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 a Tariff Setting a Rate for Electric Vehicle Charging Stations.	))))	Case No. ET-2016-0246

APPLICATION FOR APPROVAL OF TARIFF AUTHORIZING A PILOT PROGRAM FOR ELECTRIC VEHICLE CHARGING STATIONS

Under authority of and in accordance with Section 393.140.11, RSMo, and 4 CSR 240-2.060, Union Electric Company d/b/a Ameren Missouri ("Ameren Missouri" or "Company") seeks an order approving a tariff authorizing a pilot program to install and operate electric vehicle charging stations at specified locations within the Company's service area along the Interstate 70 ("I-70") corridor between St. Louis and Boonville. In support of its application, Ameren Missouri states:

1. Ameren Missouri, a Missouri corporation, provides electric and gas utility services to customers in its Missouri service areas. The Company is an "electrical corporation," a "gas corporation," and a "public utility," as each of those terms is defined in Section 386.020, RSMo, and therefore is subject to the regulatory jurisdiction and supervision of the Missouri Public Service Commission ("Commission"), as provided by law. Ameren Missouri's principal office is at 1901 Chouteau Avenue, St. Louis, Missouri 63103.

2. Correspondence, communications, orders, and other documents and notices related to this application should be sent to:

Wendy K. Tatro Director & Assistant General Counsel Union Electric Company d/b/a Ameren Missouri 1901 Chouteau Avenue P.O. Box 149 (MC 1310)	L. Russell Mitten Brydon, Swearengen & England, P.C. 312 East Capitol Avenue P.O. Box 456 Jefferson City, MO 65102 (573) 635-7166

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3. Ameren Missouri previously filed with the Commission: (i) a certified copy of the Company's Articles of Incorporation (Case No. EA-87-105); and (ii) a copy of its fictitious name registrations, as filed with the Missouri Secretary of State's Office (Case Nos. GO-98-486 and EN-2011-0069). A copy of the Company's Certificate of Corporate Good Standing is attached hereto as Exhibit 1. Those documents are incorporated by reference and made a part of this application for all purposes, as authorized by 4 CSR 240-2.060(1)(G).

4. Ameren Missouri has no overdue Commission Annual Reports or assessment fees, and has no pending or final unsatisfied judgments or decisions against it from any state or federal agency or court that involve customer service or rates and that have occurred within the three years immediately preceding the filing of this application.

DESCRIPTION OF THE PROPOSED PILOT PROGRAM

5. This application seeks approval of a tariff that would authorize Ameren Missouri to implement a pilot program to install and operate electric vehicle charging stations at five sites within the Company's certificated service area along the I-70 corridor between the City of St. Louis and the City of Boonville, respectively the eastern-most and western-most reaches of Ameren Missouri's service area along that corridor. A sixth site would be located in Jefferson City. The reasons that the Company is proposing the pilot program, the details of the program, and the benefits to be derived are discussed in the prepared direct testimony of Mark Nealon, Ameren Missouri's Director of Engineering Design and Project Management, which accompanies this application as Exhibit 2.

6. Ameren Missouri chose the I-70 corridor for the pilot program for two primary reasons. First, it is the most heavily-trafficked interstate in Missouri, with annual average daily traffic volume exceeding 100,000 vehicles in St. Louis City and County and in a range of 30,000 to 50,000 vehicles west of St. Charles County. Second, the Missouri Department of Transportation ("MODOT") announced in June 2015 that it had selected I-70 for the "Road to Tomorrow" initiative. Ameren Missouri's proposal is supportive of MODOT's initiative.

7. Each of the proposed charging sites, or "charging islands," would be available for use by the general public to charge electric vehicles used for both long-distance driving and driving within communities situated along the I-70 corridor. The charging islands at each site would feature combinations of DC fast-charging ("DCFC") and standard Level 2 AC charging stations, which would allow access to every type of industry-standard electric vehicle plug. To mirror a gasoline-fueling transaction, mobile customers would pay Commission-approved rates for vehicle charging services at the charging islands themselves. For purposes of the pilot program, Ameren Missouri proposes to assess a flat fee per fixed "plug time" interval of fifteen minutes, regardless of the amount of energy actually used for the re-charge. This will encourage customers to vacate a charging station as quickly as possible, thereby making the station available to more customers. Customers would be able to pay for charging services by credit card, magnetic card-swipe technology, radio frequency identification technology, or through billing to an account established with the charging station vendor.

8. The proposed pilot project is designed to accomplish two objectives. First, it will remove an impediment to the development of a market for electric vehicles in Missouri. As the driving range of electric vehicles increases, the lack of a convenient means to charge those vehicles during longer-distance trips – the situation that currently exists in Missouri – represents

an impediment to the development of the electric vehicle market. It also discourages non-Missouri residents from using electric vehicles during trips to or across the state. Second, the pilot project will enable Ameren Missouri to gather data that should benefit not only the Company but other Missouri electric utilities and the Commission as they address the infrastructure needs of electric vehicles that both traverse and operate within this state. Electric vehicle technology is evolving at a rapid pace, which will soon translate into lower vehicle prices ($35,000 before incentives) and increased battery ranges (approaching 200 miles per full charge). Ameren Missouri believes these factors will combine to significantly increase the numbers of such vehicles in the future, which will require development of a public charging network similar to the network of petroleum stations currently available to serve internal combustion vehicles.

9. Although the number of vehicle charging stations in Missouri, both within and outside Ameren Missouri's service area, has increased significantly, most of these facilities are private and therefore are not available for use by the general public. Additionally, no network has developed to address the charging needs of vehicles operating far from private facilities, such as vehicles driving long distances on public thoroughfares like I-70. Ameren Missouri's pilot program addresses the need for a public network of easily accessible charging stations for vehicles traversing the eastern half of Missouri's I-70 corridor. Specific things Ameren Missouri hopes to learn from its program include: (i) the ease with which charging islands can be located; (ii) the availability, performance, and reliability of charging station hardware; (iii) the smoothness of various payment options; (iv) the quality of technical support available to charging station customers; (v) customer acceptance of charging rates and structures; and (vi) local attractions and shopping options available for occupying vehicle operators and their passengers during re-charging.

REQUEST FOR APPROVAL OF PILOT PROJECT TARIFF

10. Ameren Missouri's proposed pilot program would last three years, during which the Company would install and operate electric vehicle charging stations at five locations along the I-70 corridor and at a sixth location in Jefferson City. Each charging island location would offer both DCFC and standard Level 2 AC charging, and would accommodate all industry-standard vehicle plugs, thereby making charging services available to any person wishing to re-charge an electric vehicle. Customers who use the service would be assessed a flat fee per fixed plug time interval of fifteen minutes, regardless of the amount of energy actually used for the re-charge, and a range of options would be available to pay for the charging services. Ameren Missouri plans to work with local business leaders in each community where a charging island would be installed to determine optimal locations, with an eye toward providing vehicle operators and their passengers easy access to both the charging island and to shopping or other local attractions near the charging station.

11. Ameren Missouri estimates the cost of acquiring and installing a charging island, including all related distribution lines and service facilities, to be approximately $95,000, which would bring the total cost of all six re-charging facilities to approximately $570,000. A federal tax credit of thirty percent – up to a maximum of $30,000 – is available for each charging island installed by December 31, 2016, and the Company plans to take advantage of that credit to reduce the cost of the pilot project. A state tax credit of twenty percent – up to a maximum of $20,000 – also may be available if those funds are not already otherwise committed. Ameren Missouri currently estimates annual operating costs at $6,900 per charging station.

12. The proposed rate for each fifteen minute plug time interval would be $2.50 for a DCFC charging outlet and $0.30 for a Level 2 standard outlet. Based on assumed usage of the

charging stations over the three-year pilot program period, Ameren Missouri does not believe this rate will cover all costs related to the program. No costs associated with the pilot project were included in the proposed revenue requirement in the Company's pending general rate case, File No. ER-2016-0179, although Ameren Missouri anticipates a small amount of investment related to the project may be added to rate base through the true-up process. Therefore, the Company's customers will provide little, if any, subsidy to the project through rates they pay for electric service. Instead, throughout the period rates set in the pending case remain in effect, the project will be subsidized by Ameren Missouri's shareholders through reduced earnings.

13. Ameren Missouri believes the pilot program would produce numerous benefits to the Company, the Commission, other Missouri utilities, and other parties interested in promoting and facilitating the use of electric vehicles. These include: reducing greenhouse gas emissions through increased deployment of electric vehicles; reducing Missouri's dependence on fossil fuels to further the carbon emissions reductions objectives of the federal Clean Power Plan and Missouri's own Renewable Energy Standard, and; supporting the objective of greater energy security for the future. Adding and promoting the use of electric vehicles also will allow Ameren Missouri to achieve more efficient use of the electric grid. In addition, the pilot program would stimulate and promote economic growth in areas where charging islands would be located.

14. The proposed tariff implementing the pilot program is being filed separately from this application, but a copy of that tariff accompanies this application as Exhibit 3. The tariff bears an effective date of October 15, 2016, which reflects the need for an order authorizing the program by that date to allow the Company to take advantage of previously described federal

and state tax incentives.[1] If approval is delayed and access to those incentives is lost, Ameren Missouri still wants to move forward with the pilot program, although capital-related program costs would increase due to loss of the incentives.

WHEREFORE, for the reasons stated in this application, Ameren Missouri requests the Commission issue an order authorizing the electric vehicle charging station pilot program described in this application, approve the separately-filed tariff, and do so by October 15, 2016, so the Company can take full advantage of federal and state tax incentives to reduce overall program costs.

Respectfully submitted,

By: /s/ L. Russell Mitten_____

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ATTORNEYS FOR UNION ELECTRIC COMPANY d/b/a AMEREN MISSOURI

[1] If the Commission issues an order approving the pilot project by October 15, 2016, Ameren Missouri proposes to delay the effective date of the tariff until December 31, 2016, to enable the Company to install at least one charging island before year's end.

VERIFICATION

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

WARREN WOOD, being duly sworn on oath, deposes and says that he is the Vice President, External Affairs and Communications of Union Electric Company d/b/a Ameren Missouri, that he has read the foregoing Application, knows the contents thereof, and that the information contained in that Application is true and correct to the best of his knowledge and belief, and that he has proper authority to verify the Application.

UNION ELECTRIC CO. ~~d/b/a~~ AMEREN MISSOURI

BY: _____
WARREN WOOD

Subscribed and sworn to before me, the undersigned Notary Public in and for the county and state aforesaid, on the 15th **day of** August **, 2016.**

_____
Notary Public

My Commission expires:

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

STATE OF MISSOURI

Jason Kander
Secretary of State

CORPORATION DIVISION
CERTIFICATE OF GOOD STANDING

I, JASON KANDER, Secretary of State of the State of Missouri, do hereby certify that the records in my office and in my care and custody reveal that

UNION ELECTRIC COMPANY
00040441

was created under the laws of this State on the 21st day of November, 1922, and is in good standing, having fully complied with all requirements of this office.

IN TESTIMONY WHEREOF, I hereunto set my hand and cause to be affixed the GREAT SEAL of the State of Missouri. Done at the City of Jefferson, this 2nd day of August, 2016.

JASON KANDER
Secretary of State

Certification Number: CERT-08022016-0042

EXHIBIT 1

Exhibit No.:
Issues: EV Charging Pilot Project
Witness: Mark J. Nealon
Type of Exhibit: Direct Testimony
Sponsoring Party: Union Electric Company
File No.: ET-2016-0246
Date Testimony Prepared: August 15, 2016

MISSOURI PUBLIC SERVICE COMMISSION

FILE NO. ET-2016-0246

DIRECT TESTIMONY

OF

MARK J. NEALON

ON

BEHALF OF

UNION ELECTRIC COMPANY
d/b/a Ameren Missouri

St. Louis, Missouri
August 15, 2016

DIRECT TESTIMONY

OF

MARK J. NEALON

FILE NO. ET-2016-0246

Q. Please state your name and business address.

A. My name is Mark J. Nealon and my business address is 1901 Chouteau Avenue, St. Louis, Missouri 63103.

Q. By whom are you employed and what is your position?

A. I am employed by Union Electric Company d/b/a Ameren Missouri ("Ameren Missouri" or "Company") as Director, Engineering Design & Project Management.

Q. Please describe your educational background and employment experience.

A. My educational background includes a Bachelor of Science Degree in Electrical Engineering from the Missouri University of Science & Technology in Rolla (1981), a Master of Science Degree in Electrical Engineering from the University of Illinois in Urbana (1982), and a Master's Degree in Business Administration from the University of Missouri in St. Louis (1990).

I have been an employee of Union Electric, AmerenUE, and Ameren Missouri for over 33 years in a variety of engineering, customer-facing, and supervisory roles, all within the arena of electric distribution in the Missouri service territory. Specific departments I have been a part of include System Meter, Distribution Service Test, various overhead and underground customer divisions, Reliability Improvement (running

EXHIBIT 2

the Power On – Undergrounding Program), Smart Grid Strategy & Implementation, and Engineering Design & Project Management.

Q. Please describe your qualifications.

A. I am a Registered Professional Engineer in the states of Missouri and Illinois. I am a senior member of the Institute of Electrical & Electronics Engineers and an active member of the National Society of Professional Engineers and the Electrical Board of Missouri and Illinois. I was also recently inducted into the Academy of Electrical Engineering at the Missouri University of Science & Technology.

In 2009, I was named the Manager of Smart Grid Strategy & Implementation at Ameren Missouri. In this role I was tasked to develop, in concert with Ameren Illinois, a corporate strategy around the integration of control, automation and communications technologies into the electric transmission and distribution infrastructure systems in our service territory. The technologies emerging at this time included those associated with the electric transportation industry, which was in the midst of a revival from its earlier popularity in the 1990s.

Ameren Missouri took this opportunity to immerse itself in electric vehicle ("EV") and vehicle charging technologies. As a result, I was directly involved in the acquisition of several EV models, the deployment of charging stations at our headquarters in St. Louis and delivering presentations in several public forums, including the various Smart Grid workshops hosted by the Missouri Public Service Commission ("Commission") Staff ("Staff") in Jefferson City, Missouri. Our activity at the time was focused on self-education of electric transportation-related capabilities and communicating Ameren Missouri's point of view on the technology in general. With this

expertise now firmly rooted in our corporation, Ameren Missouri is ready to get involved on a more aggressive level in the promotion and support of electric transportation and associated charging technologies.

Q. What are your responsibilities in your current position?

A. As Director of Engineering Design & Project Management, I am responsible for leading capital project design and project management activities associated with all bulk and distribution substations in the Missouri service territory, and, in particular, electric facilities therein operating at voltages under 100,000 volts. These activities encompass several design disciplines, including electric and civil engineering, design drafting, and system protection. I am also responsible for supporting project management activities associated with Ameren Missouri's Energy Delivery electric and gas capital projects.

Additionally, I lead a pilot project team called EV Promotion & Support that was launched in early 2016. This team was charged with building on Ameren Missouri's previous work in the EV space and exploring the various means by which customers and businesses are motivated to further consider electric transportation options. Current areas of focus for this team include workplace EV charging, fleet electrification options, long-distance public charging and avenues for raising stakeholder awareness of electric transportation issues and technology. My work on the EV Promotion & Support team to date has led directly to the formulation of this testimony.

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

A. This direct testimony supports a tariff filing that establishes our proposed pilot program for fueling electric vehicles at Ameren Missouri-affiliated charging stations

within its service territory. This testimony is aimed at establishing Ameren Missouri's point of view regarding electric transportation, communicating our philosophy behind and justification for a more direct involvement in the ownership, deployment and operation of electric vehicle charging stations and the billing associated with the service provided.

Q. What is the nature of Ameren Missouri's proposal that would necessitate a tariff rate for electric vehicle charging?

A. As part of the EV Promotion & Support effort I lead, Ameren Missouri proposes to deploy an electric vehicle charging station pilot project aimed at investigating the merits of providing an EV charging service intended for use by both the long-distance driving public and the communities that are situated along long-distance driving corridors.

This will involve the identification of six charging station site locations, or "charging islands," each of which will feature both direct current fast-charging ("DCFC") and standard Level 2 alternating current ("AC") charging stations for public use. These charging islands will be located in selected communities along the I-70 interstate corridor between Boonville and St. Louis City – respectively the western-most and eastern-most reaches of the Ameren Missouri service territory along this route – plus an additional charging island in Jefferson City. Ameren Missouri chose the I-70 corridor for this charging station deployment for three reasons: (1) it is the most heavily trafficked interstate in Missouri (with 2013 Annual Average Daily Traffic volume exceeding 100,000 vehicles in St. Louis City and County, and in the range of 30,000 to 50,000 vehicles west of St. Charles County); (2) it connects the two largest metropolitan areas in Missouri that together account for over 80% of the EVs registered and operating in the

state; and (3) it is the interstate corridor selected by the Missouri Department of Transportation ("MODOT") for its "Road to Tomorrow" initiative, launched in June 2015. Ameren Missouri's proposal for corridor charging along I-70 is complementary to the Road to Tomorrow initiative, and there has been on-going communication with MODOT regarding this proposed pilot project.

Ameren Missouri designed the distance between adjacent charging islands to be in the range of 20 to 45 miles and is intentionally planning their locations to serve both the local communities and the corridor's long-distance driving public. In the spirit of providing a truly public service that accommodates all currently available EV models, each of Ameren Missouri's six charging islands will feature DCFC and standard Level 2 AC charging stations that provide access to all industry-standard plugs. Ameren Missouri proposes "pay at the charger" transactions in order to mirror the kind of liquid fueling experience with which consumers are familiar. These "on-the-spot" transactions can take the form of a credit card payment using a toll-free telephone number, magnetic card swipe technology, radio frequency identification, or billing to an account the EV Customer[1] may already have with the charging station network vendor.

For this pilot, Ameren Missouri proposes the electric fueling charges take the form of a flat rate charged per 15-minute "plug time" interval, regardless of the amount

[1] I will be discussing several types of "customers" throughout this testimony. For the sake of consistency, I will use the following terms to reference each customer type:
"EV Customer" an EV owner, lessee, or charging station vendor account holder, who may or may not also be a Utility Customer;
"Non-Participating Customer" a customer to whom Ameren Missouri provides traditional electric service, who is not also an EV Customer;
"Participating Customer" a customer to whom Ameren Missouri provides traditional electric service, who is not also an EV Customer;
"Utility Customer" traditional electric service customer of Ameren Missouri who is either a Participating or Non-Participating Customer.

of energy dispensed or the length of time necessary to dispense it. Ameren Missouri currently does not have a tariff defining the rates to be paid for EV Customers utilizing charging stations, and we are not aware that the Commission has endorsed a time-based fee assessment concept that would address the potential energy re-sale concerns when third parties begin building and operating charging stations of their own. Regardless, for reasons I will discuss later in this testimony, Ameren Missouri believes it is appropriate for an electric utility to conduct a pilot project of this nature even though the service involved is not part of the traditional suite of offerings provided to Utility Customers.

Q. Why is Ameren Missouri choosing this particular approach to EV charging? That is, what are the specific needs Ameren Missouri is looking to address with this pilot project?

A. The evolution of EV technology offerings in the United States is progressing at a very rapid pace – the same pace, for all practical purposes, as the advances being made in battery technology. Ameren Missouri believes that the "breakthrough" EV – the model that begins removing the last of the vehicle barriers to widespread consumer adoption – will be the EV that offers at least a 300-mile range and costs less than $30,000 (before incentives). When this happens, American consumers will have their first viable alternative to gas-powered vehicles since the EV revival began back in 2011.

There is a high probability that the 300-mile, $30,000 "breakthrough" in EV technology will be realized in 2020 or before, as evidenced by the unveiling of the 200-mile, $35,000 (before incentives) Chevrolet Bolt and similar offerings from other auto manufacturers already planned for 2017. This will create new end-uses for EVs that

stand to significantly expand the market, including worry-free, long-distance driving, light commercial and industrial delivery/transport, and public transit.

While the prospect of all this would unlock huge benefits for Ameren's Utility Customers and the general public (as will be discussed in detail later in this testimony), a potentially lingering issue is that the driving public will expect charging infrastructure to be readily accessible in order to accommodate these new freedoms. Put another way, in the absence of any action being taken to deploy public charging means, along medium and long-distance driving routes in particular, the infrastructure barriers to consumer adoption of EV will remain despite the last of the vehicle barriers having been removed. The longer this kind of vehicle choice is constrained, the longer the associated societal benefits are forestalled. So, rather than wait for the full emergence, Ameren Missouri believes we should be on the front end of the EV breakthrough, with infrastructure in place not just to accommodate, but to foster, its growth.

In the end, as a means of enabling EV technology that offers a medium to long-distance driving alternative to the consumer public for the very first time starting next year, Ameren Missouri sees the deployment of a public EV charging service along regional driving corridors as serving a need that will ultimately allow Missouri households the benefit of having an electric vehicle be their household's only vehicle.

Q. You stated this is a "charging corridor pilot project." By conducting this pilot project, what is it that Ameren Missouri wants and expects to learn about the physical deployment of these new assets?

A. There are several deployment-related aspects of this pilot project that represent learning opportunities for Ameren Missouri, including developing a clear

understanding of the costs and schedules involved, and the most effective options for site locations and site host partnerships.

Unique to this pilot project is the fact that while in the end it deploys physical assets that provide electric service, the assets involved do so to support a specific end use – driving a car. This places Ameren Missouri in the position of not only providing the traditional line extension and associated transformation, but also providing, operating and maintaining the charging stations themselves and the electric panel that distributes energy to each of them. Ameren Missouri intends to determine the most efficient deployment model for accomplishing this from both cost and scheduling standpoints. This includes selecting the best charging station hardware and network vendor for this application and determining the partners best suited for the various stages of field installation and site commissioning.

Ameren Missouri also anticipates a need to acquire easements from local property owners in the identified communities for the traditional line infrastructure as well as the charging station panel and equipment. While the securing of easements is a standard part of daily business at Ameren Missouri, there are numerous learning opportunities associated with this particular application, including how to: (1) garner local support for the installation of such facilities; (2) interest-specific property owners in playing "host" to this new type of installation; and (3) best address the types of issues that will surface in the negotiation of property agreements with these parties. Becoming adept in all of these project management areas will only serve to minimize the time necessary to deploy additional charging islands in the future, if prudent, and hence reduce cost.

Today, the fastest charging station that is commercially available for public use charges an EV at a rate of 50 kilowatts ("kW"), the equivalent of recovering 75 to 100 miles of electric range in roughly 30 minutes. This is obviously not yet comparable to the current consumer experience of fueling with gasoline or diesel. This predicament invites two more opportunities for learning: (1) establishing which types of merchants or venues are the best for locating charging islands in that they offer a means by which EV Customers can occupy themselves for the "dwell times" involved (which can be an hour or more for a 200-mile vehicle battery); and (2) determining the ways in which Ameren Missouri can build upgrade capability into the charging island installations as a means of preparing now for charging speeds that are expected to approach 150 to 300 kW in the next several years.

Q. By conducting this pilot project, what is it that Ameren Missouri wants and expects to learn about the EV Customers involved as they use this service?

A. There are several EV Customer-related aspects of this pilot project that represent learning opportunities for Ameren Missouri, including, but not limited to, the nature and extent of charging behaviors, the degree to which they are satisfied with the charging service, and the impact this service offering ultimately has on the consumer adoption of EVs within the service territory.

In addition to the physical means by which EVs are fueled, charging station vendors bring to the table a software network application with which the charging stations can be remotely monitored, controlled and managed. Based on our knowledge of these network capabilities, Ameren Missouri will have access to data on charging

durations, "plug-in" durations, numbers of charging sessions, numbers of unique and repeat EV Customers, the energy dispensed, charging station traffic by time-of-day and day-of-the-week, revenues collected, and more. This data will be available not only by individual charging station (or "plug"), but by charging island, by the community served, and across the total network. Further analysis of this data can be used to evaluate the quality of the choices made for both charging island sites (e.g., with respect to merchant/venue types or their times of operation) and the communities served (e.g., with respect to their populations or distances off the interstate).

With regard to customer satisfaction, Ameren Missouri will ultimately be judged by the EV Customer base as a result of their personal experiences with finding these charging stations, using them to fuel their vehicles and completing their transactions. Ameren Missouri proposes to make available a truly public charging service that is not discriminating of any EV Customer, plug-in vehicle or charging network association (if any). Ameren Missouri's goal is to deliver an EV Customer experience that is as satisfying as possible with these unmanned charging facilities, in concert with our "Customer First Customer Now" commitment and mindset. As such, there will be much to learn regarding the elements that make for such an experience, including: (1) the ease with which the charging islands can be located; (2) the availability, performance and reliability of the charging station hardware; (3) the smoothness of the various payment methods; (4) the quality of the technical/phone support available; (5) the reasonableness of the pricing; and (6) the local attractions available for occupying the driver and passengers during the charging period. Between the data that will be available on equipment performance and the ability of various charging station registration websites to

log EV Customer comments and feedback, there will be significant, near real-time information with which Ameren Missouri can gauge the quality of the EV Customer's experience and make any necessary adjustments.

Lastly, Ameren Missouri feels that to the extent these charging corridors truly enable the long-distance capability that EV technology provides, these deployments should have a positive, discernable effect on consumer adoption. To date, plug-in EVs represent roughly 0.18% of new vehicle registrations in Missouri going back to 2011. Ameren Missouri currently receives aggregate quarterly vehicle registration data from the Electric Power Research Institute ("EPRI") that is presented nationally, by state and by service territory. EV registration data stratified by county is also available based on our recent discussions with IHS Automotive (formerly R. L. Polk & Company). Ameren Missouri proposes to use this data to investigate EV adoption trends in its service territory in the wake of the I-70 deployments, particularly comparing counties along the corridor to those more remote from it.

The language in the accompanying tariff refers to Ameren Missouri's proposal as a "three-year pilot project," a reference to the length of the study period being suggested subsequent to the charging island deployment. The aforementioned data sources offer a wealth of information that will allow Ameren Missouri the benefit of learning the described, and three years is the period of time we feel would be sufficient to confirm them and the other impacts of this public charging service. The tariff further describes reporting as being conducted annually, though Ameren Missouri is willing to consider other suggestions on reporting frequency.

Q. Why should Ameren Missouri pursue this "charging corridor pilot project" rather than simply wait for an entity in the free market to do so?

A. Within the Kansas City and St. Louis metropolitan areas, hundreds of EV charging stations exist for public use, and these numbers are steadily growing. Despite this, there are a couple of glaring infrastructure gaps that still persist today: (1) a lack of regional connectivity; and (2) a lack of fast-charging service equipment.

First, large communities are not "connected together" with charging infrastructure on a regional basis in Missouri. Given the driving ranges of EVs today, their owners might comfortably navigate Kansas City proper or, to a lesser extent, St. Louis Metro proper thanks to the EV charging facilities located within these cities. However, what most of these drivers can't conveniently do today is make the trip from Kansas City to St. Louis or vice versa, much less a trip even half that distance – to Columbia or Jefferson City or Lake of the Ozarks, for example – from either starting point.[2]

Second, while website sources indicate the existence of a few charging stations along regional routes, they are either: (1) Level 2 AC charging stations, which require several hours to fully recover an EV's range, or (2) Tesla charging stations, which feature a proprietary (as opposed to an industry standard) charging plug. The fastest commercially-available charging stations today featuring standard charging plugs are what the industry refers to as DC Fast Chargers. At 50 kW of output power, they can recover 75 to 100 miles of electric range in 30 minutes, but they currently do not exist in sufficient numbers to fully enable the long-distance driving capability of next year's

[2] The exceptions to this are Tesla EV owners; some Tesla models have in excess of 200-mile ranges today and are accommodated by a regional build-out of proprietary charging islands.

200-mile range EV models.

There is nothing to stop today's free market from addressing these two infrastructure gaps, provided of course there is a desire to do so in combination with the right business model. Notwithstanding, the free market has not stepped up to do this, either in Missouri or elsewhere in the Midwest, likely for a lack of those very criteria. In response to similar inactivity on both regional and national levels, some state jurisdictions have stepped in and authorized, to varying degrees, local regulated entities to get involved in the deployment of such infrastructure. This very issue was brought up recently in the form of Attachment B to the Commission Staff's *Agenda for Workshop and Request for Comments*, filed January 15, 2016, in File No. EW-2016-0123. In particular, Question 7 of this attachment asked "what other states [are] doing to fund the development and installation of EV charging stations" and whether or not "cost recovery [is] allowed through a utility's rates." (Please refer to Schedule MJN-1 for Ameren Missouri's response to this question).

Ameren Missouri considers it appropriate to engage as a regulated entity in order to address this infrastructure gap and believes that now is the time, given the current state of EV technology. Since the provision of electric service began, utilities have provided a single point of electric service to Utility Customers' premises – historically a fixed structure on a tract of real estate wherein inhabitants are sheltered from the environment, are heated and cooled, and can work, play, eat and/or sleep. Today, modern technology has introduced a new kind of premises – a "mobile premises" – occupied by a new kind of customer – a "mobile customer" – wherein they are sheltered from the environment, are heated and cooled, and can work, play, eat, and/or sleep, for the period of time they

are traversing the service territory. Like the traditional structural premises, this new "mobile" premises also requires a single point of electric service – the charging port – in order for it to serve its intended purpose.

The most recent Missouri Comprehensive State Energy Plan (October 2015) states that, due to the close inter-relation between EV charging stations and the electric grid, "electric utilities are uniquely positioned to help support electric vehicle infrastructure and charging station networks." Ameren Missouri agrees and is proposing this EV charging pilot project as a tangible and creative means of providing such support. We clearly see an opportunity like this – especially amidst the dormancy of free market activity to seize it – as lying comfortably within our domain, both as an electric service provider and as an owner/operator of delivery service assets.

While Ameren Missouri is not prepared to declare long-distance EV charging an "essential service," we are positing that it, like our area lighting offering, can be considered a "public service" to the extent that it enables the free flow of people and goods across our state. Public area lighting and public charging stations are both consumers of distribution service, and Ameren Missouri sees both as worthy of regulated offerings, despite neither being something that we alone have the skillset to provide.

Lastly, with the announcement earlier this year of the first medium-range mass-market electric vehicles becoming available in 2017, Ameren Missouri is struck by the realization that both the private sector and regulated utilities may be too late in adequately addressing the long-distance charging infrastructure gap. The consumers who start seriously considering the possibilities of electric long-distance travel with next year's EV models will likely expect the charging stations enabling this kind of travel to already

be in place – and unfortunately they will not be, at least not on a widespread basis. The transformation and the preparation for what is an inevitable future in electric transportation, both for Missourians in general and our Utility Customers specifically, must begin somewhere and be undertaken by someone, and Ameren Missouri is willing to assume that responsibility.

Q. What is the anticipated cost of the charging corridor pilot project?

A. The average cost to procure equipment, install, and commission each of the EV charging islands along I-70 and in Jefferson City is estimated at $95,000. This would result in a total infrastructure investment of $570,000 after completing all six charging islands along the proposed driving route by the end of 2017. The $95,000 per charging island is comprised of an average $15,000 Ameren Missouri line extension and transformation cost, an average $60,000 hardware cost for charging equipment and an outdoor electric panel, and an average $20,000 cost for civil construction, hardware installation and site commissioning. On-going expenses for all six islands are estimated at $40,000 annually for hardware operation and maintenance and for access to the vendor's managing charging station network. Lastly, education and marketing expenses are estimated at $10,000 annually for the first three years after deployment is completed.

There are federal and state tax credits associated with the deployment of EV charging infrastructure that could reduce Ameren Missouri's investment total and benefit Utility Customers – a federal tax credit of 30% (up to $30,000) through December 31, 2016, available per physical charging island location, and a Missouri state tax credit of 20% (up to $20,000) through December 31, 2017, available per annum pending state

funding decisions. It is also possible to sell these credits as a means of achieving the same benefits.

Q. What will the cost be "at the pump" for the consumer and how did you arrive at that pricing for the electric fueling transaction?

A. The rate tariff being filed with this testimony proposes a "plug time" charge to the EV Customer of $2.50 per quarter hour of use for the DCFC charging plugs and $0.30 per quarter hour of use for the Level 2 AC plugs. The difference between these two proposed rates is based on the significant difference in charging speeds provided by the two types of chargers. The payment processing fee is 2% of the transaction amount plus $0.25 (per vendor quotation), but this is embedded in the proposed rates and will not be assessed separately. The primary determinants of these price points were: (1) the results of a charging island traffic study conducted for the I-70 and Highway 54 corridors; (2) the net revenues from "corridor charging" over the 15-year operating lives of the charging equipment; and (3) the equivalent prices of a gallon of gasoline relative to the charging rates selected. Each of these determinants will be discussed presently in greater detail.

Q. What did Ameren Missouri's traffic study entail, and how did that help you determine the amount of use that the proposed charging islands would get?

A. The traffic study of the I-70 corridor from St. Louis to Boonville and the Highway 54 corridor from Kingdom City to Jefferson City was based on Annual Average Daily Traffic ("AADT") data for these routes provided by MODOT for the year 2013. (Please refer to Schedule MJN-2 for MODOT's map of this AADT data). MODOT defines the "daily traffic" for a particular point along a driving route as the total number

of vehicles – private and commercial – passing that point going in either direction every day. The AADT is the average of all these daily traffic volumes over the course of a year. The preliminary goal of utilizing this data was to get to how much of this daily traffic involves one-way trips of 40 miles or more in passenger vehicles, because if the vehicles making these one-way trips were EVs, they would have to charge at one of the corridor islands in order to get back.

Ameren Missouri first took the AADT volumes for all the appropriate segments of I-70 and Highway 54 and their associated exits, and subtracted 35% at MODOT's recommendation as a means of eliminating all commercial traffic across the board. Then a conservative assumption was made that 100% of all the on-ramp/off-ramp traffic was involved in one-way trips of less than 40 miles. All this traffic volume was then used to remove the maximum daily passenger vehicle traffic from the I-70 and Highway 54 backbones. Overall, this reduced the traffic numbers along these backbones another 50%. The remaining traffic volumes from these two successive operations were then multiplied by 0.00045, the fraction of Missouri's population of registered passenger vehicles (3,626,224 per the Missouri Department of Revenue) that were Ameren Missouri service territory EVs (1,686 per EPRI) as of year-end 2015.

The daily traffic volumes remaining at this stage were considered the number of Ameren Missouri EVs that could be involved in trips requiring a charge to "get back" – these EV traffic volumes averaged 6.5 vehicles between adjacent charging islands along I-70 and 2.5 vehicles between I-70 and Jefferson City along Highway 54. The last step of the analysis was to reduce these figures a final time based on the anticipated willingness of today's EV driver population to actually use the new corridor charging facilities.

As of year-end 2015, the EVs in Ameren Missouri's service territory were split 49%/51% between full battery electric vehicles ("BEV") like the Nissan LEAF and plug-in hybrid electric vehicles ("PHEV") like the Chevrolet Volt. Ameren Missouri assumed that 25% of current BEV owners would not venture onto I-70 at all due to their either: (1) feeling skittish about it; or (2) merely being content with their short distance commuting routines. We also assumed that 75% of current PHEV owners would not bother to charge along I-70 due to a combination of: (1) the much longer charging times involved with Level 2 AC chargers; and (2) they are already accustomed to covering long distances on gasoline power.

Subsequent to these final traffic reductions, and assuming the resulting vehicle averages represent EVs traveling both east and west as they head to a particular destination and then return (thus requiring a single charge), the "plug traffic" anticipated at the charging corridor islands immediately after they are built was determined to be 1.5 charging sessions daily using DCFC plugs (each 30 minutes in duration) and 0.5 charging sessions daily using Level 2 AC plugs (each 3 hours in duration).

Q. What kind of revenue test was performed in order to validate the charging rates being proposed in the accompanying rate tariff?

A. Ameren Missouri performed a detailed Utility Cost Test ("UCT") assuming 15-year operating lives for the equipment at the six charging islands. The 15-year Net Present Value ("NPV") of net corridor charging revenues – i.e., [corridor charging revenues] less the [revenue requirement for the charging island investment and annual costs], less the [transmission, distribution, energy and capacity costs associated with corridor charging], is negative at the $10.00 and $1.20 hourly "plug time" rates

being proposed for the two plug types. This 15-year NPV calculation is also negative at charging rates that are 50% higher – $15.00 and $1.80 per hour respectively for the two plug types. In fact, the 15-year NPV calculation does not begin to go positive until we approach hourly charging rates that are 100% higher – $20.00 and $2.40 respectively for the two plug types. This observation alone goes a long way in explaining the reasons why the free market has not stepped up to deploy charging infrastructure in long-distance corridor settings. The business case would be difficult for any entity requiring a quick payback period.

However, for Missouri's State Energy Plan to cite that "electric utilities are uniquely positioned to help support electric vehicle infrastructure and charging station networks" is extremely intuitive, and for one reason that ultimately made all the difference in the results of Ameren Missouri's UCT analysis: electric utilities have the benefit of both corridor charging and home charging revenues associated with Participating Customers. The UCT ratio associated with the $10.00 and $1.20 hourly charging rates being proposed is 1.42 (a number greater than 1.00 indicates a benefit to all Utility Customers). This is the result of estimated total revenues that will have been generated from both corridor and incremental residential charging activities in direct response to Ameren Missouri's deployment of long-distance charging facilities.

Q. How do Ameren Missouri's proposed corridor charging rates compare to gasoline prices?

A. A lot of discussion ensued – both internally at Ameren Missouri and externally with various stakeholders – as to what kind of pricing would be tolerated by the long distance EV Customer. Before the rate model and UCT were fully developed,

Ameren Missouri vacillated philosophically between maximizing these rates (thus holding the EV Customer as accountable as possible for the costs involved) and capping them at an equivalent price level per gallon (thus staving off any claims that fueling electrically could ever be more expensive than doing so with gasoline or diesel).

Based on the results of the UCT, Ameren Missouri settled on the $10.00 and $1.20 hourly rates – more specifically, $2.50 and $0.30 per quarter hour – on the basis of their equivalent prices of gasoline, calculated at $2.52 and $2.10 per gallon respectively. Ameren Missouri feels EV charging rates like these would make a big difference in driver acceptance relative to the $15.00 and $1.80 hourly rates that were also being seriously considered. The UCT analysis shows this price differential has a financially immaterial effect on Non-Participating Customers, which will be discussed later in this testimony.

Q. What is Ameren Missouri's estimate of revenues to be collected through this pilot project, and on what is this estimate based?

A. Based on Ameren Missouri's UCT analysis, the 15-year NPV of net corridor and residential charging revenues – i.e., [corridor charging revenues] plus [Ameren Missouri-impacted residential charging revenues], less the [revenue requirement for the charging island investment and annual costs], less the [transmission, distribution, energy, and capacity costs associated with corridor charging], less the [transmission, distribution, energy, and capacity costs associated with Ameren Missouri-impacted residential charging], is approximately $3.8 million. Annual net corridor and residential charging revenues are positive for the first time in Year 5 of the 15-year analysis. The primary determinants of these revenues were: (1) the anticipated 15-year EV adoption

rates in Ameren Missouri's service territory; (2) the anticipated impact of Ameren Missouri's charging corridor deployment on these adoption rates; and (3) the resulting "plug traffic" anticipated among corridor-charging and residential-charging EV Customers. Each of these determinants is discussed presently in greater detail.

Q. What is Ameren Missouri's view of future EV adoption in the state? What effect do you think a network of long-distance charging stations along the I-70 corridor would have on this level of adoption?

A. Since 2012, cumulative EV registrations in the United States, Missouri, and Ameren Missouri's service territory have grown on a largely linear scale. As of year-end 2015, there were 2,480 EVs registered in Missouri, 1,686 of which were registered inside Ameren Missouri's service territory, split evenly between BEVs and PHEVs. Registrations have grown in Ameren Missouri's territory at just about 400 EVs annually, so this is considered the UCT's "baseline" EV projection over the next 15 years.

Ameren Missouri does not view the forthcoming 2017 EV models with 200-mile ranges as being fully "enabled." While they will be capable of driving long distances for the first time, Ameren Missouri doesn't see them actually doing so until the means to charge them along the way (i.e., the means to "get back") is provided. Ameren Missouri proposes to provide this means within the confines of our service territory with this pilot project.

The question then becomes, "What does the adoption rate of 'fully enabled' vehicle technology look like?" We submit that Missourians have already shown us the answer, in the form of their adoption rate of hybrid electric vehicles ("HEV") like the Toyota Prius. When HEVs were introduced in 2000, they were already "fully enabled,"

operating to their fullest capability immediately upon hitting the road, since they operate on gasoline. Ameren Missouri has cumulative adoption rate data for HEVs in our service territory going back to 2000. We believe that the adoption rate of EVs subsequent to our building the I-70 charging corridor would look like the historical straight line EV adoption up until now, superimposed with the adoption rate of HEVs as it looked starting back in 2000. The UCT uses this adoption curve in its analysis, beginning with the 1,686 EVs in Ameren Missouri's service territory in 2016 and ultimately growing to 37,623 in 2031. Please refer to Schedule MJN-3 for a depiction of this forecasted EV adoption data. The red portion of the graph represents the continuation of "baseline" adoption at a rate of 400 EVs annually. The purple and green portions together represent the HEV adoption curve as it looked beginning in 2000. This is what Ameren Missouri believes "accelerated" EV adoption will look like beginning with the 2017 models, over and above "baseline" adoption. The sum of the red, green, and purple portions is Ameren Missouri's total forecasted EV adoption for its service territory over the next 15 years.

The next step in the process gets to what Ameren Missouri's contribution is to the 15-year EV adoption rate model above as a direct result of our building the I-70 charging corridor. This is an important consideration because while 100% of I-70 corridor charging revenues over the UCT's 15-year analysis period can be attributed to our provision of corridor charging stations, much of the residential charging revenues over this same period will not be. The residential charging revenues included in the UCT will depend on how many currently Non-Participating Customers purchase EVs (becoming Participating Customers) based on their awareness of both the EVs and the proposed long-distance charging infrastructure enabling them.

In the UCT analysis, Ameren Missouri conservatively lays claim to 25% of this accelerated adoption. We acknowledge that fully enabled EV long-distance driving requires, first and foremost, a car that can make the trip. It's the vehicle and its capabilities that will grab the potential EV Customer's attention first, and Ameren Missouri assumes in the majority of cases – 75% of the time – the vehicle alone will be enough to tip this potential consumer in favor of purchasing one. In the remaining 25% of cases however, Ameren Missouri feels that consumers will insist on actually being able to do that long-distance driving before they commit to purchasing – meaning they will also insist on being able to charge along those routes.

Therefore, the residential charging revenues that went into the UCT analysis are only those associated with 25% of the Participating Customers in the Ameren Missouri "accelerated" adoption curve (i.e., the green portion in Schedule MJN-3), beginning with 16 EVs in the service territory in 2017 and ultimately growing to 7,050 in 2031. These numbers represent the "incremental" number of EVs adopted due to the pilot project. A 10-year EV operating life was assumed, after which the vehicle is considered retired from being on the road.

Q. Did Ameren Missouri consider how EV "plug traffic" at home and on the I-70 charging corridor is going to change over the 15 years in the UTC analysis and what effects those changes will have on estimated revenues?

A. Yes. As the 15 years in the UCT horizon marches on, Ameren Missouri assumes that residential charging traffic increases in direct proportion to the number of EVs in the vehicle population. Daily charging habits will continue to prevail at home, and regardless of the charging speeds and vehicle ranges involved, the average daily

range recovered per EV will remain the same 40 miles for the vast majority of any given year. Again, throughout the 15-year horizon, the only residential charging revenues considered in the UCT are those Ameren Missouri claims to have directly influenced – the incremental amount associated with 25% of EVs in the "accelerated" adoption curve (i.e., the green portion of Schedule MJN-3).

Determining how corridor charging traffic along I-70 and Highway 54 changes over the 15-year analysis period is a bit more complex. As the driving ranges of EVs get to 200 miles next year and beyond 200 miles in the years following, these new models will not have to charge as often as today's 80 to 100-mile range BEVs. Conversely, the miles recovered per charging session will increase. On this basis, Ameren Missouri assumes the driving ranges of future EV models by themselves will have no effect on corridor charging revenues over time.

However, two other factors will have a substantial impact on corridor charging revenues: (1) an ever larger population of EVs on the road in general; combined with (2) far greater consumer propensities to take the newer models greater distances, since that is the reason they will have purchased them to begin with. The UCT model's forecast of EV adoption discussed herein has the 2016 EV population in Ameren Missouri's service territory growing more than nearly twenty fold over the next 15 years. This, coupled with the consumer propensity to drive ever greater distances, led Ameren Missouri to the conservative assumption that corridor plug time traffic – and hence corridor charging revenues – will increase by a factor of five over this same timeframe.

Q. Will there be a subsidy required across Non-Participating Customer classes in order to cover the costs of this pilot project?

A. Yes. Even absent the UCT results, Ameren Missouri does not expect revenues from the six charging islands to cover all costs of the pilot project. However, any subsidy provided by Non-Participating Customers will be very modest. This is true because the Company did not include any capital or operating costs associated with the project in its pending general rate case, File No. ER-2016-0179. That could change if one or more charging stations is installed and begins providing service before the end of the rate case true-up period, but capital costs associated with any such station(s) would increase rate base by no more than a couple of hundred thousand dollars. Therefore, except for any amounts described in the preceding sentence, while rates set in the pending rate case remain in effect, no Non-Participating Customer would pay any costs of the pilot project. Instead, Ameren Missouri's shareholders would bear those costs through reduced earnings.

As previously noted, Ameren Missouri used a UCT analysis period of 15 years, based on the anticipated operating lives of the charging island hardware. With "accelerated adoption" just getting underway in Year 1 subsequent to the charging corridor deployment, annual corridor and residential charging net revenues are expected to be negative for each of the first four years of the analysis period. According to the UCT model, the total non-NPV valuation of this subsidy accumulated over this period of time is approximately $475,000, requiring an average 11.3 cents annually from each residential Non-Participating Customer for those four years.[3]

[3] At the $15.00 and $1.80 rates that were being considered for DCFC and Level 2 AC plugs, this non-NPV subsidy valuation would have been approximately $390,000, saving each residential Non-Participating Customer 2.1 cents annually for those four years compared to the pricing Ameren Missouri is proposing.

With "accelerated adoption" continuing over time, annual corridor and residential charging net revenues are positive for the first time in Year 5 of the 15-year analysis, growing to $1.9 million in Year 15. In summary, there is a small cross-subsidy by Non-Participating Customers involved over this pilot project, but by virtue of the UCT ratio of 1.42 for the entire analysis period, Ameren Missouri's estimated revenues from EV charging will indeed exceed the marginal costs to deliver this electricity to the EV Customer, providing positive net revenues sufficient to exert a downward pressure on rates for all Utility Customers. The 15-year NPV of this downward pressure is quantified at $3.63 per residential Utility Customer.

Q. Who are the various beneficiaries associated with this charging corridor pilot project?

A. The advent of mass-market, production-volume EVs over the past few years began the transformation of the last remaining industry sector to undergo electrification – the transportation sector. In the end, Ameren Missouri's charging corridor pilot project is intended to stimulate and accelerate consumer adoption of EVs (particularly among our Non-Participating Customer base), enable the long-distance capability that the auto industry will provide consumers beginning with its 2017 EV models, and help better prepare Missouri for a future in electric transportation. There are a number of widely-recognized societal benefits associated with an increased consumer adoption of EVs, some affecting the general public, others shared by all Utility Customers, and others limited to EV Customers.

Q. What types of benefits to the general public does Ameren Missouri expect would result from undertaking this charging corridor pilot project?

A. An increase in adoption of EVs across the state benefits the general public through reduced greenhouse gas emissions and greater energy security.

Greenhouse Gas Emissions. An increase in consumer adoption of EVs in Missouri, to the extent that these vehicles supplant comparable combustion engine vehicles on our roadways, results in a cleaner environment for everyone in terms of greenhouse gas emissions. In an internal analysis conducted in 2011 associated with the release of a report entitled *Emerging Customer Technology – Ameren's Proposal in Support of Plug-In Electric Vehicles*, Ameren Missouri determined that mile for mile, based on its power generation fuel mix at the time, the carbon dioxide ("CO_2") emissions produced from charging an EV in its footprint is approximately 35% less than the CO_2 tailpipe emissions of a comparable gasoline-fueled vehicle. Ameren Missouri conducted this analysis having compared the 2011 Nissan LEAF to a "small" combustion engine vehicle built on a similar chassis that gets 40 miles per gallon of gasoline. Assuming an annual average 14,600 miles driven and the then-current CO_2 intensities of Ameren Missouri's generating fleet, charging the Nissan LEAF was calculated as being responsible for producing approximately 0.38 pounds of CO_2 per mile compared to the "small" vehicle's tailpipe emissions of approximately 0.59 pounds of CO_2 per mile (please refer to Schedule MJN-4 for a copy of this report; the analysis details are described in Appendix C). Environmentally-based conclusions similar to this one were also presented on May 25, 2016, at Staff's EV Charging Facilities Workshop by representatives from the Electric Power Research Institute, the Sierra Club and the Natural Resources Defense Council.

Also noteworthy regarding the environmental benefit of EVs is the fact that in Ameren Missouri's service territory - where dependence on fossil fuels is relatively high - EVs are rendered "greener" in lockstep with our own efforts to transition to cleaner energy. Since the aforementioned 2011 study, Ameren Missouri has added more renewable resources to its generation portfolio, including the utility-scale solar facility in O'Fallon, and this trend will continue. Additionally, Ameren Missouri has plans for significant mass-based reductions in its carbon emissions as the state pursues compliance with the Environmental Protection Agency's Clean Power Plan. Every subsequent action taken in Ameren Missouri's clean energy transition will reflect in kind on every road-worthy EV its generation fleet charges on a daily basis.

Greater Energy Security. Ameren Missouri's corporate vision is one in which we see ourselves "leading the way to a secure energy future." Indeed, the greater the adoption of EVs in our service territory and beyond, the greater the extent to which we help reduce our dependence on foreign supplies of petroleum. The driving that Ameren Missouri's EV Customers do with the help of domestically-produced electricity rather than fossil fuel reduces our reliance on these markets, thus promoting greater energy security.

Q. What types of Utility Customer benefits does Ameren Missouri expect would result from undertaking this charging corridor pilot project?

A. An increase in consumer adoption of EVs across the state benefits all of Ameren Missouri's Utility Customers in the form of more efficient grid utilization, state and regional economic gains, and an integration of EV charging with renewable energy and other grid services.

Efficient Grid Utilization. Ameren Missouri's electric grid, like most others across the nation, operates below maximum capacity for most of any given year. Aided by thoughtful load management, a considerable EV population could root itself in the service territory without the need for generation or line infrastructure upgrades, hence applying a consistent downward pressure on electric rates. This carries a necessary presumption that Ameren Missouri's grid infrastructure is, in its present form, ready to accommodate considerable growth at the hands of the electric transportation movement, without the burden of such investment.

Ameren Missouri's grid is prepared in terms of capacity. From a generation standpoint, per the Integrated Resource Plans filed in recent years, weather-normalized system peak loads over the five years from 2008 – 2013 decreased from 8,567 megawatts ("MW") to 7,633 MW in our service territory, representing an average annual decline of 2.3%. Weather-normalized energy over the same period decreased from 40,637,933 MW-hours to 39,076,549 MW-hours, an average annual decline of 0.8%. This was largely the result of meaningful industry advances in lighting and motor technology, effectively-executed energy efficiency programs and responsible load management.

From a grid standpoint, in the response to Data Request 442 (regarding St. Louis City and County) associated with File No. ER-2014-0258, Ameren Missouri reported that the temperature-corrected 2013 summer peak loadings among 660 medium-voltage distribution feeders serving this portion of the service territory were such that an average 34% of their capacities remained, even after allowing for what is deemed necessary to reserve portions of adjacent feeders in outage scenarios. Similarly treated 2013 summer peak loadings among 115 distribution substations serving the same area were such that an

average 24% of their capacities remained, even after allowing for the simulated loss of each station's largest unit in a contingency scenario. Therefore, at a time when electric infrastructure loading is in the midst of steady decline and transportation is among the only load sectors with the potential for growth in the foreseeable future, Ameren Missouri's distribution grid is poised today to accommodate EVs in the hundreds of thousands of units across its service territory.

Ameren Missouri's grid is also prepared in terms of reliability. The storm-normalized System Average Interruption Frequency Index ("SAIFI") – that is, the average number of "blue sky" extended outages (i.e., over five minutes) experienced by each Utility Customer annually – has been less than 1.0 for over five years running, with an Ameren Missouri record having been set in 2013 at 0.70. In 2015, SAIFI was 0.77, and based on reliability metrics year-to-date, SAIFI is forecasted at 0.75 in 2016. A number of factors have contributed to this level of performance, including: (1) the 2007 adoption of Rule 4 CSR 240-23.020 – Electrical Corporation Infrastructure Standards regarding the periodic inspection and repair of distribution grid assets; (2) the effective execution of this rule on an annual basis since then; and (3) a similar overhaul of vegetation management practices over the same time period.

A 2015 analysis of Ameren Missouri's system determined that even if EV sales were to steadily grow to 50% of all new vehicle sales in Missouri by 2030, the total increase in associated energy usage over that time period will still not have made up for what energy efficiency programs and related lighting and motor technology advances have removed from Ameren Missouri's base load in recent years. Ameren Missouri's distribution grid is reliable, capacity-rich, and more than ready for widespread consumer

adoption of EVs, requiring virtually no investment – in either generation or distribution plant – to comfortably accommodate hundreds of thousands of these vehicles today. This would have the benefit of spreading Ameren Missouri's fixed costs over more units, exerting a downward pressure on rates across all Utility Customer classes.

Economic Development. Macroeconomic studies indicate that money saved annually by EV owners on fuel costs and vehicle maintenance will ultimately be spent as disposable income in other sectors of the local economy. The combination of fuel and maintenance savings together can approach thousands of dollars annually per EV owner that would be re-directed into the communities served in Ameren Missouri's service territory, creating more local jobs and economic activity.

Renewables & Services Integration. Another widely touted benefit associated with EVs is the fact that they represent among the most flexible and controllable electric load segments on a utility grid. This is especially advantageous given how substantive the rates of charge can be in a residential setting. When aided by a home charging device, an EV can use energy at a rate of over 3 kW, which could roughly double an average household's demand on a summer afternoon. Some EV models charge at a rate of over 6 kW, nearly tripling an average residential household's summer demand.

This type of load coincidence is what carries the threat of unwanted infrastructure upgrades, especially given the vast majority of EV charging will continue to be conducted at home. The utilization of Time-of-Use ("TOU") rate structures to encourage EV charging at times during the day other than when the typical peak loading occurs, and/or that coincide with the operation of renewable energy sources, provides another

means of ensuring the most efficient use of the grid in its current form and staves off the need for additional investment.

It may appear counter-intuitive to discuss the residential flexibility of EV charging as part of testimony relating to EV charging in a long-distance setting, arguably the least flexible of all possible charging scenarios. However, according to the 2009 National Household Travel Survey, 95% of trips made by the driving public are trips of fewer than 30 miles, most of which do not make use of interstates. To the extent that EV adoption can be positively affected by enabling the long-distance end-use, the fact remains that the vast majority of the charging involved for those new vehicles – in fact, 80% to 90% of it – will still be done at home, and subject to the types of creative load management measures a well-designed TOU rate represents. Therefore, home charging will likely be an area of focus for load management programs Ameren Missouri considers.

Q. What types of benefits to EV Customers does Ameren Missouri expect could result from undertaking this charging corridor pilot project?

A. Aided by the enablement that long-distance charging offers, EV Customers who traverse the State of Missouri would come to enjoy the full breadth of vehicle utilization for the first time. Motivated by the prospect that a household could function with just an EV, everyone with the means to own a car could look forward to having one that promises far greater end-use efficiency and substantially-lower operating costs.

Full Vehicle Utilization. Again, an underlying premise of the charging corridor pilot project is to help enable the long-distance capability that the electric transportation

industry will avail to the consumer public with its 2017 EV models. For the past several years, EVs have categorically represented "niche purchases" for a relatively small number of consumers – typically those with technology and/or environmental leanings, or with enough household income to support owning an "extra" vehicle dedicated solely to daily commutes. To date, the EV adoption rate in Missouri has been 0.18% of new vehicle sales going back to 2011, compared to 0.53% nationally. All this will likely change very soon – the state of the technology today is such that the historical range and price barriers to widespread adoption of EVs will be removed starting in the next six months.

The most expensive (and most limiting) single component of an EV has been its propulsion battery. The current tracks of two battery technology measures – battery pack energy density and battery pack cost – are indicative of the rapid rate of progress being made to increase an EV's driving range while reducing its price. The USDOE's Energy Efficiency & Renewable Energy division indicates that since 2008, battery pack energy densities have increased from 50 to 300 watt-hours per liter of volume at the same time their costs have decreased from $1,000 to $80 per kilogram of mass. It is neither measure alone, but rather the combination of the two that already represents a complete iteration on the technology that was introduced back in 2011 – an iteration that is transforming a "niche purchase" into the mass market product that will be accessible to the consumer public for the first time next year.

The current iteration rates in battery energy densities and costs make it likely the 300-mile, $30,000 breakthrough EV will debut before 2020, at which time consumers will be presented with the first viable alternatives to modern day gasoline vehicles. Over

30 EV models are available today, with dozens more soon to follow, especially given that several manufacturers have announced their intent to offer a plug-in electric version for every model they offer. All this serves to perpetuate two other attractive trends for car buyers: (1) new EV prices that are driven downward into "volume sale" ranges as a by-product of increased adoption; and (2) EV re-sale prices that remain depressed amidst continued iterations in battery technology.[4]

Within a few short years, the only likely remaining barriers to full EV utilization and widespread adoption of this technology will be those associated with charging infrastructure. Regardless of how EV driving ranges increase over time, what will never change is the need to charge an EV over long distances – and it is this that Ameren Missouri is working to address directly with this corridor charging pilot project.

Superior Energy Efficiency. The savings associated with electric fueling represent a significant benefit to EV owners. These fuel savings are primarily the result of the higher energy efficiency levels of EVs. An EV today, propelled under the power of an electric motor, is roughly 60% efficient in translating the electrical energy stored in the propulsion battery to the rotary motion of the axle, and hence the motive power of the wheels. This level of efficiency is about three times that of a vehicle with an internal combustion engine and two times that of a hybrid vehicle. For example, a conventional vehicle with a fuel economy of 30 miles per gallon uses roughly 4.0 megajoules ("MJ") of purchased energy per mile. By contrast, an EV with a fuel economy of 2.9 miles per kW-hour (assuming a charging efficiency of 85%) uses 1.5 MJ of purchased energy per

[4] As evidence of this, a pre-owned, low-mileage Nissan LEAF can be purchased today for about $10,000 and leased for under $200 a month. Nancy E. Ryan and Luke Lavin, *Engaging Utilities and Regulators on Transportation Electrification*, Energy+Environmental Economics, 2015.

mile while in electric mode. All told, EV owners generally have to purchase 60% to 70% less energy per "electric mile" traveled than would be required for conventional gasoline vehicles. The conservation potentials for this kind of cross-fuel efficiency are easily as large as those being sought in the electricity sector today.

Lower Operating Costs. Compared to an internal combustion engine vehicle that gets 30 miles per gallon, "driving electric" at Ameren Missouri residential energy prices is equivalent to paying $1.00 per gallon or less, and electricity prices have proven to be far less volatile than those of liquid fuels over the years. At $2.50 per gallon of gasoline, and assuming the U.S. median 30-mile daily commute, this can save EV Customers over $350 in fueling costs annually compared with a hybrid, and over $800 annually compared with an average gas-powered vehicle.

Additionally, there are hundreds less moving parts to maintain in a full battery EV relative to those in a combustion engine vehicle. There are fewer fluids to manage, no spark plugs, no oil changes, no muffler, no fuel filters, and no transmission in the conventional sense, given that electric motors produce full, usable torque starting at zero RPMs. EV manufacturers are warrantying their propulsion batteries for up to 100,000 miles. On this basis, both EPRI and consumer information sources on EVs estimate a two-thirds annual maintenance savings relative to conventional gasoline vehicles.

Q Have you read Staff's report in File No. EW-2016-0123 and are you familiar with the recommendations made in that report?

A. Yes, I have read Staff's report and am familiar with the recommendations.

Q. Staff's report notes that Kansas City Power & Light/Greater Missouri Operations Company ("KCPL/GMO") has been able to get businesses that host

charging stations to pay some of the costs associated with EV charging. Has Ameren Missouri investigated this possibility?

A. We have not looked into the possibility of getting the site hosts of our proposed charging islands to pay a portion of the costs associated with installing and operating them, but we intend to explore that possibility once that level of engagement with property owners begins. However, we have not made that a requirement for our proposed pilot project, nor have we made this assumption in our UCT analysis. While the EV charging program underway at KCPL/GMO is complementary to the long-distance corridor charging project Ameren Missouri is proposing, there are significant differences between the two. Those differences may make it less likely that charging station hosts along the I-70 and Highway 54 corridors will be willing to bear some of the costs of the pilot. That said, as with the federal and state tax credits I mentioned earlier, Ameren Missouri will investigate and take advantage of any opportunity available to reduce the cost of the proposed pilot project.

Q. What about Staff's recommendation that any utility implementing an EV pilot project be required to annually report data derived from the project to the Commission and interested stakeholders?

A. Ameren Missouri supports Staff's recommendation, and our proposed pilot project tariff includes an annual data reporting element. While some items identified in Staff's recommendation in its report in File No. EW-2016-0123 are not applicable to Ameren Missouri's proposed pilot – underscoring the differences between our proposed pilot and the EV charging program underway at KCPL/GMO – sharing with the

Commission and interested stakeholders data derived from our pilot project is something we have intended to do from the outset.

Q. What final remarks would you like to make with regard to Ameren Missouri's undertaking of this charging corridor pilot project?

A. Given the prices of batteries – and the EVs they propel – are on a steady decline, and further aided by well-documented savings on fuel and maintenance costs, Ameren Missouri recognizes a growing awareness of and appeal for EV technology on the part of consumers. While it's unrealistic to ever expect that all road-worthy consumer vehicles will be electric – indeed, our most economically secure future is likely one featuring a balance among several fuel types – it is likely that someday 10%, 25%, or even 50% of these vehicles could be fueled electrically, given sufficient infrastructure to support their use. Whatever their market penetration, Ameren Missouri sees the environment, the regional economy, the reliance on petroleum markets, the energy efficiency play and our grid utilization all improving with every new EV that hits the road in our service territory, in our state and beyond.

The Participant Customers in Ameren Missouri’s service territory will be winning to the greatest extent as they reap the societal and Utility Customer benefits above, in addition to those associated with an ever-declining cost of ownership. This begs the biggest question of all, as Ameren Missouri considers this long-distance charging infrastructure deployment – the question that asks why all Missourians who have the means to own one car should not at least have the opportunity for that one car to be an EV, thus unlocking the full range of benefits for everyone. The opportunity for Missourians to even have that choice to make will not wholly present itself until the

associated charging infrastructure – particularly in the long-distance arena – helps to make that choice possible.

As the charging infrastructure gap continues to go unaddressed amidst a growing consumer consideration of electric transportation options, many Non-Participating Customers who are in the market for a new car will naturally gravitate toward pondering the various reasons behind their electric company's silence on this matter. The automobile industry is doing its part on the vehicle side of the consumer adoption issue. With this pilot project as a start, Ameren Missouri sees an opportunity – even a responsibility – to do our part on the infrastructure side.

Q. Does this conclude your direct 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 a Tariff Setting a Rate for Electric Vehicle Charging Stations.	))))	Case No. ET-2016-0246

AFFIDAVIT OF MARK NEALON

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

Mark Nealon, being first duly sworn on his oath, states:

1. My name is Mark Nealon. I work in the City of St. Louis, Missouri, and I am employed by Union Electric Company d/b/a Ameren Missouri as Director, Engineering Design & Project Management.

2. Attached hereto and made a part hereof for all purposes is my Direct Testimony on behalf of Union Electric Company d/b/a Ameren Missouri consisting of 38 pages, and Schedules MJN-1 thru MJN-4, 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.

Mark Nealon

Mark Nealon

Subscribed and sworn to before me this 15th day of August, 2016.

Julie Irby

Notary Public

My commission expires:

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

EXHIBIT 2

ELECTRIC VEHICLE CHARGING PILOT PROGRAM

PURPOSE

The purpose of the Electric Vehicle Charging Pilot Program (Program) is to offer charging service to owners or operators of electric vehicles within portions of the Company's Missouri service territory.

PROGRAM DESCRIPTION

Company will make charging facilities available at up to six (6) locations roughly adjacent to Interstate 70 and Highway 54 in Company's certificated service territory in order to establish a long-distance corridor for electric vehicles to operate. Customers will purchase charging service in time blocks to suit their needs.

AVAILABILITY

Charging service under this Program is available to any owner or operator of an electric vehicle that can be charged from a Level 2-AC (Standard) or Level 2-DC (Fast) charger. Customers will complete their payment transaction (via credit card payment, eligible RFID card, or promotional code) through a third party contracted by Company.

DEFINITIONS

Level 2-AC (Standard) Charger – A charging facility designed to provide charging at a rate of up to 7.4 kW.

Level 2-DC (Fast) Charger – A charging facility designed to provide charging at a rate of up to 50 kW.

Total Connection Time – The length of time between when a customer fully seats the charger plug into the charging port of the electric vehicle before fueling begins to the time when the customer disengages the charger plug from the charging port of electric vehicle after fueling has stopped, rounded up to the next full fifteen (15) minute increment. All charging time and non-charging time within the Total Connection Time is billed at the same rate.

CHARGING SERVICE RATE

Total Connection Time Charge (per 15 minutes):

	Rate(1)
Level 2-AC (Standard)	$ 0.30
Level 2-DC (Fast)	$ 2.50

(1) Prices will be clearly posted prior to customer initiating charging and accepted by customer prior to charging commencing.

TAX ADJUSTMENT

Any license, franchise, gross receipts, occupation or similar charge or tax levied by any taxing authority on the amounts billed hereunder will be so designated and added as a separate item to bills rendered to customers under the jurisdiction of the taxing authority.

ELECTRIC VEHICLE CHARGING PILOT PROGRAM (Cont.'d)

BILLING

All charges to the customer will be completed at the time of sale and participant's relationship to Company will end when the payment of transaction has been completed.

TERM OF PROGRAM

The term of the Program will be three (3) years from the initial effective date of this tariff. However, this tariff shall immediately become void, and the Company shall have no further obligations or liabilities hereunder, if any term or terms of this Program are determined to be discriminatory or otherwise unlawful by a court of competent jurisdiction.

ANNUAL REPORT

Within sixty (60) days of each anniversary of the implementation date of the Program, the Company will submit a written report detailing usage at each charging facility; revenue generated from vehicle charging, in total and at each charging facility; costs of the Program, in total and for each charging facility; impact on customer bills; and any ancillary benefits or costs of the Program.

GENERAL RULES AND REGULATIONS

Company's Mo.P.S.C. Schedule No. 6 General Rules & Regulations pertaining to providing service and billing a customer for service as well as deposit practices do not apply to this tariff.