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.	))))	File No. ET-2016-0246

RECOMMENDATIONS OF NATURAL RESOURCES DEFENSE COUNCIL

We thank the Commission for accepting these recommendations on behalf of the Natural Resources Defense Council (NRDC). NRDC is a non-profit environmental organization with more than two million members and online activists. NRDC uses law, science, and the support of its members to ensure the rights of all people to clean air, clean water, and healthy communities. One of NRDC's top priorities is to reduce transportation sector emissions of the air pollutants causing climate change.

Early in 2016, the US Energy Information Administration found that for the first time since 1979, carbon emissions from the transportation sector surpassed those from the power sector in the US.[1] Light-duty vehicles (LDVs) are responsible for over half of the carbon emissions associated with the transportation sector.[2] Moreover, these LDVs are responsible for elevated levels of harmful criteria pollutants in many urban areas. It is estimated over 50,000 Americans in the lower 48 states die prematurely from traffic pollution every year, which is over one-and-a-half times as many as die in traffic accidents.[3] Any comprehensive effort to reduce carbon emissions and criteria pollutant emissions must consider how to effectively decarbonize the domestic vehicle fleet.

Numerous independent studies have come to the same conclusion: reducing global warming pollution to 80 percent below 1990 levels by 2050 will require a dramatic shift to electric-drive vehicles powered by zero-emitting energy sources.[4] Because just 15 to 17 million passenger

[1] http://www.c2es.org/blog/vined/transportation-emissions-roll-over-power-sector-emissions

[2] https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions#transportation

[3] *See* Fabio Caiazzo et al., *Air pollution and early deaths in the United States*, Atmospheric Environment, 2013; National Highway Traffic Safety Administration, Fatality Analysis Reporting System (FARS) Encyclopedia.

[4] *See* California Council on Science and Technology, *California's Energy Future*, May 2011; Williams et al., *The Technology Path to Deep Greenhouse Gas Emissions Cuts by 2050: The Pivotal Role of Electricity, Science*, January, 2012; Joshua Cunningham (Air Resources Board), *Achieving an 80% GHG Reduction by 2050 in California's Passenger Vehicle Fleet*, SAE International Journal of Passenger Cars, December, 2010; Max Wei et al., *Deep carbon reduction in California require electrification and integration across economic sectors*,. Environ. Res. Lett. 8, 2013; Melaina and Webster, *Role of fuel carbon intensity in achieving 2050 greenhouse gas reductions within the light-duty vehicle sector*, Environ. Sci. Technol. 45, 3865–3871, 2011; International Energy Agency, *Transport, Energy, and CO2: Moving Towards Sustainability*, OECD/IEA, 2009; National Research Council, *Transitions to Alternative Vehicles and Fuels*, The National Academies Press, 2013.

vehicles are sold each year in the U.S., it will take decades to transform the existing U.S. stock of 250 million vehicles. To meet long-term global warming pollution reduction targets, studies have estimated, plug-in electric vehicles (PEVs) will need to account for 40 percent or more of new vehicle sales by 2030.[5] In the long-term, fuel cell electric vehicles (FCEVs) could gain significant market share and play an important role in meeting 2050 climate goals, but PEVs will remain the dominant advanced vehicle technology for the foreseeable future. Hydrogen fuel cell technology faces significant obstacles in terms of technology costs and a near-complete lack of refueling infrastructure. At this point, only two fuel cell models are available and only in very limited numbers. U.S. sales of fuel cell vehicles are forecast to total less than 8,000 through the end of this decade.[6] In sum, fuel cell electric vehicle technology lags significantly behind PEV technology, which will remain the dominant advanced vehicle technology beyond the useful life of the investments proposed by Ameren Missouri.

NRDC has been actively driving discussions, developing reports, and participating in regulatory proceedings to further accelerate plug-in electric vehicle adoption. In Missouri, we participated in the *Working Case Regarding Electric Vehicle Charging Facilities* (File No. EW-2016-0123), providing substantive comments and materials on the necessity of charging stations to the development of the PEV market and how utilities could beneficially engage in this space. As part of the docketed proceeding, NRDC presented at the Missouri Public Service Commission's EV workshop on May 25, 2016; along with Sierra Club and the Electric Power Research Institute, we presented on the environmental benefits of vehicle electrification and the need for strategic deployment of charging infrastructure to realize these benefits. NRDC is also participating in Kansas City Power & Light's (KCP&L) current general rate case regarding its Clean Charge Network.

Achieving significant PEV penetration levels requires the development of an extensive, well-planned charging station network that provides value to drivers.[7] For several reasons, electric utilities are uniquely positioned to accelerate the vehicle electrification process; several are already actively developing their own PEV infrastructure programs in the Midwest.[8]

The current PEV infrastructure deployment by automakers, government, and startup charging station companies will not be sufficient to develop the robust charging station network needed to achieve significant levels of PEV adoption in the long-term.[9] These actors currently face a "chicken and egg" market coordination problem that arises when low penetration of charging

[5] See California Air Resources Board, *Vision for Clean Air: A Framework for Air Quality and Climate Planning*, Public Review Draft, June 27, 2012; and National Research Council, *Transitions to Alternative Vehicles and Fuels*, National Academies of Science, 2013.

[6] Baum and Associates, *U.S. Electric Vehicle Sales Forecast; Detail by Type by Company by Segment by Calendar Year*, Monday, March 09, 2015.

[7] Kassakian, John G., David Bodde, and Jeff Doyle. "Overcoming Barriers to Deployment of Plug-in Electric Vehicles." The National Academies Press. 2015.

[8] See http://midwestenergynews.com/2016/07/27/michigan-utility-plans-statewide-electric-vehicle-charging-network/

[9] Baumhefner, Max, Roland Hwang, and Pierre Bull. "Driving Out Pollution: How Utilities Can Accelerate the Market for Electric Vehicles." Natural Resources Defense Council. June, 2016.

stations inhibits the growth of the PEV market, and vice versa.[10] Utilities are able to leverage deep pools of capital, extensive knowledge of the grid, and established customer relations to not only reliably jump start charging station deployment at large but also target and educate site host segments that are historically underserved by the existing market.

NRDC is generally supportive of Ameren Missouri's interest in vehicle electrification and the development of a PEV infrastructure pilot program. As mentioned in Mark Nealon's testimony, the advent of mass-market, affordable PEVs with higher performance batteries will increase the demand for public and private charging stations; as the transition to PEVs accelerates, it is important that a robust charging network be in place to accommodate and sustain that growth.

We have several recommendations and comments regarding Ameren's PEV infrastructure pilot program. They pertain to: the proposed electric rates charged at Ameren's stations, cost recovery, education and outreach, DC Fast Charger type, program evaluation, and future utility engagement.

Proposed Tariff at Charging Stations

Ameren Missouri has proposed a time-based charge of $0.30 per 15 minutes and $2.50 per 15 minutes for Level 2 and DC Fast Chargers, respectively. Ameren Missouri also notes that based on its Utility Cost Test (UCT) analysis and assumptions, the net present value (NPV) of the revenues associated with the charging stations would be negative at these charging rates. The company's rationale for establishing rates below those necessary to achieve a positive UCT result is that these lower rates would be more acceptable to drivers without materially impacting non-participating customers. It also makes the prices PEV drivers face comparable to the prices they would face for gasoline on a per-mile basis *depending on the performance of the PEV battery*.[11]

NRDC supports Ameren Missouri's consideration of gasoline prices and PEV driver price tolerance in the development of its charging station tariff. A survey of over 16,000 PEV drivers reveals that "saving money on fuel costs" is the single most important decision factor driving PEV purchases.[12] Therefore, to ensure that Ameren Missouri's pilot achieves its goal of developing the electric vehicle market in Missouri, it is crucial that PEV drivers generally realize fuel cost savings when switching from gasoline to electric fuel. Charging for electricity in excess of equivalent gasoline costs would dilute the incentive to purchase a PEV or charge one at Ameren Missouri's charging islands, jeopardizing the use and usefulness of the charging stations as well as the overall success of the program. For these reasons, reasonable and transparent tariffs that give drivers the potential to achieve fuel cost savings relative to gasoline are an essential element of Ameren Missouri's Pilot.

[10] Ryan, Nancy E., and Luke Lavin. "Engaging Utilities and Regulators on Transportation Electrification." Energy+Environmental Economics. March 1, 2015.
[11] This is further explained in the following paragraphs.
[12] Center for Sustainable Energy (2016). California Air Resources Board Clean Vehicle Rebate Project, EV Consumer Survey Dashboard. Retrieved [date retrieved] from http://cleanvehiclerebate.org/survey-dashboard/EV.

However, NRDC does not agree with the decision to base the prices PEV drivers face on units of time, as the company has proposed. The reason is that this type of time-based charge discriminates against customers that drive PEVs with lower-capacity onboard chargers. It is important to note that the kilowatt (kW) rating of electric vehicle charging station plugs indicates the maximum rate at which the plug can deliver electricity, *not the rate at which a PEV battery actually charges*. This rate is dependent on the battery in the electric vehicle, which varies by model and model year. Ameren Missouri acknowledges this concept in its testimony:

"When aided by a home charging device, a PEV can use energy at a rate of over 3 kW, which could roughly double an average household's demand on a summer afternoon. Some PEV models charge at a rate of over 6 kW, nearly tripling an average residential household's summer demand." [13]

If different PEVs charge at different rates, customers who have lower capacity onboard chargers will be paying more for the same amount of electricity under the current proposed rate structure. For example, the company is proposing to install Level 2 stations that provide charging at a rate of up to 7.4 kW. Consider two drivers who need 6.6 kilowatt-hours (kWh) to meet their charging needs; one has a Nissan LEAF SV with a 6.6 kW onboard charger and the other has a Chevrolet Volt with a 3.3 kW charger.[14] The owner of the Nissan LEAF will only need to charge for one hour and pay $1.20 while the owner of the Chevrolet Volt will need to charge for two hours and pay double for the equivalent amount of electricity. This time-based rate structure unduly discriminates against PEV drivers with less powerful onboard chargers and threatens to eliminate the fuel cost savings of driving on electricity for a large group of electric vehicles.[15]

For this reason, NRDC proposes that the tariff for both Level 2 and DC Fast Charging stations be modified to a per-kWh charge that treats all PEVs equally based on the amount of electricity they use. This kWh-based fee is consistent with how electricity is priced for residential customers and should eliminate PEV drivers' concerns about inequitable rates.

There may be some arguments made by parties that time-based tariffs lead to an efficient use of stations by incentivizing PEV drivers to unplug once their charging needs are met and encouraging vehicle turnover at charging stations. While there may be some merit to this argument, a linear per-kWh fee accomplishes the same objective as a linear time-based fee without penalizing PEV drivers with less powerful onboard chargers. "The more you use, the more you pay" concept is intuitive under a kWh charge and should send the right price signal to the customer to charge only for as long as they need to. Moreover, Ameren Missouri's PEV Pilot is intended to remove barriers to long-distance PEV travel along a major highway corridor. If

[13] Testimony of Mark Nealon, p. 31, lines 14–7.
[14] *See* http://EVobsession.com/electric-car-charging-101-types-of-charging-apps-more/
[15] Of the approximately 25 PEV models available to drivers, the majority only offer a 3.3kW onboard charger. http://EVobsession.com/electric-car-charging-101-types-of-charging-apps-more/

one is to assume that the majority of potential users of the proposed charging islands are traveling along the highway en route to their final destination, they have a strong incentive to dwell at a station no longer than their charging needs require before continuing their trip.

Considering these arguments, NRDC strongly recommends modifying the Level 2 and DC Fast Charging tariff to a kWh charge comparable to the company's original time-based charge and to the cost of gasoline. Given the additional costs and customer value associated with DC Fast Charging, we find it reasonable that the per kWh tariff for DC Fast Charging could be greater than the per-kWh tariff for Level 2 stations. Similar to the company's approach to the development of time-based tariffs, Ameren Missouri should consider how acceptable certain per-kWh charges would be to PEV drivers.

Cost Recovery

Ameren Missouri has stated that they do not expect the revenues generated from the Pilot to cover all costs of the project and that, contingent upon the timing of installation, Ameren Missouri would put the capital cost associated with the already-installed charging islands into the rate base in the current general rate case.

In this case, NRDC supports Ameren Missouri's request to seek cost recovery for the installed charging islands on account of the public benefits that accrue to all utility customers. Increased electric load from PEVs exerts downward pressure on rates by spreading the utility's fixed costs over a greater amount of kWh sales. Although Ameren Missouri finds that residential customers would on average contribute 11.3 cents per year for the first four years of the charging islands' operational life (45.2 cents total), the overall NPV of the benefit over 15 years is shown to be $3.63 per customer. This benefit calculation takes into account the importance of network effects of complementary goods (EVs and charging stations): as the quantity of electric vehicle charging stations increases, the value proposition of purchasing an electric vehicle increases.[16] In turn, this increases the PEV load that creates downward pressure on electric rates. Similar trends have been observed in other markets with complementary goods, such as telecommunications and credit card processing systems markets.[17]

Moreover, there is a public benefit associated with the reduction of greenhouse gas emissions relative to gasoline-powered vehicles. According to the Department of Energy, even with Missouri's current coal-heavy generation mix, battery electric vehicles and plug-in hybrid electric vehicles still emit approximately 25 percent less CO_2 equivalent than gasoline-powered vehicles under equivalent driving conditions.[18] Additionally, as market trends and policies like the Clean Power Plan shift Ameren Missouri's generation mix towards lower carbon generation sources, the clean air and carbon emissions benefits from PEVs will become magnified.

[16] Ryan, Nancy, and Lucy McKenzie. "Utilities' Role in Transport Electrification: Promoting Competition, Balancing Risks." *Public Utilities Fortnightly*(2016): 32-37. Web. 21 Sept. 2016.
[17] *See* footnote 16.
[18] *See* http://www.afdc.energy.gov/vehicles/electric_emissions.php#wheel

Widespread vehicle electrification will allow the transportation sector to tap into and benefit from the decarbonization of the electric sector.

Finally, there is a public benefit associated with the decreased dependence on petroleum. Despite recent increases in domestic production, the United States is still a major importer of foreign oil; consuming less oil enhances Missouri's energy security by shielding utility customers and business from the volatility of global oil markets that can disproportionately impact low-income drivers.[19] In contrast, retail electricity rates are relatively stable.

For these reasons, NRDC supports Ameren's request for the reasonable and modest cost recovery associated with its Pilot.

Education and Outreach

Ameren Missouri plans to budget $10,000 per year for education and marketing during the three years of the project. NRDC supports the expenditures associated with education and outreach for the Pilot. Lack of consumer awareness of the benefits of PEVs is still viewed by experts as a significant barrier to widespread PEV adoption.[20] Unlike automakers seeking to promote their own vehicles, utilities can leverage their broad and established customer relations to reach potential PEV drivers more effectively.[21] Sharing and elevating information on fuel cost savings, applicable utility rates, incentives, and programs across a variety of mediums should boost awareness of the Pilot. Ameren Missouri should be incentivized to invest in education and outreach activities as efficiently as possible to maximize impact and generate interest in the Pilot.

DC Fast Charger Type

In testimony, Ameren Missouri states that its charging islands will be built to accommodate all industry-standard PEV plugs. NRDC supports this important element of the Pilot program and recommends that each charging island be equipped with both CHAdeMO and SAE Combo DC Fast Charging plugs. This lesson was critical for the continued development of the West Coast Electric Highway in the Pacific Northwest and will be critical for the development of any DC Fast Charging network.[22] Popular PEV models like Nissan LEAF and BMW i3 can only fast-charge on one plug type or the other (CHAdeMO or SAE Combo, respectively), and a functional Pilot program that delivers a convenient charging experience for all PEV drivers should have each fast charging plug available at each charging island.

[19] *See* https://www.eia.gov/dnav/pet/pet_move_impcus_a2_nus_ep00_im0_mbbl_a.htm
[20] *See* footnote 8.
[21] *See* footnote 9.
[22] *See* http://driveoregon.org/wp-content/uploads/2016/08/Drive-Oregon-DCFC-Paper-EVS29-June-2016.pdf

Evaluation

Ameren Missouri intends to report on and share a variety of program metrics with stakeholders including but not limited to: program costs, detailed charging profiles and usage, revenues from charging, and customer bill impacts. NRDC appreciates this intent to report not only because it allows stakeholders and Ameren Missouri to make necessary improvements to the Pilot while it is running but also because it will serve as a valuable resource for future utility PEV infrastructure programs. In order to better observe how the program evolves and changes over time, NRDC recommends that Ameren report on a bi-annual or preferably quarterly basis through the life of the Pilot.

Additionally, the useful life of the charging infrastructure does not end after three years. NRDC recommends that Ameren Missouri continue to report, at least on an annual basis, on the metrics described in testimony after the three year Pilot has ended to show how use of the infrastructure changes over 15 years.

Market Segments and Program Expansion

NRDC appreciates Ameren Missouri's interest in facilitating long-distance PEV travel and combatting "range anxiety", one of the critical barriers to PEV adoption today.[23] Filling this need for charging during low-frequency, long distance trips is key for making customers feel comfortable with purchasing PEVs. However, developing the infrastructure necessary to support daily charging needs is also essential to accelerating the PEV market.

Ameren Missouri correctly points out that the majority of PEV charging takes place at the home, and this is by far the most crucial segment to spur PEV adoption. In a recent report of the National Research Council of the National Academies of Science (commissioned by the Department of Energy at the direction of the U.S. Congress) entitled, "Overcoming Barriers to the Deployment of Plug-in Electric Vehicles," the authors characterize home charging as follows:

First, home charging is a virtual necessity for all EV classes given that the vehicle is typically parked at a residence for the longest portion of the day. Accordingly, the home is (and will likely remain) the most important location for charging infrastructure, and homeowners who own EVs have a clear incentive to install home charging. Residences that do not have access to a dedicated parking spot or one with access to electricity clearly have challenges to overcome to make EV ownership practical for them.

[23] Range anxiety in this context is the concern that an electric vehicle battery may run out of charge before a driver can refuel at a charging station. Range anxiety is influenced the performance of the battery as well as the availability of a charging station network.

Following this argument, drivers are very unlikely to purchase plug-in vehicles if they cannot plug in at home, where cars are typically parked for 12 hours out of the day.[24] Unfortunately, less than half of U.S. vehicles have reliable access to a dedicated off-street parking space at an owned residence where charging infrastructure could be installed.[25] To date, almost 90 percent of PEV drivers live in single-family detached homes.[26] As the National Research Council notes: "Lack of access to charging infrastructure at home will constitute a significant barrier to PEV deployment for households without a dedicated parking spot or for whom the parking location is far from access to electricity."[27] It is essential for the PEV market to move beyond single family detached homes to scale up to achieve the benefits described in the most recent Missouri Comprehensive State Energy Plan.[28] Installing charging stations at apartment buildings and other multi-unit dwellings could unlock the potential for a broader, younger, and more diverse market for PEVs. This targeted approach to charging station deployment at multi-unit dwellings has been adopted by San Diego Gas and Electric, Southern California Edison, and Avista Utilities in their respective approved PEV infrastructure programs.[29] NRDC recommends that future utility infrastructure programs in Missouri include multi-unit dwellings as a key market segment for driving greater and more inclusive PEV adoption.

The range-extending function and visibility of charging stations in the social context of a workplace can also spur additional vehicle sales. Nissan credits a workplace charging initiative with a five-fold increase in monthly PEV purchases by employees at Cisco Systems, Coca Cola, Google, Microsoft, and Oracle.[30] Likewise, the Department of Energy recently concluded that employees of companies who participated in its "Workplace Charging Challenge" were 20 times more likely to drive a PEV than the average worker.[31] Workplace charging can effectively double the electric miles driven on a daily basis by PEVs. This is especially important for plug-in hybrid electric vehicles (PHEVs) that can operate on both electricity derived from the grid or gasoline, which have shorter all-electric ranges than battery electric vehicles (BEVs).[32]

Workplace charging can also improve the utility of BEVs and help alleviate "range anxiety" for drivers who want to make the occasional longer trip after work. EPRI's analysis reveals that one

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[24] *See* Adam Langton and Noel Crisotomo, *Vehicle-Grid Integration*, California Public Utilities Commission, October, 2013, p. 5; *see also* Marcus Alexander, *Transportation Statistics Analysis for Electric Transportation*, Electric Power Research Institute, December, 2011.

[25] Traut et al., US Residential Charging Potential for Electric Vehicles, (Transportation Research Part D), November, 2013.

[26] Center for Sustainable Energy, *California Plug-in Electric Vehicle Owner Survey Dashboard*.

[27] National Research Council of the National Academies of Sciences, *Overcoming Barriers to the Deployment of Plug-in Electric Vehicles*, the National Academies Press, 2015, p. 116.

[28] *See* https://energy.mo.gov/energy/docs/MCSEP.pdf

[29] *See* http://www.utilitydive.com/news/if-you-build-it-will-they-charge-utilities-cautious-in-plans-to-spur-elec/423982/

[30] Brandon White, Senior Manager of EV Sales Operations, Nissan North America, at EPRI Plug-in 2014, "Taking the 'Work' Out of Workplace Charging."

[31] U.S. Department of Energy, *Workplace Charging Challenge – Progress Update 2014: Employers Take Charge*.

[32] California New Car Dealers Association, *California Auto Outlook*, February, 2015.

in ten weekdays a vehicle is driven, it is driven in excess of 70 miles, which approaches the point at which many drivers of the pure battery electric vehicles would begin to suffer from range anxiety, with about ten miles of fuel left to reach a destination with a charging station.[33] The fear of being stranded is not just a source of anxiety for those who have already purchased BEVs, but a significant barrier to a mass market for BEVs.

In sum, workplace charging can drive the adoption of both BEVs and PHEVs, as summarized by the National Research Council:

Charging at workplaces provides an important opportunity to encourage the adoption of PEVs and increase [electric vehicle miles traveled]. BEV drivers could potentially double their daily range as long as their vehicles could be fully charged both at work and at home, and PHEV drivers could potentially double their all-electric miles. Extending the electric range of PHEVs with workplace charging improves the value proposition for PHEV drivers because electric fueling is less expensive than gasoline. For BEVs and PHEVs, workplace charging could expand the number of people whose needs could be served by a PEV, thereby expanding the market for PEVs. Workplace charging might also allow households that lack access to residential charging the opportunity to commute with a PEV. [34]

Workplace charging is also essential to allow the Commission to leverage the growing customer investment in PEVs to support the integration of variable renewable generation. Missouri PEV drivers have already purchased batteries that collectively represent about 40 megawatt-hours of advanced chemical energy storage that could be used to address this new load shape by absorbing afternoon solar generation and overnight wind generation.[35] The Commission should take advantage of that growing sunk investment to benefit all utility customers. Combining both workplace and residential charging will provide maximum availability to help cost-effectively integrate renewables. Workplace and home charging are needed to make this possible; PEVs that are not connected to the grid cannot support the grid.

<u>Beneficial Rate Structures for PEV Adoption</u>

Consistent with the findings in Staff's report from *A Working Case Regarding Electric Vehicle Charging Facilities* (File No. EW-2016-0123) and the Missouri Comprehensive State Energy Plan, NRDC recommends that Ameren Missouri develop and market a full scale time-of-use rate to manage residential PEV load and augment the benefits of vehicle electrification.[36] Transportation electrification done at a scale necessary to meet air quality and climate goals

[33] Marcus Alexander, *Transportation Statistics Analysis for Electric Transportation*, Electric Power Research Institute, December, 2011.

[34] National Research Council of the National Academies of Sciences, *Overcoming Barriers to the Deployment of Plug-in Electric Vehicles*, the National Academies Press, 2015, p. 117.

[35] Assuming sales-weighted average battery size of 24.6 kWh, based on sales data from the Department of Energy's Alternative Fuels Data Center and the Missouri Department of Economic Development's estimate of 1,600 PEVs in the state.

[36] See footnote 28.

will have significant implications for the electrical grid. If it is done poorly, the costs will be substantial and could undermine the viability of a strategy that is critical to meet mid- and long-term goals. However, with the right policies and programs in place, the electrification of the transportation sector could be cost-effective and maximize benefits for all utility customers.

In California, one of the world's largest PEV markets with over 200,000 vehicles, costs associated with integrated PEV load to date have been *de minimis*—less than 0.1% of PEVs have required a service line and/or distribution system upgrade.[37] An analysis of California's distribution systems also reveals that a mass market for PEVs could be achieved without significant new investments if the right policies are put in place.[38] However, modelling conducted by the Sacramento Municipal Utility District shows that managed charging will likely be needed at higher levels of vehicle penetration to minimize distribution system investments.[39] Likewise, the analysis done by the Pacific Northwest National Laboratory that demonstrates the potential for transportation electrification to reduce the marginal cost of electricity assumes charging is accomplished in a manner that takes advantage of existing spare capacity and does not require extensive grid upgrades. Real world data from the Department of Energy's "EV Project" demonstrate that, in jurisdictions without active utility PEV programs where time-of-use tariffs are either not available or not widely adopted, PEV customers will plug in and charge immediately upon returning home from work, exacerbating evening system-wide peak demand, but that in jurisdictions with effective utility education and outreach and time-variant price signals, the vast majority of PEV charging occurs during off-peak hours.[40] In other words, active utility programs, time-variant rates, and effective customer education and outreach will be needed to ensure that efficient transportation electrification benefits all utility customers in the long-term.

Conclusion

In light of the pressing need to accelerate the PEV market in the manner that supports the electric grid, NRDC urges the Commission to act expeditiously on Ameren Missouri's PEV pilot program.

[37] *See* California Auto Outlook, February, 2016; Pacific Gas & Electric, San Diego Gas & Electric, Southern California Edison, *Joint IOU Electric Vehicle Load Research Report 4th Report*, Filed on December 24, 2015.

[38] Energy and Environmental Economics (E3), *California Transportation Electrification Assessment Phase 2:Grid Impacts*, October 23, 2014.

[39] Berkheimer, J., Tang, J., Boyce, B., and Aswani, D., *Electric Grid Integration Costs for Plug-In Electric Vehicles*, SAE Int. J. Alt. Power. 3(1):2014, doi:10.4271/2014-01-0344.

[40] *See* http://www.theevproject.com/documents.php

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CERTIFICATE OF SERVICE

I hereby certify that a true and correct PDF version of the foregoing was filed on EFIS and sent by email on this 28th day of September, 2016, to all counsel of record.

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