrated, they should bid more aggressively (i.e., require lower incentives) to get that business.

V. RESPONSE TO STAFF WITNESS OLIGSCHLAEGER

Q. What issues does Mr. Oligschlaeger address in his rebuttal testimony?

A. Mr. Oligschlaeger addresses the accounting and ratemaking considerations that the Company proposed be afforded to the program. His primary position is that the deferral accounting that the Company proposes is inappropriate because the costs at issue are not "extraordinary." He also argues that the Commission cannot approve ratemaking treatment of any costs that would be deferred in this proceeding, but would need to consider them in a future general rate proceeding.

Q. What is your response to Mr. Oligschlaeger?

A. I will start by acknowledging that I am neither an accountant nor a lawyer by trade, and so cannot speak definitively to the appropriate standard under which the accounting authority should be granted. I do, however, have a long history of being involved in regulatory matters in Missouri, and I am aware of numerous occasions where this exact type of accounting authority has been utilized in circumstances that do not meet the definition of "extraordinary" that Mr. Oligschlaeger puts forth, some of which are

extremely analogous in terms of specific details to the Charge Ahead proposal. I am confident that the terms for deferral accounting requested in this case are no less extraordinary than many of these other circumstances.

Q. Please provide an overview of some analogous uses of deferral accounting to that proposed in this proceeding.

A. Of course. While my list is not likely to be comprehensive of all such occurrences, it should be sufficient to demonstrate that the Charge Ahead proposal is not at all out of line with past practice of the Commission.

- As recently as this summer, the Commission ordered approval of a Stipulation and Agreement in the Company's Renewable Choice case (File No. ET-2018-0063). That Stipulation and Agreement explicitly calls for three different instances of deferral accounting for different program elements: deferral of net energy costs to avoid double-counting in the FAC; deferral of Production Tax Credits ("PTCs") to spread the effect of PTCs over the life of the asset, and deferrals associated with the sharing of risk between the Company and non-subscribing customers related to variances in program costs from the assumptions used to develop subscription prices. This order therefore provided explicit Commission authorization for the deferrals in question. If the Commission believed that it was bound by an "extraordinary" standard like that suggested by Mr. Oligschlaeger for any authorization of deferral accounting, it would not have taken this action.
- The Commission authorized deferral accounting for recovery of the costs of energy efficiency programs run by the Company, as well as by Kansas City

Power & Light and Missouri Gas Energy, prior to the utilization of riders for program cost recovery authorized under MEEIA. This is in substance *exactly* what we are proposing in this case.

- In File No. ER-2012-0166, the Commission authorized a storm cost tracker for Ameren Missouri. This was not related to a specific catastrophic storm that resulted in an extraordinary cost, but rather tracked ordinary expenses associated with major storm damage that may happen year to year.
- In File No. ER-2014-0351, the Empire Electric District was authorized to utilize deferral accounting to track maintenance expense under a contract associated with its Riverton Unit 12. While these expenses were highly variable, they were not extraordinary according to Mr. Oligschlaeger's definition.
- Most Missouri investor-owned utilities that are regulated by the Commission have used deferral accounting to track pension and other post-employment benefit expenses. While these expenses do tend to be large and volatile, they are also an ordinary part of conducting business.

I would highlight in particular the first two examples as being particularly analogous to the Company's request in this case, where a new program has been proposed that is beneficial to customers, but where without a deferral mechanism in place, it could be financially detrimental to the utility to pursue it. The Commission should adopt policies to encourage these types of innovative and beneficial programs, not to discourage them.

Q. Do you have any other observations regarding the extraordinary standard?

A. Yes, and again, I would emphasize that I am not an accountant, but in my observation, it seems that the extraordinary standard is generally applied fairly strictly when a party seeks to move costs into a regulatory asset or liability "after-the-fact." The best example being any time a storm tracker was not in place and a utility incurred truly extraordinary costs to repair its system after a catastrophic storm. But it is well within the Commission's usual practices to utilize deferral accounting to accomplish other objectives, including enabling new programs that are intended to provide customer benefits.

Again, application of an overly strict reading of the use of regulatory assets and liabilities will work to force utilities to delay innovative ideas and new programs so that they always start in concert with new rates in a rate case. This will slow innovation and further complicate rate cases, neither of which should be a goal of the Commission.

Q. Mr. Oligschlaeger also suggests that the Commission should not make ratemaking determinations concerning Charge Ahead program costs in this docket. What is your response?

A. Again, I am not a lawyer, but I do understand on advice from counsel that the Commission may not make a final ratemaking determination that is binding in a future rate case in this proceeding. That said, I believe the Commission can weigh in on the reasonableness of recovering these costs in base rates and on the reasonableness of the structure of the Company's proposal to do so.

Q. Despite his recommendation for the Commission not to determine ratemaking treatment in this case, does Mr. Oligschlaeger weigh in on the analysis that the Company used to determine what it believes is an appropriate amortization period for program costs?

A. Yes. He acknowledges the general reasonableness of some of the assumptions that the Company used to perform the financial analysis, but goes on to highlight one notable exception – future rate case timing. He mentions the impact of the Company's PISA election under Senate Bill ("SB") 564 on reducing the regulatory lag it will incur as evidence that the Company may stay out of rate cases for longer than two years at a time, on average in the future. However, whether utilities will have less frequent rate cases as a result of SB 564 is pure speculation at this time. I could argue as easily that rate case timing will maintain its existing clip (which has been about every 1.66 years for Ameren Missouri over roughly the past decade) or even accelerate. This is because, despite the reduction in lag on any given investment, the grid modernization efforts enabled by SB 564 will significantly increase the pace of investment – to the tune of over a billion dollars of incremental investment over five years for Ameren Missouri – and that those investments will ultimately still need to be reflected in rates on a timely basis, subject to the rate cap. In fact, my understanding of the accounting rules that govern PISA deferrals is that the Company will be unable to recognize for financial reporting purposes the equity return component of those PISA deferrals until revenues from retail sales of electricity are recognized that are derived from rates which reflected the amortization of the amounts deferred under PISA. So for the Company to report financial results that include *any* earnings related to investments deferred to the PISA regulatory asset under SB 564, timely rate cases will have to be filed.

Despite the uncertainty regarding the impact of PISA on rate case timing, we do also know some other things that are relevant to this conversation, though. First, based on the analysis shown in Figure 4 and Figure 5 in response to Ms. Lange above, we know that

the impact of the rate case timing assumption is not as highly impactful to the balance of the benefits between customers and the Company as one might initially expect. Second, we know that if the Company is successful in both creating large benefits from Charge Ahead and staying out of rate cases longer, the ultimate impact of both of those things is quite good for customers.

Q. Mr. Oligschlaeger also discusses the impact of the rate moratorium on Charge Ahead, suggesting that there will be at least three years between the Company's last rate increase and its next one. Do you have any observations on this point?

A. Yes. As I pointed out before in response to Ms. Lange, nearly two full years of the three year rate moratorium associated with SB 564 and the Company's PISA election will have elapsed before a single dollar could be spent under Charge Ahead, making the rate moratorium largely irrelevant to rate case timing assumptions that will actually impact outcomes associated with the programs.

VI. RESPONSE TO STAFF WITNESS MURRAY

Q. What issues does Mr. Murray raise that you will be addressing?

A. Mr. Murray recommends rejection of the Charge Ahead – Business Solutions program in its entirety. Mr. Pickles will respond to some of the detailed criticisms that Mr. Murray raises regarding the program, but I will address the crux of Mr. Murray's recommendation, related to the Company's request for a waiver of the promotional practices rules.

Q. What rationale does Mr. Murray provide for suggesting that the promotional practices waiver should not be granted?

A. Mr. Murray offers little support or discussion of his reasoning, except to say that, "Staff finds that this program is in direct competition with energy sources provided by other Commission regulated utilities." (Murray Rebuttal, Page 3, Lines 8-9).

Q. Does Mr. Murray identify which energy sources provided by other Commission regulated utilities with which Staff believes the program competes?

A. No. He offers his statement with no support and no example to back it up. Given the strong net economic and other benefits that are associated with the program, one might have expected a recommendation to reject to be accompanied by at least some evidence. To my knowledge, the only other energy source besides electricity that is regulated by the Commission is natural gas. Therefore I can only assume that Mr. Murray is somehow implying that the Business Solutions program fosters competition with natural gas, since the Commission does not regulate propane, diesel or gasoline suppliers.

Q. Does Charge Ahead compete with natural gas?

A. No. Mr. Pickles testifies to this point further, but the incentives in this program are focused on technologies where the alternatives to electric equipment use propane, diesel, or gasoline as a fuel source. None of these fuels are associated with a Commission regulated utility service provider. To my knowledge, none of the technologies even have commercially relevant natural gas options. I would note that, if Staff had found that, say for example, one measure in the program had a commercially relevant natural gas option, it still should not logically lead to a rejection of the program in its entirety. Staff could easily identify portions of the program that it had problems with and recommend modifications to just those portions. That, of course, was not done in Staff's rebuttal testimony.

Q. If the program technologies do not compete with natural gas, why did the Company even request a variance of the promotional practices rule in this case?

A. Without a rule variance, the program as designed could strictly be read to violate the Prohibited Promotional Practice listed in 4 CSR 240-14.020(1)(B) and perhaps (1)(D). The definition in the Commission's regulations is as follows:

> Promotional practices shall mean any consideration offered or granted by a public utility or its affiliate to any person for the purpose, express or implied, of inducing the person to select and use the service or use additional service of the utility or to select or install any appliance or equipment designed to use the utility service, or for the purpose of influencing the person's choice or specification of the efficiency characteristics of appliances, equipment, buildings, utilization patterns or operating procedures. (4 CSR 240-14.010(6)(L))

Under the language of the rule, a program that seeks to induce customers to select electric based equipment, for example, likely fits the definition of a promotional practice. It does not have to be selection over another regulated utility service. Given the broad language of the rule, I am told by my attorneys that it was prudent to seek a waiver of this rule. Legal interpretations aside, good cause exists to waive the rule in a case where the promotional practice is associated with a strongly economically beneficial program for participants and non-participants alike.

Q. If any of the technologies did have a commercially relevant natural gas option and therefore the program did contemplate potential competition with another Commission regulated energy source, would that be sufficient reason to reject the promotional practices waiver and the Charge Ahead – Business Solutions program?

A. Not necessarily. The General Provisions of the Commission's promotional practices rules clearly state that "On written application by a utility the commission may grant variances from the rules contained in this chapter for good cause shown." (4 CSR

240-14.010 (2)) In my opinion, the Commission would be well within its authority to consider the compelling economics for participants and non-participants alike as good cause for the variance. In the instance where competition with natural gas was implicated, the Commission may also choose to inquire into the economic impact of the fuel switching on the gas company and its customers. But the combined picture could still yield a circumstance that represents good cause for a variance. The same could be true of a program run by a natural gas utility if it met similar benefit-cost benchmarks. Regardless, the question of whether a promotional practices variance for a different program than the one at issue here is simply not ripe for decision in this case.

Q. Mr. Murray goes on to observe that there are some electrification incentives that may be available as a result of the Missouri Division of Energy's plan for disbursing Missouri's share of the Volkswagen Environmental Mitigation Trust Agreement ("VW Trust"). What is the relevance of Mr. Murray's observation?

A. I have no idea. Clearly neither the Missouri Division of Energy nor the VW Trust are energy providers regulated by the Commission, so I can't imagine that it is Mr. Murray's attempt to justify his otherwise unsupported statement that the Company's program competes with other regulated energy sources. The only conclusion I draw from this discussion is that other parts of the state government are recognizing the merits of incentivizing electrification as a means of improving air quality and that the Company's proposal fits in nicely with that state effort. Mr. Justis' testimony addresses the interplay between the VW Trust plan and Ameren Missouri's proposed Charge Ahead – Electric Vehicles program.

VII. RESPONSE TO OPC WITNESS MARKE

Q. Do you have any initial observations to share about Dr. Marke's testimony?

A. Yes. As was the case with Staff, it is notable that Dr. Marke does not challenge the underlying premise of the Company's proposal – that both the Charge Ahead – Electric Vehicles and Charge Ahead – Business Solutions programs help reduce rates for all customers by spreading fixed costs over more total electric usage. In fact, Dr. Marke accepts this premise at face value, saying, "Mr. Wills makes a reasonable argument for ratepayer subsidized load building and the potential positive impact on fixed cost recovery." (Marke Rebuttal, Page 12, Lines 1-2).

Q. Despite his acceptance of your stated rationale for the Charge Ahead programs in terms of the positive contribution they make to recovery of fixed costs, Dr. Marke questions the appropriateness of the programs when the Company also has active and proposed electric energy efficiency programs under MEEIA. What is your response?

A. I also responded to this issue regarding the juxtaposition of these two programs in the Company's MEEIA case and I referenced that response briefly at the outset of this testimony in my risk discussion. I will recap more of that MEEIA testimony for consideration in this case here to help describe the compelling way that MEEIA and Charge Ahead are actually very complementary programs that are designed to work in harmony with each other to achieve related goals.

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

A. The most critical point to understand is that both MEEIA 2019-21 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." A key thing to recall is that the electrification of end uses that are incentivized under Charge Ahead are expected 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 4 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 4 – 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. Dr. Marke observes that the Company recovers lost revenues under MEEIA and will "find" revenues under Charge Ahead. Does the Company's program design fairly consider these "found" revenues?

A. Absolutely, and I already addressed this point in response to Ms. Lange above. I will just briefly reiterate that the Company was very cognizant of the "found" revenues associated with this program. For that reason, the Company transparently and deliberately crafted a cost recovery proposal that recognizes the found revenues that benefit the Company between rate cases and provides a commensurate and offsetting benefit to customers. Again, that benefit is the Company's proposal to not recover from customers the real financing costs that it will incur while deferring program costs for a period of years, by excluding the unamortized balance of those costs from rate base in a future rate case.

Q. In his discussion of MEEIA and Charge Ahead, Dr. Marke also questions the value of the program for reducing emissions, suggesting that "policy

ought to seek out the cheapest reductions first, such a [sic] price-based tools." (Marke Rebuttal, Page 12, Lines 19-20). What is your response?

A. Getting into the merits of other mechanisms to reduce emissions is beyond the scope of what this case really needs to consider. While the emissions reductions Mr. Justis and Mr. Pickles testify to are real (and substantial immediately in the case of NOx emissions, and will grow meaningfully over time with the introduction of additional renewables in the case of CO_2), they are also an ancillary benefit of the program that accompany the primary economic benefits that I have testified to at length. While Dr. Marke suggests that policy should seek the cheapest reductions first, I cannot imagine that such a policy would possibly ever be in conflict with a program that achieves emissions reductions at the same time as generating net economic benefits.

Q. Please turn to discuss Dr. Marke's specific recommendations regarding the programs. What does Dr. Marke recommend regarding the Charge Ahead – Business Solutions program?

A. He recommends that the Commission reject it. In addition to the concerns Dr. Marke expressed related to the juxtaposition of MEEIA and Charge Ahead, his recommendation is also predicated on issues he has with the program design and the need for the program in general due to the present level of market penetration of some of the technologies proposed for incentives. Mr. Pickles will respond in turn to each of the specific issues raised by Dr. Marke about the specifics of the program. Mr. Pickles will describe that several of the issues Dr. Marke is concerned with amount to a concern that the program will have high levels of free-ridership, where customers participate and receive

incentives in order to take actions that they would have taken otherwise, even without the program. Mr. Pickles describes in detail why that concern is unfounded.

Q. Do you have any other observations about the free-ridership issue beyond the specific measure by measure responses that Mr. Pickles provides?

A. Yes. I will emphasize once again the benefit of the innovative design of program cost recovery proposed by the Company. It should be clear that, not only does the Company receive *no benefit whatsoever* for paying incentives to customers without inducing truly incremental load additions that would not have otherwise occurred, but the Company would actually *lose money* in these circumstances. Not to belabor the point, but the Company is planning on financing all of the program costs for a period of at least seven years. That financing will come at a cost to the Company. And yet the Company will not recover a dime of that financing cost without causing new load to come onto the system that will ultimately benefit all other customers. Creating a program for the sake of a program and paying ineffective incentives would be detrimental to the Company's financial interests. As a consequence, the Company worked closely with ICF to understand the value proposition for customers that arises from the Business Solutions program and we believe that the case for this program is compelling. By structuring the program as we have, the Company has in effect "put its money where its mouth is" and tied its ability to recover the costs of the program to the successful creation of benefits for customers.

Q. What is OPC's position regarding the Charge Ahead – Electric Vehicles program?

A. OPC, as I mentioned earlier in my discussion of the risks of Charge Ahead, is very focused on the risk of the proposal without giving due consideration, in my opinion,

to the substantial benefits associated with the proposal and the nature in which the Company has already proposed to have its own financial stake in creating meaningful benefits for customers. Ultimately OPC does not oppose the program per se, but asks the Commission to impose a significant guarantee mechanism on the Company as a condition of approval.

Q. What is the basis of OPC's proposal?

A. OPC essentially calculates a sharing grid that specifies different amounts of cost recovery the Company could achieve based on the number of EVs in its territory after a period of up to ten years. I discussed at a high level in the earlier section of my testimony regarding risk why this proposal is not good policy for the Commission to follow in an era of evolving technologies and rising expectations of utilities. There are additional reasons that I do not believe the specific form of this risk sharing mechanism is appropriate for the Commission to impose.

Q. What are those reasons?

A. Reasons that the OPC's risk sharing is inappropriate include:

- It originally called for no cost recovery *at all* for a period of ten years, after which an assessment would be made whether and to what extent the Company would be reimbursed for the costs. While OPC's supplemental rebuttal testimony created some provisions where cost recovery *might* occur sooner, there is still a delay and potentially still a ten year delay. My expectation is that accounting rules would require the Company to record the costs at the time incurred as a loss, and then, if the targets were achieved, would book some additional earnings in 2028 (or some interim year where

provisions in OPC's supplemental proposal kicked in). No rational utility is going to implement a program that is certain to reduce its earnings for a significant period of time up to 10 years simply because of the possibility of a one-time earnings bump years from now.

- There was no mention of recovery of the financing costs over this up to ten year period provided in OPC's rebuttal discussion. Their supplemental testimony contemplated short-term interest credits, but with a delay in recovery for up to 10 years, short-term interest is not a suitable carrying cost.
- It uses the Company's base case forecast of EVs in the service territory as a baseline that must be exceeded before the Company would get a single dollar of cost recovery. It is important to remember that the Company presented three forecast scenarios related to EV adoption, which reflected a substantial range of possible outcomes, which will be influenced by many factors besides just this program. The risks associated with all of those other factors would be implicitly borne almost entirely by the Company, while customers would enjoy the potential upside associated with higher EV penetrations.
- There is another reason that using the base forecast as a baseline below which no cost recovery occurs is unreasonable. I have established earlier in this testimony that the base forecast of EV's is *much more* than sufficient to fully pay for the Charge Ahead program. The implication is that even some number of vehicles less than that base forecast – perhaps even substantially

less - would still economically justify the EV charging investment associated with this program. As such, to afford zero dollars of cost recovery if that base level is not achieved is entirely unreasonable.

Q. Dr. Marke stated that this proposal is necessary, in part, because "no person in a transaction should have certainty about the outcome while the other one has uncertainty." (Marke Rebuttal, Page 20, Lines 21-23). Does Ameren Missouri have the certainty that Dr. Marke portrays given its actual proposal?

A. No. I would once again reference the fact that the Company only succeeds in recovering the first dollar of financing costs associated with the program if it succeeds in growing load that will benefit all customers for the long term. The Company's proposal, which provides a means of aligning its interest with its customers' interest in generating the maximum benefits from the program possible, is far better thought out than OPC's proposal. First, the Company would recover the financing costs incurred due to the deferral of program costs commensurate with the actual new load that was added, not based on an "all-or-nothing" line in the sand established at some pre-determined number of vehicles below which there was zero recovery. Second, the Company's proposal succeeds in aligning the financial interest of the Company and its customers without making the "return of" its investment in prudently incurred program costs subject to a different standard than other utility investments (although "return on" is, notably, still put at some risk). OPC's guarantee proposal is not only unreasonable, but it is unnecessary to achieve the type of alignment OPC is seeking between Company and customer outcomes under the program, when the Company already has an estimated seven plus million dollars (recall Table 2

above in response to Ms. Lange) of return dependent on program success that create benefits that ultimately accrue to customers.

Q. Are there any other issues that Dr. Marke raises that you wish to address?

A. Yes. Dr. Marke's only real comment concerning the economic impact of the program on customers is a statement where he claims that the estimates that the Company modeled are "highly dependent on rate-case timing and other confounding variables." (Marke Rebuttal, Page 12, Line 4). I would simply point out that I discussed the detailed modeling the Company performed to address this point about the impacts of rate case timing at length in response to Ms. Lange's and Mr. Oligschlaeger's testimony and the same conclusions apply equally here. Since Dr. Marke does not identify what other "confounding variables" he has issues with, I cannot directly address those. But my discussion in response to Ms. Lange at some point addressed almost every variable of significance to this analysis. To that end, I expect that I have addressed any such variable assumptions that may have been implicated by Dr. Marke's statement.

VIII. SUMMARY AND CONCLUSIONS

Q. Please summarize your testimony.

A. To get right to the point, I will simply say that the Company has done its homework on this proposal and the potential benefits of these programs are extremely compelling. There is enough economic value for all customers that even under a wide range of potential outcomes, the rate impacts of Charge Ahead should be favorable for everyone. Charge Ahead is really a win-win-win-win, when you consider impacts on participants, non-participating customers, the Company, and the environment. It is also a notable and

meaningful step forward for clean energy policy in the state of Missouri that will enable a transformation of the transportation sector that will reduce vehicle emissions at the same time as the resulting EVs (and other electrified technologies) create the flexible demand that can help integrate renewables, fostering a cleaner electric generation mix. The icing on the cake is the broad array of new consumer choices that will be enabled by addressing the EV charging barrier, allowing Missourians to engage fully with the emerging EV market that is clearly becoming the focus of the automotive sector's own innovation efforts. I recommend that the Commission approve the Charge Ahead program as filed.

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 the Application of Union Electric Company d/b/a Ameren Missouri for Approval of Efficient Electrification Program.	))))	File No. ET-2018-0132

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 72 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 November, 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