Exhibit No.:	
Issues:	Charge Ahead – Electric Vehicles Program, Electric Vehicle and Electric Vehicle Charging Station Market Development; Utility Involvement with Electric Vehicle Charging Station Deployment; Considerations for Underserved Residents
Witness:	Cherylyn Kelley
Sponsoring Party:	Missouri Department of Economic Development – Division of Energy
Type of Exhibit:	Rebuttal Testimony
Case No.:	ET-2018-0132

MISSOURI PUBLIC SERVICE COMMISSION

UNION ELECTRIC COMPANY d/b/a AMEREN MISSOURI

CASE NO. ET-2018-0132

REBUTTAL TESTIMONY

OF

Cherylyn Kelley

ON

BEHALF OF

MISSOURI DEPARTMENT OF ECONOMIC DEVELOPMENT

DIVISION OF ENERGY

Jefferson City, Missouri
October 1, 2018

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	))))	Case No. ET-2018-0132

AFFIDAVIT OF CHERYLYN KELLEY

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

Cherylyn Kelley, of lawful age, being duly sworn on her oath, deposes and states:

1. My name is Cherylyn Kelley. I work in the City of Jefferson, Missouri, and I am employed by the Missouri Department of Economic Development as a Planner II, Division of Energy.
2. Attached hereto and made a part hereof for all purposes is my Rebuttal Testimony on behalf of the Missouri Department of Economic Development – Division of Energy.
3. I hereby swear and affirm that my answers contained in the attached testimony to the questions therein propounded are true and correct to the best of my knowledge.

Cherylyn Kelley

Subscribed and sworn to before me this 1st day of October, 2018.

LAURIE ANN ARNOLD
Notary Public - Notary Seal
State of Missouri
Commissioned for Callaway County
My Commission Expires: April 26, 2020
Commission Number: 16808714

Notary Public

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I. INTRODUCTION

Q. Please state your name and business address.

A. My name is Cherylyn Kelley. My business address is 301 West High Street, Suite 720, PO Box 1766, Jefferson City, Missouri 65102.

Q. Please describe your educational background and employment experience.

A. In December 2015, I graduated from the School of Natural Resources at the University of Missouri - Columbia with a Bachelor of Science in Environmental Science. While there, I took part in several groups and volunteer organizations that supported community gardens, stream cleanups, and invasive species removal. My coursework concentrated on math and science as well as social science topics such as environmental sociology and rural sociology.

I was first employed with the Division of Energy ("DE") in August of 2016, as an Energy Specialist in the Energy Efficiency group. I coordinated DE's Missouri Home Energy Certification program, which involved conducting outreach and education on energy efficiency topics to target audiences such as homeowners and real estate agents. I also developed an accredited continuing education course for real estate agents on the subject of energy efficiency in the home buying process to be presented throughout the state.

In August of 2017, I accepted a position as a Planner II in the Energy Policy and Resources group. My duties within this group include participation in discussions regarding various energy-related matters, participation in program collaboratives, coordinating fiscal note response drafting and tracking, attending

State Senate and House Committee hearings, and conducting technical and policy research on energy related topics including electric vehicles ("EVs").

Q. Have you previously filed testimony before the Missouri Public Service Commission ("Commission") on behalf of DE or any other party?

A. No.

II. PURPOSE AND SUMMARY OF TESTIMONY

Q. What is the purpose of your Rebuttal Testimony in this proceeding?

A. The purpose of my testimony is to provide an overview of the EV market, describe the current landscape of EV charging station ("EVCS") infrastructure, and examine utility involvement in infrastructure development and deployment. I discuss current barriers to EV adoption as well as the potential benefits that could result from allowing utility investment in EV charging infrastructure. Finally, I discuss the role of electric utilities in ensuring underserved areas of the state have comparable access to EV infrastructure.

Q. What materials did you review prior to submitting this testimony?

A. I reviewed Union Electric Company d/b/a Ameren Missouri's ("Ameren Missouri" or "Company") filings in Case No. ET-2018-0132, including the tariff sheets that reflect the Charge Ahead – Electric Vehicles program and the Application for Approval. I reviewed information provided by Ameren Missouri through their technical conferences as well as Direct Testimony in the case. Additionally, in my work at DE I have reviewed numerous reports that examine EVCS development in multiple regions across the U.S.

III. ELECTRIC VEHICLE MARKET DEVELOPMENT

A. INFRASTRUCTURE NECESSITIES

Q. What is the Charge Ahead – Electric Vehicles program?

A. The Company's Charge Ahead – Electric Vehicles program aims to stimulate the development of EVCS infrastructure by offering incentives to customers in Ameren's service territory. The four groups eligible to receive incentives include workplaces, public places, multifamily units, and vehicle corridors such as highways. In total, the Company is asking for a budget of no more than $11 million.[1] The program adheres to the "make-ready" model in that the company would provide the infrastructure buildout to the charging station but would not own the station itself.

Q. What is the current state of electric vehicle charging station (EVSC) infrastructure?

A. According to the U.S. Department of Energy's Alternative Fuels Data Center (AFDC), there are about 370 publicly available charging stations in Missouri.[2] While the Electric Vehicle Infrastructure Projection Tool provided by the AFDC indicates this number could be adequate for the number of electric vehicles in the state, the issue in Missouri is EVCS location rather than total number of stations.[3] EVCSs are more common in Missouri's largest urban areas, however, infrastructure is lacking elsewhere, such as along highways and in rural areas –

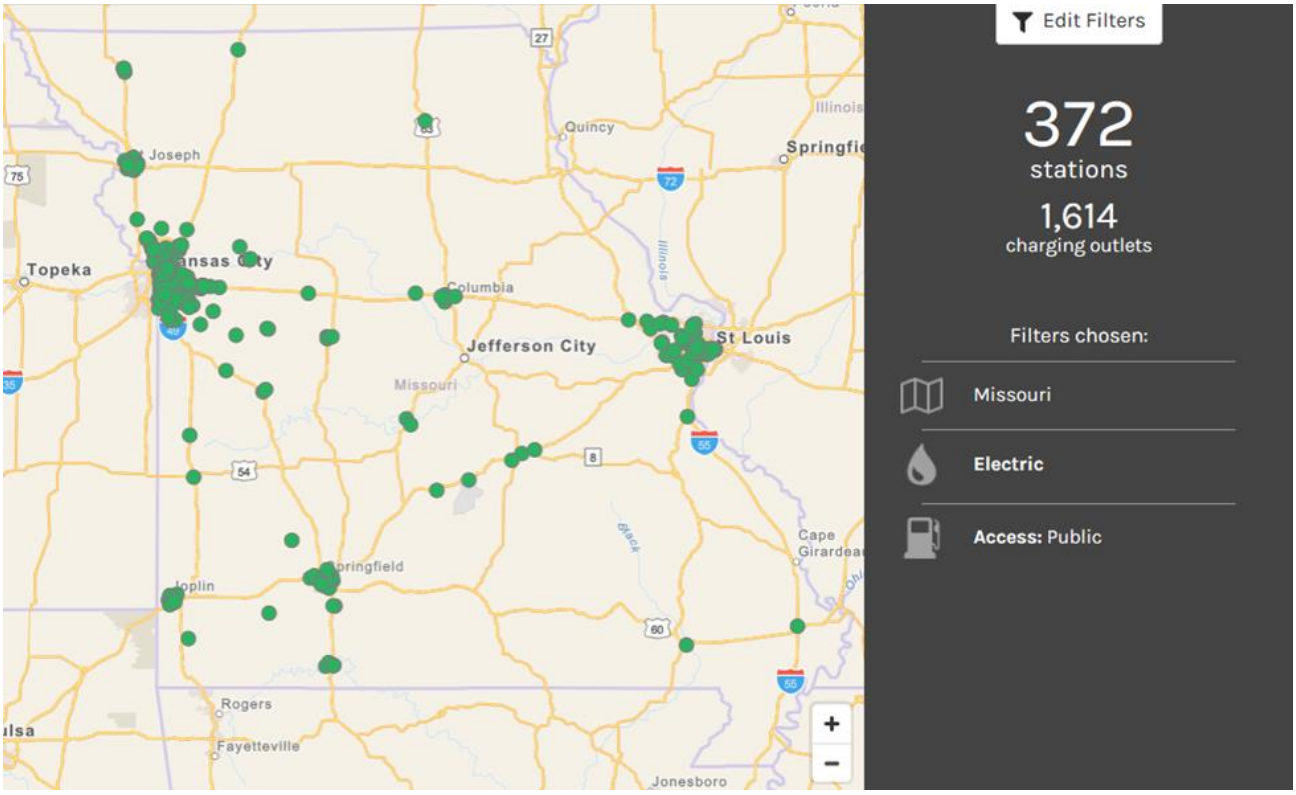
[1] Ameren Missouri, Charge Ahead – Electric Vehicle Program Tariff Sheets, ET-2018-0132.
[2] Alternative Fuels Data Center, *Electric Vehicle Charging Station Locations*, U.S. Department of Energy, https://www.afdc.energy.gov/fuels/electricity_locations.html#/analyze?region=US-MO&show_map=true&fuel=ELEC&ev_levels=all
[3] *Electric Vehicle Infrastructure Projection Tool (EVI-Pro) Lite*, https://www.afdc.energy.gov/evi-pro-lite

see Figure 1 below. Inability to access charging infrastructure while traveling across the state could hinder travel resulting in drivers becoming stranded, fewer EV travelers coming into and through the state, and lower EV market penetration in Missouri's rural areas.

The cost of building a charging station can be high and few incentives are currently available. A level two charging station, which provides roughly 10-25 miles of range in an hour of charging, can cost anywhere from $2,300 to $6,000 for hardware and installation.[4,5] DC fast chargers can charge a battery to around 80% capacity in 30 minutes and can cost between $50,000 and $100,000 for hardware and installation.[6] These costs are an impediment to creating an environment in which Missourians feel comfortable using electric vehicles – or in which non-residents (e.g., tourists, shippers) can feel confident in driving EVs through the state.

[4] Eric Schaal, *A Simple Guide to Electric Vehicle Charging*, Fleet Carma, https://www.fleetcarma.com/electric-vehicle-charging-guide/
[5] Rocky Mountain Institute, *Pulling Back the Veil on EV Charging Station Costs*, https://rmi.org/pulling-back-veil-ev-charging-station-costs/
[6] *Ibid*.

Figure 1. Publicly available electric vehicle charging stations in Missouri – all charging levels.[7]



Q. Should it be assumed that there is disinterest in EVs based on their limited presence in the state?

No. While only about 4,450 of the approximately 5.6 million vehicles registered in Missouri are EVs,[8] [9] EV sales are continuing to rise. Between 2016 and 2017 alone there was a 32.2% year-over-year vehicle sale increase.[10] The lack of

[7] U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy. 2018. "Alternative Fueling Station Locator." Alternative Fuels Data Center.
[8] *State Motor-Vehicle Registrations – 2016*, https://www.fhwa.dot.gov/policyinformation/statistics/2016/mv1.cfm
[9] Huiqi Xu, CHART: Electric vehicles and charging stations in Missouri, July 2018, http://www.missouribusinessalert.com/industries/96929/2018/07/20/chart-electric-vehicles-and-charging-stations-in-missouri/
[10] EV Market Share by State, http://evadoption.com/ev-market-share/ev-market-share-state/

EVCS in necessary locations and the funds to build out the infrastructure threatens our preparedness to meet the growing market trend toward EVs. The lack of infrastructure can also make purchasing an EV in rural or suburban areas less feasible to potential buyers, and those who travel long distances may also see EVs as an impractical option and/or choose not to travel through Missouri.

Automakers are reacting to these changes in consumer preference. For example Ford has pledged to invest $4.5 billion over five years on all-electric vehicles and plans to release thirteen new models by 2023.[11] General Motors is planning for an "all-electric future," starting with twenty all-electric vehicles by 2023.[12]

Q. Why is it appropriate to allow investor-owned utilities to provide incentives for the development of EV infrastructure rather than leaving market growth to the private sector?

A. The electric vehicle industry faces a "chicken or egg" paradox – consumers are hesitant to invest in the nascent technology and potential EVCS operators are not installing equipment because of an apparent lack of market uptake of the vehicles.[13] A study from 2015 examined three simulations, each with different infrastructure availability: home charging; home and work charging; and, home,

[11] *Ford Adding Electrified F-150, Mustang, Transit by 2020 in Major EV Push; Expanded U.S. Plant to Add 700 Jobs to Make EVs, Autonomous Cars,* https://media.ford.com/content/fordmedia/fna/us/en/news/2017/01/03/ford-adding-electrified-f-150-mustang-transit-by-2020.html

[12] *GM Outlines All-Electric Path to Zero Emissions,* https://media.gm.com/media/us/en/gm/news.detail.html/content/Pages/news/us/en/2017/oct/1002-electric.html

[13] Till Gnann, Patrick Plotz, Martin Wietschel, *How to address the chicken-egg-problem of electric vehicles? Introducing an interaction market diffusion model for EVs and charging infrastructure*, https://www.researchgate.net/publication/279187975/download

work, and public charging. The study found that EV market diffusion would only occur with a mixture of home and public charge points, and that public charge points would only be economically viable for private sector investment before 2030 with financial assistance. Workplace charging points would be the second-best option to encourage EV adoption if public charging was not available.[14] Left to the private sector, EVCS investment would inevitably and understandably result in the stations being installed in densely populated areas – probably those that are more affluent – so that investors could turn a profit.

By contrast, investor-owned utilities have access to the necessary capital to invest in areas that would otherwise not see EVCS development for many years. Investor-owned utilities can also leverage economies of scale that reduce investment costs. These considerations, combined with the utility's understanding of the demands EV charging would place on the grid, mean that utilities are logical investors in this sector. Further, the Western District Court of Appeals in Case No. WD80911 (*In the Matter of: Kansas City Power and Light Company's Request for Authority to Implement A General Rate Increase for Electric Service v. Missouri Public Service Commission and Midwest Energy Consumers Group*), recently affirmed that EVs are electric plant which may be subject to Commission jurisdiction.

[14] *Ibid*.

Finally; though the Company's current plan is based on the "make-ready" model, this does not mean a utility could not own EVCSs themselves. Utilizing both can ensure that there is equitable EVSC deployment.

Q. What benefits could EVs provide for a utility's ratepayers?

A. Both the utility and its customers have the potential to benefit from the increase in load provided by a robust EV market if such vehicles are charged at appropriate times. New load from EVs is flexible: EVs can connect to the grid any time they need a charge. EV charging when energy demand is low – such as at night – can actually result in more efficient use of the grid and allow for greater deployment of wind energy. This form of load management that spreads utility distribution costs across a larger volume of electricity sales has the effect of putting downward pressure on electricity rates for all customers.[15] These benefits would not be readily apparent to customers, so educational resources should be provided to make the case for overnight charging. Eventually, time-of-use ("TOU") rates that provide a discount for charging during off-peak hours could promote efficient use of the grid, but likely would not be necessary on a mandatory basis until there is high EV market penetration and significantly increased on-peak demand.

[15] *Accelerating the Electric Vehicle Market*, March 2017, https://www.mjbradley.com/sites/default/files/MJBA_Accelerating_the_Electric_Vehicle_Market_FINAL.pdf

Q. Are there other benefits associated with EVs?

A. Yes. EVs produce fewer emissions than vehicles with internal combustion engines ("ICEs"), even when powered by fossil fuel-using resources.[16] Emissions from driving EVs will decline further as utilities such as Ameren Missouri continue to transition to renewable energy resources. The Company's 2017 Integrated Resource Plan stated a goal of adding 700 MW of wind generation to its portfolio by 2020.[17] Improved air quality can result in lower healthcare costs as well: exposure to pollution such as that resulting from ICE-powered vehicles can lead to higher rates of cancer, asthma, emphysema, heart disease, inhibited child development, and premature death.[18]

Supporting the EV market also has positive economic implications. For example, fewer healthcare costs from improved air quality and significantly lower operating costs mean more money can be spent in other sectors of the economy.[19] Missouri does not produce a large number of fossil fuels, so widespread use of vehicles that do not require these products could reduce the amount of oil imported into Missouri, creating a more energy-independent economy.[20] Higher demand for EVs could also result in job creation, not only in auto manufacturing but also in scientific research, engineering, and vehicle

[16] Union of Concerned Scientists, *Cleaner Cars from Cradle to Grave*, 2015, https://www.ucsusa.org/clean-vehicles/electric-vehicles/life-cycle-ev-emissions#.W2yuAaqotCo
[17] Chapter 1, *2017 Integrated Resource Plan*.
[18] U.S. Environmental Protection Agency, www.epa.gov/pm-pollution
[19] Michael Sivak and Brandon Schoettle, R*elative Costs of Driving Electric and Gasoline Vehicles in the Individual U.S. States*, January 2018, http://www.umich.edu/~umtriswt/PDF/SWT-2018-1_Abstract_English.pdf
[20] U.S. Energy Information Administration. 2018. "Missouri – State Energy Profile Analysis." State Energy Data System. https://www.eia.gov/state/analysis.php?sid=MO.

maintenance.[21] In 2017, nearly 1,600 people worked in the EV job sector in Missouri – that is a 31% increase over 2016.[22] Furthermore, businesses with sustainability goals may be more inclined to locate or grow in Missouri if EV infrastructure is supported.

Q. Should there be consideration as to how incentives for EVCS deployment are allocated?

A. Since the utility would benefit from the increased load from EV charging, and because the funds for the charging station incentives would be sourced from ratepayers, access to the stations should be equitable to the extent possible. The utility is responsible for ensuring that underserved areas (such as low income, rural, and inner city areas) and disadvantaged communities in particular have access to EV charging. [23] Disadvantaged communities disproportionately experience the impacts of vehicle pollution and can face greater health risks as a result; these communities would benefit the most from the clean air and cost-savings benefits of EVs.[24] Community outreach and education will be important in conveying the benefits of EVs and encouraging system-beneficial charging and should be a main focus in any outreach and education campaign. It will be necessary to involve community leaders and community-based organizations

[21] Bureau of Labor Statistics, *Electric vehicle careers: On the road to change,* 2012, https://www.bls.gov/careeroutlook/2012/summer/art02.pdf
[22] *Clean Energy Jobs in Missouri,* https://www.cleanjobsmidwest.com/state/missouri
[23] "Disadvantaged community" defined as those that disproportionately struggle with a combination of economic, health, and environmental burdens, including poverty, high unemployment, health conditions like asthma, as well as air and water pollution and nearby hazardous waste disposal.
[24] Cheryl Katz, *People in Poor Neighborhoods Breathe More Hazardous Particles*, https://www.scientificamerican.com/article/people-poor-neighborhoods-breate-more-hazardous-particles/

throughout this process as they are key to understanding a community's current level of knowledge, knowing what methods of communication would be most effective, and coordinating successful outreach activities.

Eversource in Massachusetts is addressing the underserved by dedicating up to ten percent of funds to charging infrastructure in environmental justice communities, such as those that are considered low income.[25] This is a feature that should be commonplace in utility EV incentive programs, including Ameren Missouri's proposal. The cost of a new EV can be high, and the federal tax credits cannot be used by everyone; however, EV prices continue to decline every year and, over time, more EVs will become available at used car dealerships. Used car markets and lower prices for new EVs may improve EV access for low-income consumers, making charging station accessibility in such communities of increasingly greater importance. Charging infrastructure needs to be in place in anticipation of near-future needs.

IV. CONCLUSIONS

Q. Please summarize your conclusions and the positions of DE.

A. The benefits made possible through EV deployment outweigh the challenges of creating a supportive infrastructure system. If left only to the private sector, investment in EVCS infrastructure will be limited and inequitable, necessitating utility involvement. DE recommends that Ameren consider targeting a minimum of 10% of charging stations incentives to low income and disadvantaged

[25] EPA definition of environmental justice: "fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies."

communities. Education and outreach should be emphasized in low-income and disadvantaged areas in addition to the general population. These campaigns should include, but should not be limited to, the financial and health benefits that EVs provide, in addition to how to maintain the vehicle, how to find charging stations, how to utilize financial incentives for the purchase of EVs, and information on the best times to charge an EV to efficiently utilize the grid and improve benefits for all ratepayers.

Q. Does this conclude your Rebuttal Testimony in this case?

A. Yes.