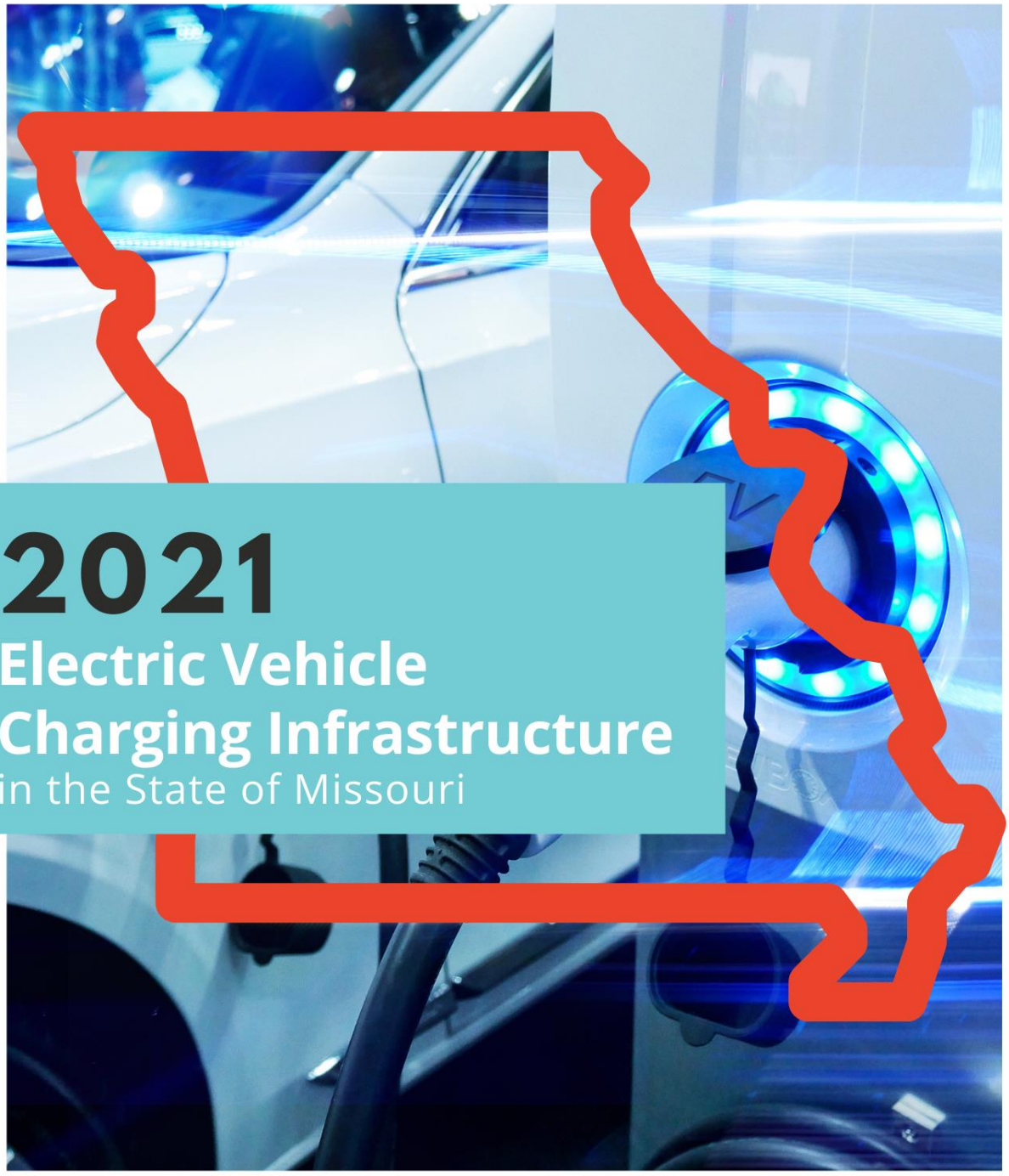

2021
Electric Vehicle Charging Infrastructure
in the State of Missouri

MissouriEnergyInitiative
Leadership for our energy future

Prepared by:Travis Wood

In Collaboration with

ELECTRIFY MISSOURI

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Missouri Energy Initiative (MEI) is a Missouri 501c3 public private partnership of nearly 30 companies and organizations committed to collaborative solutions. Their mission is to work to identify opportunities and solutions to meet Missouri's energy needs through support and facilitation of energy economic development, education, research and pragmatic policies.

MissouriEnergyInitiative
Leadership for our energy future

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E-MO seeks to advance policies at the state and municipal level that will prepare Missouri for an electrified future.

Advancing ordinances and incentives will allow for appropriate electrical infrastructure to support the current and future of electric vehicles (EV) in Missouri. Neighboring states and cities have already moved forward in their efforts to attract EV users as a means to encourage new residents, additional business, and updated technology which is an overall positive impact on the economy. In addition, there is a direct benefit that EV's provide to our public health.

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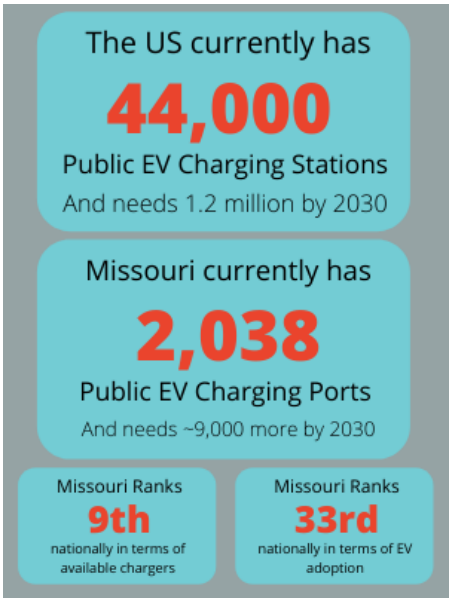
Executive Summary



Like many states, Missouri has been working to embrace and balance the transition to electric vehicles. With major automakers announcing plans to go electric, electric vehicle (EV) sales steadily increasing, and advances in battery technology and vehicle range; the EV industry is rapidly growing and many are asking the question of whether Missouri is ready. Does Missouri have the charging infrastructure it needs to support this expanding market?

The U.S. has ~ 44,000 public charging stations, but an estimated 1.25 million statons will be needed by 2030. While U.S. Department of Energy projections show that Missouri's ~2,030 public charging station ports are enough to support the approximately 9,000 EVs currently on the road, estimates show that an additional 8,000-plus charging ports will be needed within the next several years to meet expected EV adoption growth. While Missouri's number of EV registrations in terms of available charging ports ranks 9th nationally, the state ranks 33rd in EV adoption.

Notwithstanding Missouri's national ranking for charging ports in 2021, available charging infrastructure isn't evenly distributed throughout the state, with the majority of charging stations found only in Missouri's metropolitan areas. Missouri is unique in that, unlike the country as a whole, the majority (70%) of the state's charging stations are owned and operated by electric providers. Charging infrastructure has also been deployed using utility incentives, Volkswagen Settlement funding distributed by the state, and private investments by Tesla, site hosts, and third-party investors.

As Missouri looks to add thousands of charging station ports statewide, several obstacles and deployment gaps pose challenges to be overcome. Key stakeholders in the state identify high upfront costs for installation and operation of charging stations, poor return on investment opportunities, low EV adoption levels, and a lack of statewide coordination as the primary obstacles to expanding the public charging network in Missouri. In addition to these

obstacles, deployment gaps, including the state's rural communities and multifamily dwellings present hurdles to ensuring the benefits of transportation electrification are accessible to all Missourians.

Introduction

With major automakers announcing their intent to go electric in the coming years, electric vehicle (EV) sales increasing year to year, and advancements in battery technology expanding vehicle range, EVs are here to stay. Linked with EV adoption is the need for charging infrastructure to enable EV users to get from point A to point B – whether it's the short drive to the office or the road trip across the state. This survey of the Missouri electric vehicle charging landscape provides an overview of the status of public charging infrastructure in the state, from the extent of deployment and the location of charging stations to the programs and policies in place and what the future may hold for the industry. Our hope is that with the expected growth of the EV industry and attention on the sector, this paper will support greater and more effective collaboration between partners, allowing for a more efficient and cost-effective use of resources.

This document provides a comprehensive overview of the current status of public EV charging infrastructure in Missouri, highlights the activities of key players impacting the deployment of charging stations, and identifies existing barriers to developing an effective network of charging stations that meets current and anticipated market demand. Through a series of stakeholder interviews with key players in the EV charging industry[1] and extensive research, MEI has compiled this overview to be shared and used by decision makers and interested parties to deploy charging infrastructure in a manner that promotes local economic development, job creation, equitable access to new technologies, efficient use of existing infrastructure and resources, health and comfort benefits, and affordability, as Missouri's EV market continues to grow.

[1] see Appendix A for a list of organizations interviewed.

The National EV Landscape: EV market is young, but growing fast

Electric vehicles represent just 2% of new vehicles on the road today, but the EV market is growing steadily[2]. While estimations of the future growth of the EV industry vary by source, they all point to consistent growth over time as battery technology improves and costs decline. Nationally, the automotive industry expects EV adoption to grow from 1.5 million to 18.7 million vehicles by 2030[3]. EV market share is expected to reach 10% in just a few years by 2025, 28% by 2030, and 58% by 2040[4]. Growth in EV adoption is due to a variety of factors, including state and local policies, and private industry is moving in the direction of EVs. The automotive industry is increasingly embracing electrification, with Alliance for Automotive Innovation members, which produce nearly 99% of cars and trucks sold in the U.S., planning to invest $250 million in vehicle electrification by 2023[5]. Ford plans to spend $11.5 billion on EVs through 2022, including $3.2 billion for new all-electric vehicles, such as the F-150. GM announced it will invest $27 billion in EVs and associated products through 2025. There are ~ 40 models of EVs on the road today, with an additional 90 models expected to be introduced by 2030[6].

Federal policy is also pointing towards an increase in the number of EVs on the road. Through an executive order, the Biden administration set a federal goal of half of all new vehicle sales to be zero-emissions vehicles by 2030. While not legally binding, the goal is supported by major U.S. and foreign automakers serving the U.S. market. The 2021 Infrastructure Investment & Jobs Act includes funding earmarked for the expansion of electric vehicle charging infrastructure, as well as policies to incentivize EV charging station deployment, such as the extension of the federal tax credit for companies hosting charging stations.

[2] Pew Research Center, 2021. https://www.pewresearch.org/fact-tank/2021/06/07/todays-electric-vehicle-market-slow-growth-in-u-s-faster-in-china-europe/
[3] Edison Electric Institute, 2018. https://www.edisonfoundation.net/-/media/Files/IEI/publications/IEI_EEI-EV-Forecast-Report_Nov2018.ashx
[4] Bloomberg New Energy Finance, 2020. https://about.bnef.com/electric-vehicle-outlook-2020/
[5] Alliance for Automotive Innovation, 2021. https://www.autosinnovate.org/posts/press-release/statement-on-greenhouse-gas-emissions
[6] Reuters, 2021. https://www.reuters.com/article/us-autos-electric-forecast/outside-of-tesla-future-ev-sales-in-u-s-may-be-thin-for-most-brands-study-idUSKCN1SZ20I

Coupled with the growth of EV adoption is the need for charging infrastructure to support electrification of the transportation sector. From homes and workplaces to shopping centers and highway rest stops, chargers need to be in place to support a transition from vehicles powered by internal combustion engines and gasoline to those powered by batteries and kilowatts. While up to 80% of charging takes place at the home, there remains a need for public charging infrastructure to support EV drivers. For EV users commuting to work, up to 25% of their charging takes place at work, while public and highway corridor charging locations are used only 5% of the time.[7] Yet, public charging infrastructure makes longer trips possible and allows EV users to "top off" as needed, an important consideration for potential EV owners evaluating whether to purchase an EV.

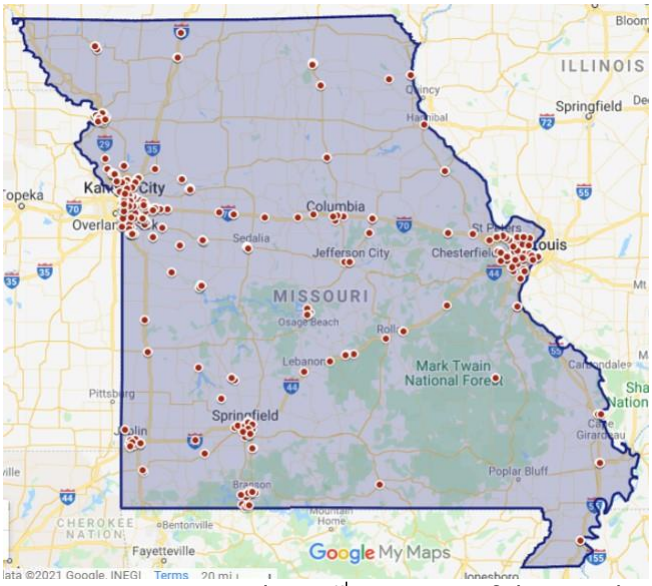
Nationally, the U.S. has ~ 44,000 EV charging stations available to the public, with access to ~ 109,000 charging ports[8]. Yet, an estimated 1.25 million charging stations will be needed by 2030 to support a projected 20 million EVs being added to the road[9]. Like a gas station can contain many pumps, charging station locations can contain few or many ports and those ports can either be alternating current (AC) charging Level-2 (L2) ports or direct current (DC) fast charging (DCFC) ports. Approximately 90% of the stations currently in place are L2 chargers, which use a 240-volt outlet, like ovens or clothes dryers, beyond the120-volt outlet typically found in residences. These chargers are typically located at residential or commercial properties, allowing EV users to "top-off" their battery, providing 25-30 miles of driving range per hour, with a full charge requiring ~ 8 hours of charge time to get 200 miles of driving range. The remaining chargers, typically located in public and commercial spaces (rest stops, shopping centers, office buildings), are DCFC units. DCFC stations require a 480-volt outlet and provide 125 miles of driving range in 30 minutes, achieving a full charge in less than 1 hour. L2 chargers cost between $2,000 and $5,000 to install, while DCFC units can cost more than $100,000 per station. While EVs can be charged from standard three-pronged 120-volt sockets, it can take up to 40 hours to get 200 miles of range using the "trickle charging" method.

[7] Hardman et al., 2018. https://phev.ucdavis.edu/wp-content/uploads/a-review-of-consumer-preferences-and-interactions-with-electric-vehicle-charging-infrastructure.pdf
[8] U.S. Department of Energy Alternative Fuels Data Center, 2021. https://afdc.energy.gov/stations/#/find/nearest
[9] The Brattle Group, 2020. https://brattlefiles.blob.core.windows.net/files/19421_brattle_-_opportunities_for_the_electricity_industry_in_ev_transition_-_final.pdf

Distribution of charging infrastructure in Missouri

According to the Missouri Department of Revenue, there were 8,979 registered light duty EVs in Missouri as of January 1st, 2021. According to the U.S. Department of Energy (DOE)'s EV Infrastructure Projection Tool[10], Missouri needs a total of 785 charging ports, including 752 L2 charging ports, and 33 DCFC ports to support the electric vehicles currently on the road. Missouri is home to 970 stations and 2,038 charging ports[11] (**Figures 1** and **2**), exceeding the charging infrastructure the DOE predicts is necessary to support the current level of EV adoption in the state. Of the, 2,038 charging ports, 1,823 are L2 and 215 are DCFC. Of the DCFC ports, 127 (59%) are Tesla ports accessible only to Tesla EVs.

Figure 1. Location of Charging Station Ports Throughout Missouri[12]



Missouri ranks 33rd in terms of the number of EVs on the road as a share of registered vehicles at 0.12%, but ranks 9th in terms of the number of registered EVs compared to publicly available charging ports[13]. Looking at the number of charging ports per capita; Missouri ranks in the middle of the pack at a more modest 17th. Missouri has relatively robust charging

[10] U.S. DOE Alternative Fuels Data Center Electric Vehicle Infrastructure Projection Tool (EVI-Pro) Lite. https://afdc.energy.gov/evi-pro-lite

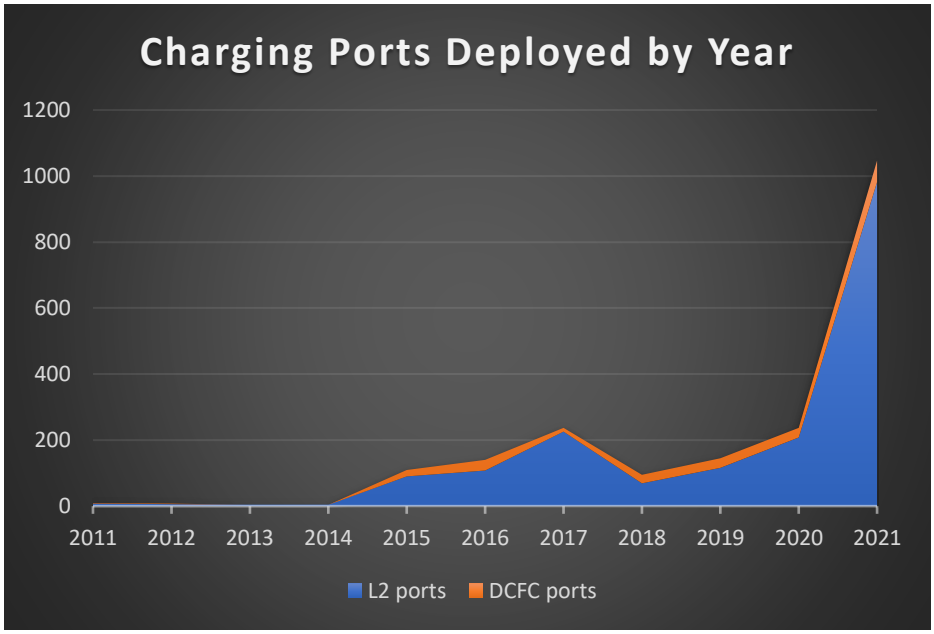
[11] U.S. DOE Alternative Fuels Data Center, 2021. https://afdc.energy.gov/stations/#/find/nearest

[12] MEI-developed map showing charging stations locations based on charging type and station owner can be accessed here: https://www.google.com/maps/d/u/0/edit?mid=1ySolloDrApyOCAyDBRSTjHMVy9VtLFtr&usp=sharing

[13] Rankings determined using U.S. DOE Alternative Fuels Data Center data for publicly available charging stations and EV registrations by state, as well as the U.S. Department of Transportation, Federal Highway Administration.

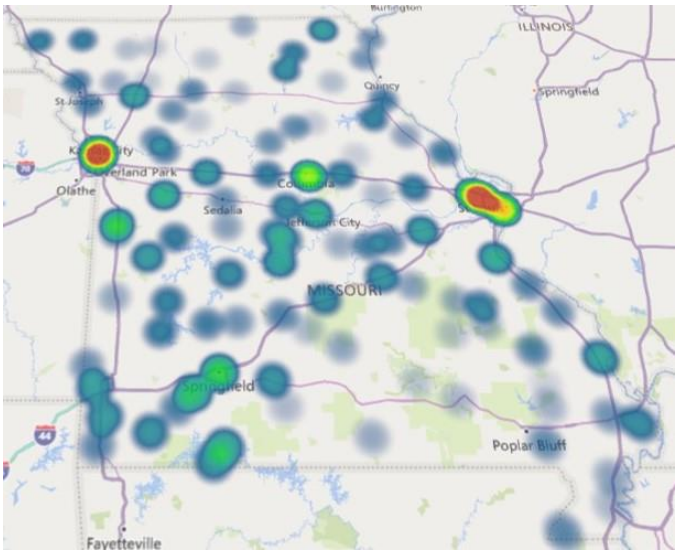
infrastructure to support the current level of EV adoption in the state, but the rate of adoption has been slower than most states, with a lot of room to grow, along with the charging infrastructure to support that growth.

Figure 2. Charging Ports (L2 & DCFC) Deployed by Year



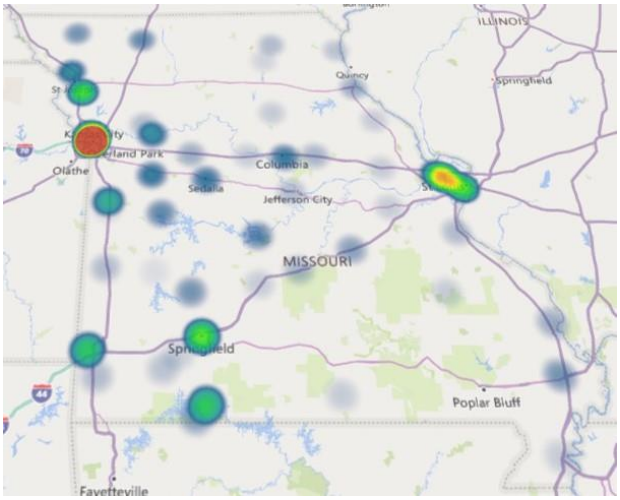
EV adoption rates and charging infrastructure are unevenly distributed within Missouri. Examining EV adoption rates in the form of registered EVs per total registered vehicles by county, show St. Louis, St. Louis City, Platte, St. Charles, Boone, Jackson, Clay, Greene, Christian, and Cass counties rounding out the top 10, with the major urban areas in the state – St. Louis, Kansas City, Columbia, and Springfield metropolitan areas hosting the bulk of EVs (**Figure 3**).

Figure 3. Registered EVs/Total Registered Vehicles



Data at the county level tells a similar story when examining the number of charging station ports installed across the state (**Figure 4**).

Figure 4. # Of Charging Ports by County



Charging station port density largely parallels EV adoption rates, with the Kansas City area having the greatest density of charging ports, followed by the St. Louis area, and Springfield, while charging stations are much more difficult to find in Missouri's rural communities where EV adoption is lowest. While the level of EV adoption is closely linked to the density of available charging infrastructure, it's not the only factor. The deployment of charging stations is impacted by a variety of factors, many of which will be touched on in this paper, including vehicle availability, available financial assistance - including utility incentives and grant funds, proximity to major highway systems, local ordinances or initiatives, issues of equitable access to beneficial technologies, and environmental health concerns.

While it can be argued that Missouri as a whole may have sufficient charging infrastructure in place for the current level of EV adoption, the state is projected to have 201,000 EVs on the road by 2030, with 10,370 charging ports needed to support EV drivers.[14] This would require more than 8,000 charging ports to be deployed over the next several years. Given the growth rate of charging infrastructure in the state up to this point, an acceleration of the deployment of charging stations will need to occur to support predicted EV adoption rates (**Figure 5**).

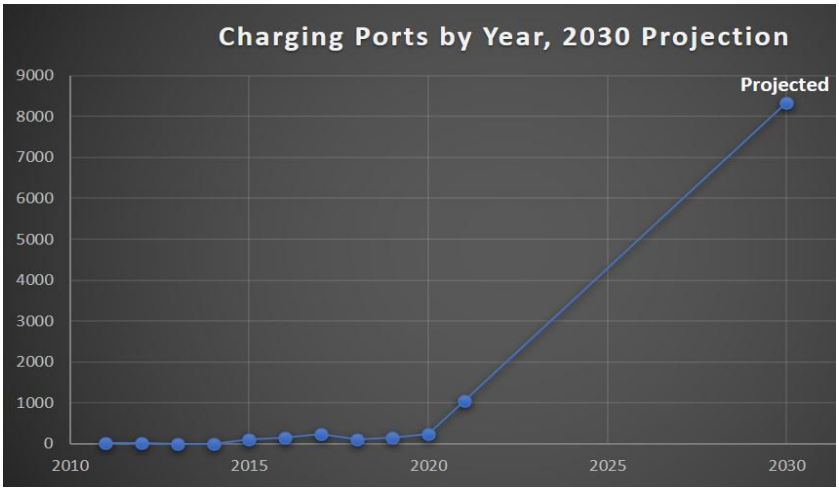


Figure 5. Charging Ports by Year, 2030 Projection

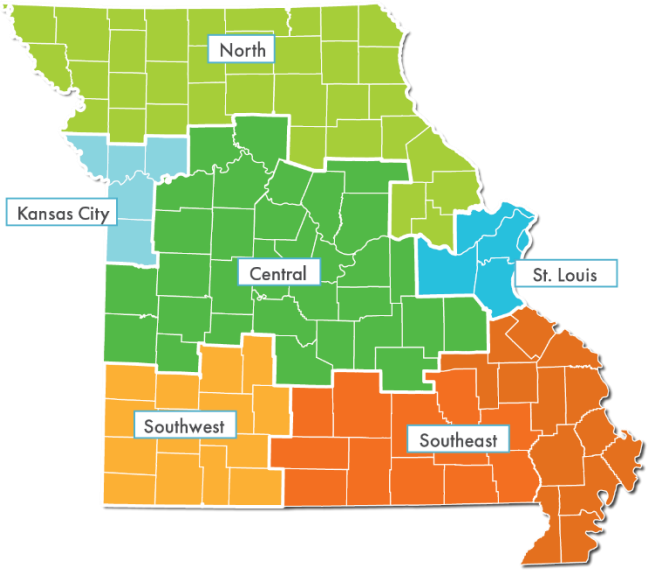
Utilities, private companies, and governments are making

[14] National Renewable Energy Laboratory (NREL), 2017. https://www.nrel.gov/docs/fy17osti/69031.pdf

decisions now that will impact what the EV industry and charging infrastructure landscape will look like in Missouri decades from now.

Planning how 8,000-plus additional charging ports will be deployed, where they will be located, what technologies they will encompass, and who will have access to them will require a 10,000-ft view of the issues, as well as a regional and local account of the unique characteristics that will impact the direction of charging infrastructure deployment. What follows is an overview and analysis by economic development region, as defined by Missouri's Department of Economic Development[15] (DED) (**Figure 6**), of the current status of EV charging infrastructure and actions taken to build out charging stations across the state.

Figure 6. Mo DED Economic Development Regions



Regional Spotlight: *Kansas City Region*

The Kansas City (KC) region, including Cass, Clay, Jackson, Platte, and Ray counties leads the state in number of charging ports deployed and is second to the St. Louis region in the level of EV adoption. The KC region accounts for nearly 60% of the total charging station ports deployed in the state (**Figure 7**), but only 23% of the registered EVs on the road in Missouri. This is due in part to the large number of wealthier communities on the Kansas side of the border served by Evergy, many of whom work in or travel to the Missouri side of the border.

[15] Missouri Department of Economic Development: https://ded.mo.gov/contact-us#mini-panel-contact-information3

The KC region has a high density of L2 charging infrastructure, but far fewer DCFC stations, with L2 ports making up 98% of the charging infrastructure in the region. The KC region accounts for 65% of the state's L2 ports, but has a lot of room to grow its network of fast chargers, with only 13% of the state's DCFC ports. Research by the International Council on Clean Transportation (ICCT) showed the Kansas City metropolitan area has one of the highest deployments of public chargers per capita in the country, but had relatively low EV adoption compared to other major metropolitan areas[16]. Of the fifty largest metro areas, only KC had a sufficient number of charging ports to serve the number of EVs projected to be on the road in 2025. Rocky Mountain Institute (RMI) identified KC as a regional metropolitan leader in EV infrastructure in 2020.[17]

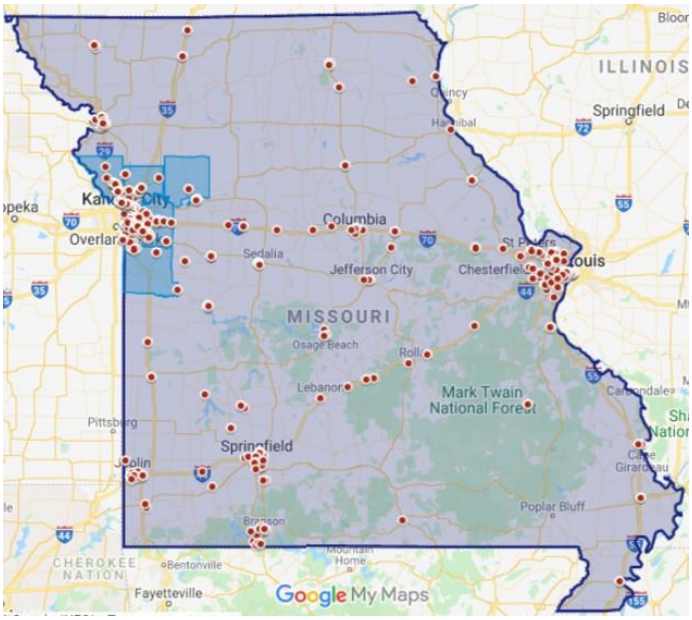


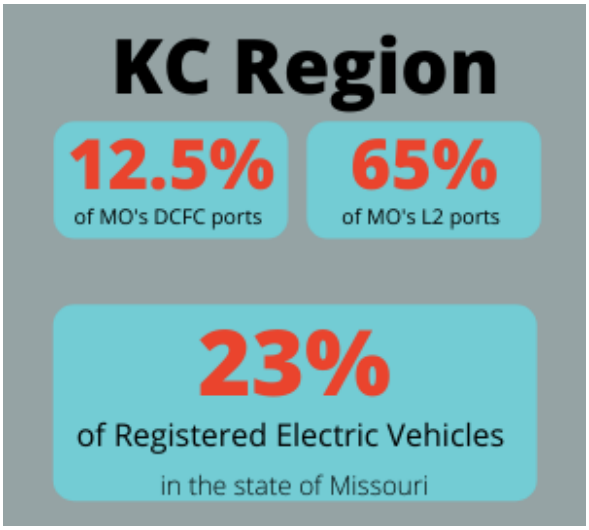
Figure 7. Location of Charging Station Ports Highlighting KC Region

The story of the development of the KC region's EV market is a tale of EV adoption following in the wake charging station deployment. The "if you build it, they will come" model. The development of a robust EV charging network in the KC market is due almost entirely to the proactive deployment of publicly-available L2 stations by Evergy, the regional electric utility. Missouri is unique, with utilities primarily driving the development of the state's public charging network. Nationally, the majority of charging stations are privately owned, with only ~ 3% of public stations owned by utilities[18].

[16] ICCT, 2019. https://theicct.org/publications/charging-gap-US

[17] Rocky Mountain Institute, 2020. Metropolitan rankings based on the number of charging stations within 20 miles of the city center, number of charging stations within 5 miles of the top day-trip destinations, and the number of charging stations at airport facilities. https://rmi.org/taking-a-regional-approach-to-electric-vehicle-readiness/

[18] Information provided during stakeholder interview with Edison Electric Institute.



Of the 2,038 public charging ports listed in Missouri, utilities own and operate 67% of them, with Evergy owning the lions share (63%) of the public charging infrastructure in the state. Within the KC region, Evergy's influence is even more pronounced, with 91% of the ports installed by the utility company. Headquartered in the city of Kansas City, Evergy, formed as a result of the merger between Kansas City Power & Light and Westar Energy in 2018, began the rollout of its Clean Charge Network (CCN) in 2015. That initial buildout is complete, with the deployment of 636 stations in Missouri, consisting of 1,250 L2 ports and 11 DCFC ports within its service territory.

Evergy built out the CCN under the utility owner-operator model, directly deploying and managing the stations, rather than offering incentives to spur private investment in EV charging infrastructure. The utility company installed this vast array of chargers in an effort to serve as a catalyst to jump-start the EV market in the region. Evergy and other utility companies view electrification of the transportation industry as an opportunity to expand the use of electricity. In addition to the increased revenue growth such electrification will create, it also allows for the more efficient utilization of existing resources. Electric providers like Evergy have grids designed to meet peak demand, providing reliable power when air conditioners are being run during the height of summer. Yet, those grid systems are underutilized outside of peak demand periods, such as the overnight hours when demand is lowest. If EVs are charged during those off-peak overnight periods, when demand is low, the electrification of transportation provides an opportunity to increase sales and revenue, while also utilizing existing resources more efficiently. The more efficient use of resources allows electric providers to lower rates for all customers, as the providers costs per kWh generated decreases.

Since the establishment of the CCN, the KC region has experienced significant growth in EV adoption compared to Evergy's central Kansas service area, where few charging stations

have been deployed[19]. Research has shown a strong link between the growth of EV adoption and the number of public and workplace charging station ports, with markets with the greatest level of EV adoption having four times more public charging available compared to the national average[20]. Public charging infrastructure can reduce range anxiety, while also increasing awareness of electric vehicles among the general public. Consumer survey data consistently points to the availability of public charging as a major consideration when evaluating whether or not to purchase an EV.

While Evergy's CCN made hundreds of L2 stations available to the public, the network only includes 11 DCFC ports. Evergy's plan for future charging infrastructure development includes offering incentives to spur private investment in charging stations, continuing to deploy additional stations directly as needed, and offering rates to incentivize off-peak charging. Evergy's proposed transportation electrification programs are currently being evaluated by state regulators[21].

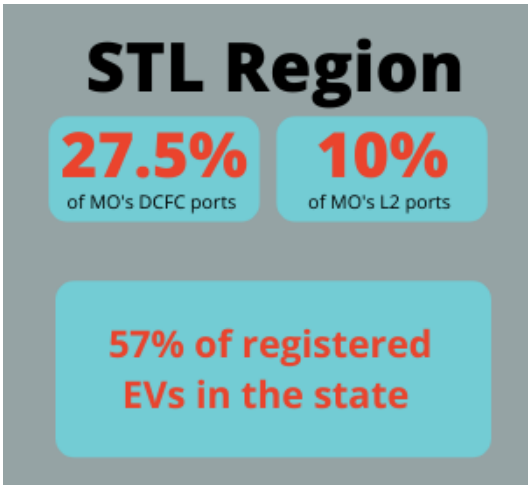
While Evergy has had the greatest impact on the region's public charging network, it's not the only player in the area. The company is part of a pilot project funded by a $5.2 million grant from the U.S. DOE and spearheaded by the Metropolitan Energy Center (MEC). Project partners also include the National Renewable Energy Laboratory (NREL), Missouri University of Science & Technology (Missouri S&T), Lilypad EV, EVNoire, and Westside Housing. The project is focused on providing equitable access to EV charging in underserved areas that lack access to charging stations. Publicly-available charging stations will be deployed on existing streetlights. Based on traffic patterns, demographics, and other variables, NREL and Missouri S&T identified locations with expected market demand coupled with a lack of current options for charging at home, such as near multifamily dwellings. Project partners are engaging with the community to determine final locations for the charging stations, with the hope of installing 30-60 units. The intent is to utilize data from the study to determine if streetlight charging might be a viable option for KC, as well as other cities looking to improve access to charging stations.

[19] Evergy's 'Transportation Electrification Portfolio' application filed with the Missouri Public Service Commission (Case # ET-2021-0151).
[20] International Council on Clean Transportation, 2016. https://theicct.org/leading-us-city-electric-vehicle-2016
[21] Those plans are discussed in more detail in the Key Stakeholders: Utilities section on page 15.

While the City of Kansas City has not passed EV-ready ordinances for new or existing construction, building codes do allow EV charging stations to count towards minimum parking space requirements for developments and restrict EV charging stations for use by EVs only[22]. The city manager recently announced the city's fleet electrification initiative. The city plans to purchase electric vehicles when feasible, but the initiative doesn't include specific goals or reference supporting charging infrastructure. The city is currently in the process of developing a new climate protection and resiliency plan, which may include EV-related goals, but the city has not developed a long-term plan regarding EV charging infrastructure.

The Kansas City Area Transportation Authority is in the process of adding electric buses to its fleet after receiving a $3.3 million grant from the U.S. Department of Transportation's (DOT) Low- or No-Emission Grant program. Additional electric buses have been funded by the Federal Transit Administration (FTA) along with matching funds from the city's transportation sales tax and sponsored by Evergy. Kansas City International Airport was also the first airport in the country to introduce electric shuttle buses to its fleet, purchasing three electric buses in 2017 and an additional three in 2020.

Regional Spotlight: *St. Louis Region*



While the KC region accounts for over half of all charging infrastructure in the state, the St. Louis (STL) region, including St. Louis City, St. Louis County, St. Charles County, Franklin County, and Jefferson County account for over half (57%) of all registered EVs on the road in the state, but only 12% of deployed charging station ports (**Figure 8**). Compared to the KC region, the STL region has a more balanced deployment of charging infrastructure, with L2 chargers making up 75% of the infrastructure and DCFC ports making up 25%.

Just as Evergy played a significant role in the development of EV charging on the west side of the state, Ameren Missouri has facilitated much of the growth of charging infrastructure

[22] Great Plains Institute, 2019. https://www.betterenergy.org/wp-content/uploads/2019/06/GPI_EV_Ordinance_Summary_web.pdf

on the Eastern side. Unlike Evergy, Ameren has relied on incentive programs to encourage private investment in charging stations, rather than direct deployment under the utility owner-operator model. Ameren dedicated $11 million to its 'Charge Ahead' electric vehicles program, which includes incentives for DCFC stations along highway corridors and local charging incentives for the installation of L2 or DCFC stations at workplaces, multifamily dwellings, and publicly-accessible locations.

13 DCFC stations have been deployed as a result of Ameren's corridor charging program, which provided up to $360,000 towards line extension and upfront installation costs per project. Ameren's local charging program has resulted in the funding of 48 projects, including five multifamily, 20 public locations, and 23 workplace projects. Ameren expects to facilitate the installation of 1,000 charging ports at more than 350 locations by the end of the three-year program[23]. In addition to Ameren's incentive programs, the company is conducting an education and outreach campaign to help increase EV adoption and has committed to electrifying its fleet, including 100% of new light-duty vehicles purchased by 2030. Ameren is also spearheading a collaboration among Midwestern utilities that have committed to building a network of EV charging stations across the Midwest. The coalition spans 11 states and each company signed a memorandum of cooperation with an aim to have the charging infrastructure in place by the end of 2022.

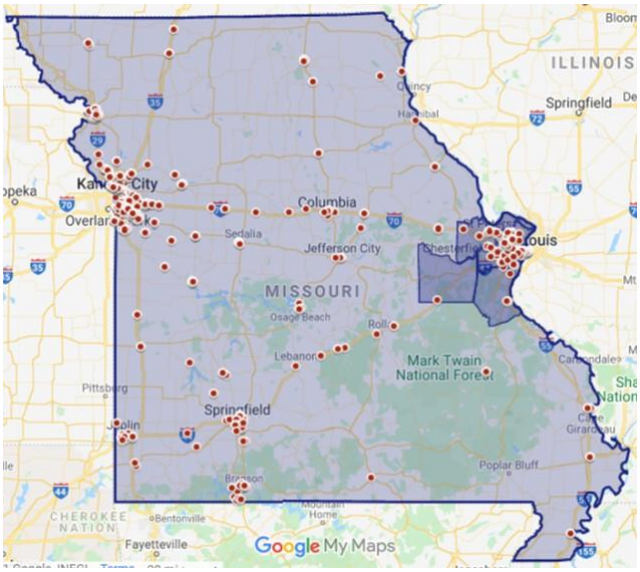


Figure 8. Location of Charging Station Ports Highlighting STL Region1

In addition to Ameren's programs to help grow the EV industry in its service territory, the City of St. Louis has taken strides to prepare for a world with more EVs on the road. In February 2021 Mayor Lyda Krewson signed bills mandating either EV readiness or installation of

[23] Ameren's EV planning and charging infrastructure programs is reviewed in more detail in the Key Stakeholders: Utilities section on page 36.

charging stations for new construction and retrofit projects[24]. The first of the requirements go into effect in January 2022, with all requirements to be phased in by 2025. The 2022 requirements apply to new single-family, multifamily, and commercial construction projects, as well as major rehabilitation projects for commercial buildings. Commercial projects will require EV-ready parking spaces, as well as the installation of charging stations, while residential projects will need to be made EV-ready through the installation of outlets that can support charging units.

According to the City, the cost of making new construction multifamily projects EV-ready could range from $750 - $2,000, while retrofits could cost up to $10,000 per project. EV-ready outlets for single-family residential new construction are expected to cost ~$380, while the installation of actual charging stations could cost between $800 and $1,170. Based on these numbers, the city expects cost savings for projects in the long-term, as fewer properties will require expensive retrofits to add charging infrastructure post-construction. The city also expects Ameren's incentive offerings to help property owners and developers manage the added project costs associated with the ordinances.

The City of St. Louis has committed to reaching carbon neutrality by 2050 and 100% clean energy by 2035, citing a variety of benefits related to EV adoption, including reduced air pollution and carbon emissions, opportunities for workforce development, and reduced operating costs over time. The City plans to purchase EVs and invest in supporting charging infrastructure for its municipal fleet using Volkswagen Settlement Environmental Mitigation Trust (VW Settlement) funds[25].

Richmond Heights, a suburb of St. Louis City, was the first municipality in Missouri to pass EV-ready ordinances. The community passed ordinances for new construction to be EV ready for both single family homes and multifamily dwellings. St. Louis County recently passed an 'Electric Vehicle Charging Code'[26], which applies to new construction and major remodel projects for commercial, industrial, institutional, recreation, entertainment, cultural, municipal,

[24] City of St. Louis Board Bills 162CS, 163CS, and 181.
[25] Missouri Department of Natural Resources VW Settlement Trust Funds Page can be found here: https://dnr.mo.gov/air/what-were-doing/volkswagen-trust-funds. Missouri's VW Settlement funding process is detailed on page _ of this document.
[26] St. Louis County Electric Vehicle Charging Code, adopted 10/19/21. https://www.stlmuni.org/wp-content/uploads/2021/10/STL-County-Commercial-EV-Bill-No.-75-2021.pdf

and park land properties. Under the provisions of the new set of codes, projects with 10 or more required parking spaces must make 10% of the parking spaces 'EV-ready' and 2% must have charging stations installed.

Like the KC region, there is a focus in the STL region on exploring ways to make transportation electrification available to a broader segment of the community beyond existing EV owners. Forth, a nonprofit focused on accelerating the use of electric and smart transportation in an equitable manner, won a grant from the U.S. DOE Advanced Innovation Vehicle Technologies office to implement the St. Louis Vehicle Electrification Rides for Seniors (SiLVERS) project. The SiLVERS pilot project aims to increase EV adoption and reduce transportation costs for social service agencies in low-income communities. The project is part of a collaboration between Forth, the City of St. Louis, The Natural Resources Defense Council (NRDC), and Bloomberg Philanthropies through the American Cities Climate Challenge. EVs will be provided to community organizations to transport senior residents. The project, which will run through 2023, includes data collection from charging stations and analysis to develop a financially sustainable model for fleet electrification for cities, organizations, and agencies. Ameren's incentives will be utilized to reduce station installation costs.

The STL area is also home to workforce development related to the growing EV charging station industry. The Electrical Connection, a partnership of the International Brotherhood of Electrical Workers (IBEW) Local One and the St. Louis Chapter of the National Electrical Contractors Association, developed a training curriculum in 2011 for electricians and electrical contractors focused on the installation of charging stations. Over 100 electricians and 20 contractors have been trained through the program and it's been used to train workers across the country to prepare them to take advantage of a growing industry. Trained contractors are able to act as a one-stop-shop for installation projects, from technical and permitting expertise to siting stations appropriately and taking advantage of available incentives.

Like the KC region, St. Louis' transportation authority, Metro/Bi-State Development, has begun to invest in the electrification of its bus fleet. Metro utilized low- and no-emission grant funding through the FTA to add 18 electric buses to its fleet, with another six to be added in 2022. Charging infrastructure for the buses was built through a partnership with Ameren, with the company investing $11.3 million in a new substation to support overnight charging of the

buses, as well as supporting the increasing electrical needs of the surrounding area. Metro is committed to replacing buses with electric models going forward to provide economically and environmentally sustainable transit options to riders.

Bi-State, the development organization overseeing transit development in the region, is exploring the addition of charging stations to some of its park-and-ride lots. The lots are currently under-utilized, with surplus spots available for EV stations. The organization is evaluating the infrastructure costs required to run power to the stations. Bi-State previously put out a request for proposal (RFP), making the park-and-ride lots available to private companies to invest in charging infrastructure. Bi-State only received a marginal response to the RFP and no projects crossed the finish line. Even with Ameren's incentive offerings, Bi-State needs outside funding to make the project work.

Through a U.S. DOE Vehicle Technologies grant, a coalition of 14 states received funding for a DRIVE Electrification USA initiative to build Drive Electric programs at the state level to increase EV adoption and expand charging infrastructure. The St. Louis and Kansas City Regional Clean Cities initiatives are growing a statewide coalition to develop an Electrify Missouri plan. An advisory committee is currently being formed to educate stakeholders on EV trends, coordinate EV-related actions, conduct statewide gap analysis of EV charging infrastructure, and engage fleets on electrification.

Regional Spotlight: *Southwest Region*

The Kansas City and St. Louis regions have led the way in terms of deployment of charging infrastructure, but the Southwest (SW) region is home to a strong public charging network and a significant number of the state's EV drivers. The SW region accounts for approximately 11% of the charging station ports installed statewide (**Figure 9**), nearly the same percentage as the St. Louis region and 8% of the state's registered EVs. Charging stations in the region are largely clustered in Branson, Joplin, and Springfield.

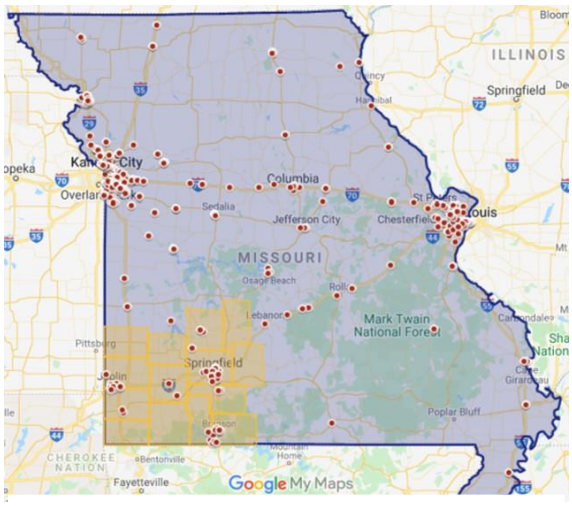
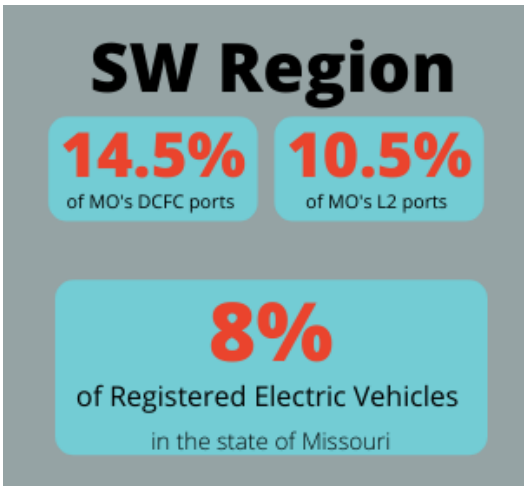


Figure 9. Location of Charging Station Ports Highlighting SW Region



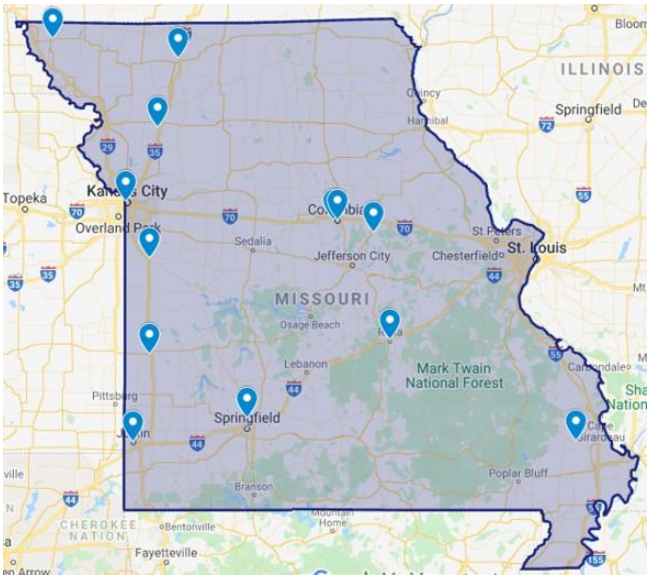
Like the Kansas City and St. Louis regions, the investor-owned electric provider, Liberty Utilities, has been active in the deployment of charging infrastructure and has plans to expand EV-related activities in the near term. Of the 226 charging ports in the SW region, over a quarter of them (27%) are owned by Liberty (formerly Empire District Electric Company) as part of the former utility's EVolve initiative to expand the adoption of electric vehicles in its service territory. Launched in 2015, the EVolve initiative combined rebates toward the purchase of EVs with the company's direct deployment of charging stations. The program was put on hold following the acquisition of Empire by Liberty.

Just as Evergy is waiting on state regulators to determine the company's path forward for its EV-related programing, Liberty's proposed transportation electrification programs are under review by the Missouri Public Service Commission (PSC), the regulatory body that oversees investor-owned utilities in the state. The proposed programs include incentives for the installation of residential charging equipment, direct deployment of chargers under the utility owner-operator model, and commercial rates for charging stations to reduce demand charges and improve the economics of owning and operating charging stations[27]. Liberty's proposed programs are focused on jump-starting the EV market in SW Missouri to create an environment conducive to the adoption of EVs and to fill gaps in private investment with the hope of attracting future investments in EV infrastructure in the region. One of the primary obstacles identified during stakeholder interviews was the high upfront costs and poor near-term return on investment (ROI) associated with owning and operating charging stations. Investor-owned utilities have the financial resources and internal drivers to fill market gaps in regions where EV adoption has yet to hit a critical mass to make operating charging stations anything but an investment in the future.

[27] See page _ of this document for a detailed review of Liberty's proposed EV-related programs.

The SW region is also home to two of the nine charging stations awarded through the Volkswagen Settlement Trust Located in the Springfield and Joplin areas; the stations are part of a minimum practical network of charging stations planned along highway corridors throughout the state to ensure EV drivers can crisscross the state without losing a charge (**Figure 10**). VW Settlement funding is funneled through the Department of Natural Resources and locations for the charging sites were selected through a stakeholder engagement process.

Figure 10. VW Settlement EV Charging Station Sites



City Utilities of Springfield, a municipal electric provider in the region is developing electrification programs as well. The utility offers an EV-Ready home rebate for the residential sector. The rebate covers up to $100 towards the installation of 240-volt outlets to support L2 chargers for new construction single-family homes. This incentive program is the initial offering of what City Utilities plans to be a broader electrification program in the future, including the potential for additional rebates for existing homes and business. City Utilities worked as a project partner with LilyPad EV, a distributer of ChargePoint stations, in the deployment of two DCFC stations funded through the VW Settlement process. City Utilities also operates Springfield's transit system and has deployed two electric buses, also funded through the VW Settlement Trust.

Regional Spotlight: *Central Region*

The Central region of Missouri ranges from Keytesville down to Lebanon and from Butler across to Potosi, including the cities of Columbia, Jefferson City, Rolla, and Sedalia. The region accounts for 8% of registered EVs in the state, similar to the SW region and 8% of all charging ports (**Figure 11**).

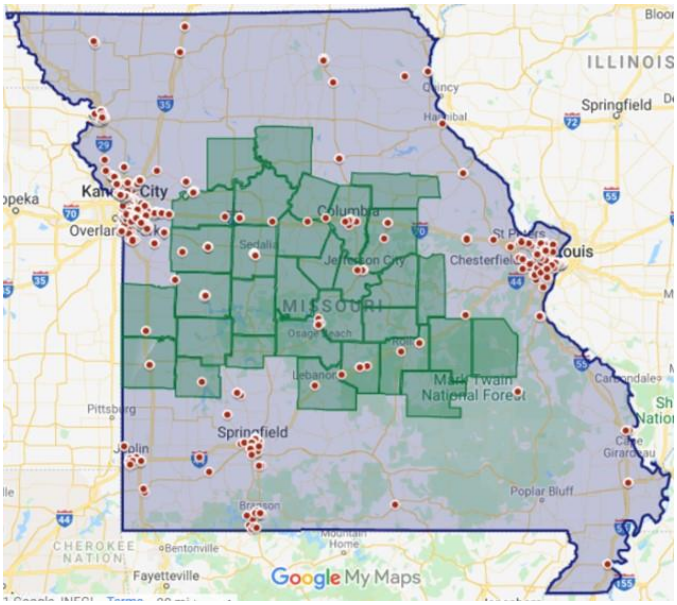


Figure 11. Location of Charging Station Ports Highlighting Central Region

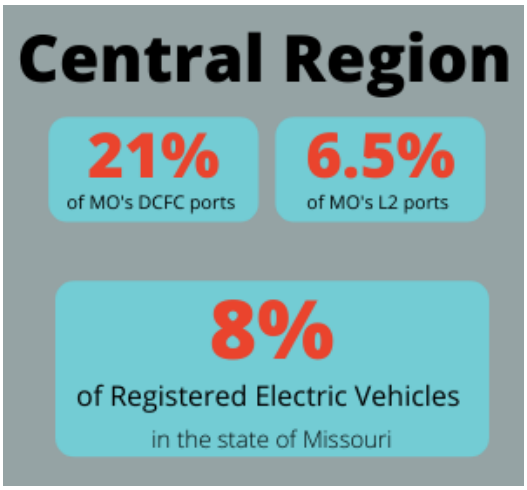
The region accounts for an oversized portion of fast-charging infrastructure in Missouri, accounting for 21% of all DCFC ports in the state. This may owe in part to the presence of major highway corridors crisscrossing the center of the state, including interstates 44 and 70, as well as highway 63, among others. These interstate connections have attracted investment by Tesla, as well as Ameren's corridor charging incentive program and VW Settlement Trust funding. Tesla accounts for 70% of the DCFC ports in the region, but they are currently accessible only to users of Tesla vehicles. Charging stations in Columbia and Kingdom City were awarded funding through the VW Settlement Trust and Rolla is one of four additional sites yet to be awarded during the first phase of the funding process.

The charging project in Kingdom City was a partnership between LilyPad EV, FastLane Convenience Store, and Callaway Electric Cooperative, with LilyPad EV acting as project developer, FastLane providing the parking spaces, and Callaway owning and operating the station. In addition to partnering and owning the Kingdom City station, Callaway offers its residential and commercial members a $250 rebate towards the installation of L2 charging stations[28].

Municipal utilities in the Central region, including the City of Columbia Water & Light (Columbia W&L) and Rolla Municipal Utility (Rolla Municipal), are taking a more reactive approach to planning for EV market growth. Rolla Municipal chose not to compete for grant funding through the VW Settlement process due to the perceived lack of demand for charging in the city paired with the significant upfront costs of installing a charging station, even with

[28] Additional information on Callaway Electric Cooperative's involvement in EV infrastructure is detailed in the Electric Cooperative Spotlight section on page_.

financial assistance. The utility is taking a wait-and-see approach, letting the market develop and looking for opportunities that make sense in the future.



Researchers at Missouri University of Science & Technology (Missouri S&T) in Rolla have several ongoing projects tackling EV charging-related issues, including a project focused on ultra-fast charging through a $2.9 million grant from the U.S. DOE. Project partners include Ameren Missouri, LG Chem Michigan, and Bitrode. The intent of the project is to aid in the development of a charging experience that is similar to the current gas station fueling experience, taking ~ 10 minutes, rather than 30 minutes or more. Project researchers are exploring the potential of energy storage systems to be paired with charging infrastructure to mitigate potential impacts to the electric grid from extreme fast charging. The university is also in the process of developing a high voltage laboratory, which could help test technologies related to EV fast-charging, powering light rail systems, and electrification of transit buses.

Columbia W&L is waiting on the completion of their integrated resource plan (IRP) to determine what their EV initiatives, among other programs will look like. The utility is modeling low, medium, and high EV adoption scenarios to determine how their future programs might impact the market. Columbia W&L collaborated with a customer who was awarded one of the VW Settlement-funded sites in their service territory, but the utility has no plans of owning and operating charging stations directly. The utility is more likely to move forward with incentive programs to foster growth of the industry, while letting the market drive adoption. With current EV adoption levels, the economics associated with owning and operating charging stations are difficult for the utility, as well as potential site hosts. Demand charges make owning a station cost-prohibitive when utilization is low and removing demand charges can negatively impact the utility's bottom line. Until the market reaches a tipping point, a balance needs to be struck between offering incentives to EV station owners to overcome upfront costs

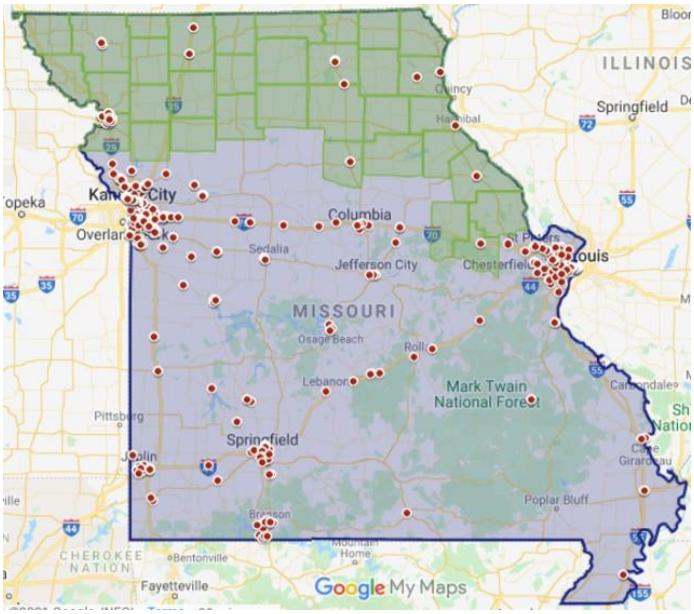
and demand charges to spur private investment, while ensuring utilities are making wise investments that are in the best interest of all of their customers.

The City of Columbia passed a Climate Action & Adaptation Plan in 2019[29], which includes a focus on reducing vehicle miles traveled and increasing vehicle fuel economy. The city was the first in Missouri to move forward with electrification of its transit fleet and is prioritizing the replacement of buses with electric and hybrid models moving forward.

Regional Spotlight: *North Region*

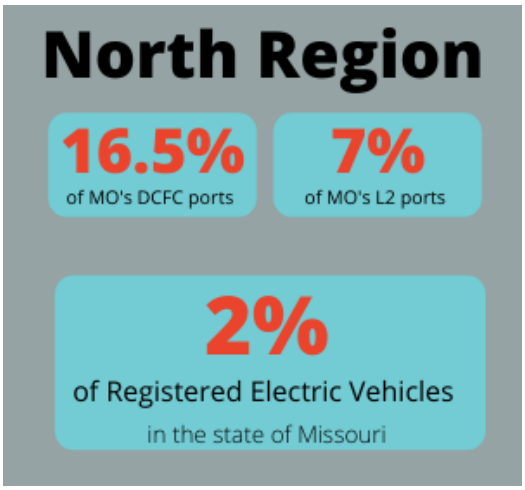
Missouri's North Economic Development region ranges from St. Joseph across to Hannibal, snaking down to Warrenton, and to the upper regions of the state, including Maryville and Kirksville. The region accounts for 8% of the state's charging infrastructure, but only 2% of the state's registered EVs. Nearly 17% of the state's DCFC ports are located in this region, with the majority of those (61%) being owned and operated by Tesla. The charging infrastructure in the North region is disproportionately found in St. Joseph (**Figure 12**).

Figure 12. Location of Charging Station Ports Highlighting North Region



66% of the region's charging infrastructure is part of Evergy's CCN, accounting for the preponderance of stations near St. Joseph, which is within the company's service territory. Portions of the region are also within Ameren's service territory, with access to the company's 'Charge Ahead' program incentives. In addition to available incentives, utility investment in charging stations, and Tesla's ever-expanding supercharger network, the VW Settlement funds facilitated the deployment of charging stations in Tarkio, Bethany, and Cameron. The stations are located at a grocery store, City Hall, and convenience store respectively.

[29] Columbia, MO Climate Action and Adaptation Plan. https://www.como.gov/sustainability/areas-of-focus/climate-action/



The North region is also home to Missouri's first electric school bus. Knox County R-1 School District was able to make the investment in an electric bus using VW Settlement funding, as well as investments by Associated Electric Cooperative and Lewis County Electric Cooperative. The school district purchased the bus as a pilot project to take advantage of a variety of benefits associated with electrification, including reduced emissions, maintenance cost savings, and a quieter and smoother ride for students. The school district intends to study how the bus performs compared to its diesel counterparts and is sharing data publicly comparing the electric bus to its diesel buses in terms of energy consumption, maintenance, and total cost of operation[30].

Regional Spotlight: *Southeast Region*

The Southeast (SE) region runs from Farmington down to the tip of the bootheel across to Ava and up to Roby, covering the region east of Springfield across the state south of Interstate 44. The SE region has the lowest density of charging infrastructure in the state, accounting for just 2% of statewide charging ports (**Figure 13**).

The region is also tied with the North region for the lowest level of EV adoption in the state, with just 2% of the state's registered EVs. While a portion of the region is within Ameren's service territory, with access to its 'Charge Ahead'

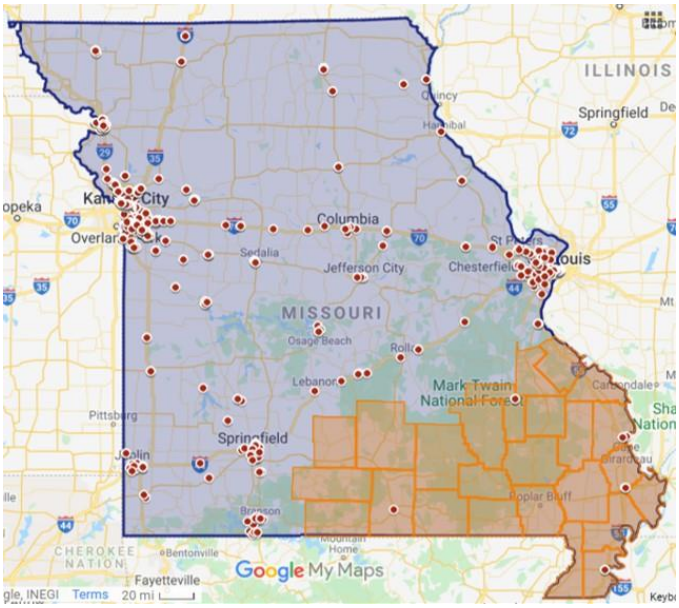
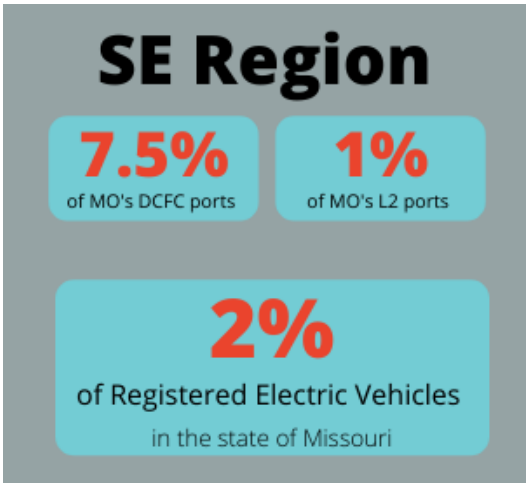


Figure 13. Location of Charging Station Ports Highlighting SE Region

[30] Knox County R-1 School District Bus Project page. https://sites.google.com/knoxr1.us/busproject/home?authuser=0

incentive programs, there has been little investment in charging infrastructure. This may owe in part to the low population density of the region compared to other economic development regions.

Despite the lack of charging infrastructure currently in place in the region, planning is being undertaken to prepare for an electrified future. The Southeast Metropolitan Planning Organization (SEMPO) set aside funding for the development of an EV readiness plan for the area in its budget for fiscal year 2022. SEMPO is a metropolitan planning organization focused on coordinating transportation planning and investments consisting of members of Southeast Missouri, including the city of Cape Girardeau, Cape Girardeau County, and the city of Jackson, as well as communities in southern Illinois. The intention of the EV readiness plan is to identify recommendations for local governments and transportation areas in SEMPO's planning area to expand the installation of charging stations and spur the adoption of EVs in the region.



Through the development of an EV readiness plan, SEMPO hopes to attract tourism dollars, economic development investments, and become better positioned to take advantage of grant dollars that may become available nationally. SEMPO recently contracted with Olsson, a consulting firm out of Overland Park, Kansas to develop the plan. SEMPO envisions the plan will include a stakeholder outreach process to determine the current need for charging infrastructure in the area and to identify the types and locations for chargers that match the needs of the community. The plan is also meant to identify barriers to the expansion of charging infrastructure within the planning area, such as existing building codes and permitting processes.

Perryville, one of the 13 locations identified through the VW settlement funding process for the deployment of charging stations along highway corridors, is expected to be awarded a charging station in December of 2021. No applications were received for this location during

the first round of grant awards, but the Missouri DNR expects a project to be awarded in the area by the end of the year.

Key Player Spotlight: Electric Providers

Missouri is home to a diverse array of electric providers, including Investor-owned Utilities (IOUs), Municipal Utilities, and Electric Cooperatives. Electric utilities have played a significant role in developing the state's EV charging landscape through construction of EV charging networks under the direct owner-operator model, offering programs to incentivize the expansion of EV infrastructure by private entities, rate design and strategic planning initiatives, and education and outreach to customers focused on EV ownership and charging infrastructure. Nationally, the majority of public charging stations are privately owned, with only ~ 3% of public stations owned by utilities[31]. In Missouri, utilities have played an outsized role in developing the state's EV charging network. Of the 972 charging stations, supporting 2,038 charging ports, utilities own and operate 684 (70%) of them. In addition to those charging stations directly owned by electric providers, there are those stations deployed by private entities using utility incentive programs.

Each type of utility has its own mix of internal and external drivers related to the planning and implementation of EV infrastructure strategy. Drilling down further, each electric provider, whether municipal, cooperative, or IOU, is responding to a unique set of opportunities and barriers. Regardless of those specific characteristics, electric providers have the unique opportunity to fill gaps in the deployment of charging infrastructure which aren't being filled by the private market. This section highlights a selection of various actions electric providers in Missouri have taken or are actively planning related to EV infrastructure, including a discussion of the regulatory landscape impacting IOUs.

Investor-owned Utilities

IOUs in Missouri have cited the need for direct involvement in the electrification of transportation and the expansion of associated EV charging infrastructure to ensure their customers are able to maximize the benefits of EV expansion, including the more efficient

[31] Information provided by Edison Electric Institute during stakeholder interview.

utilization of existing electric grid infrastructure when charging during off-peak hours, which when combined with increased electricity usage through EV adoption, can lower customer rates by spreading a wider base of revenue across the same fixed cost structure. Electric grids are developed to meet peak demand, with infrastructure being underutilized during off-peak periods. If EV charging occurs during off-peak hours, which can be encouraged through specific rate designs and demand-response programs, off-peak capacity can be more efficiently utilized. As a result, utility companies are incentivized to facilitate L2 charging at the home, which takes place at a lower power level and over a longer duration than fast charging. Utilities are working to maximize long-term, low-power charging during off-peak hours, while also working to ensure sufficient public charging infrastructure is in place to meet customer needs in their service territories. Additional benefits of electrification cited by utilities include air quality improvements due to reduced vehicle emissions, opportunities for local economic development, grid flexibility, fuel cost savings, and lower total cost of ownership for EV owners.

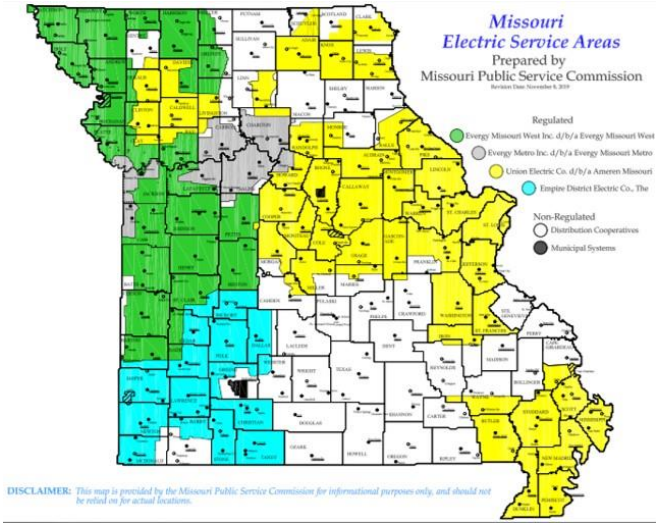
All of Missouri's IOU's have filed EV infrastructure programs with the PSC and both Ameren Missouri and Evergy have active programs, with Evergy's current programming focused on the direct ownership of charging stations and Ameren Missouri's current programming focused on incentivizing private investment in charging infrastructure. Both Evergy and Liberty Utilities have applications under review by the PSC for pilot programs encompassing a wide variety of programming, including incentives, director ownership, EV-specific rate designs, and customer education. Nationally, 52 electric companies in 31 states have approved electrification transportation programs as of January 2021[32]. IOUs in Missouri and across the country are exploring a variety of strategies to aid the expansion of charging infrastructure to support vehicle electrification. Ameren, Evergy, and Liberty have signed on to a memorandum of cooperation with several other midwestern utilities to partner on the development of an EV charging network across the Midwest by the end of 2022.

Investor-owned Utility Snapshot: *Evergy*

Evergy's service territory covers parts of western Missouri and eastern Kansas, including the Kansas City metropolitan area, providing electric service to 1.6 million customers in Missouri and Kansas (green and gray areas in **Figure 14**).

[32] Edison Electric Institute, 2021. https://www.eei.org/issuesandpolicy/electrictransportation/Pages/default.aspx

Figure 14. Missouri IOU Service Territories[33]



Evergy is headquartered in Kansas City, MO and was formed in 2018 through the merger of Kansas City Power & Light (KCP&L) and Westar Energy. With the rollout of the company's Clean Charge Network (CCN) beginning in 2015, Evergy has been proactive in developing a robust network of public charging stations in its service territory and has been an early adopter and key player in the EV charging landscape in the western half of the state. Prior to the merger with Westar, KCP&L initiated the buildout of its CCN in 2015, along with project partners LilyPad EV and ChargePoint, to be comprised of 1,000 L2 charging stations throughout its service territory, with the utility directly owning and operating the stations. Evergy's initial charging station buildout within the Missouri portion of its service territory is complete and is capped at 650 stations through an agreement[34] approved by the Missouri PSC. As a regulated IOU in Missouri, Evergy must obtain approval from the PSC for additional EV infrastructure programming, including any expansion of the CCN or alternative EV programming beyond what was approved in 2015.

Evergy built out a robust network of publicly-available L2 charging stations in an effort to serve as a catalyst to jump-start the EV market in the Kansas City area. Since the establishment of Evergy's CCN, the Kansas City area has experienced significant growth in EV adoption and has been identified as the region's top city for EV infrastructure by the Rocky Mountain Institute[35]. Kansas City has experienced three times the EV adoption growth rate compared to the central Kansas corridor in Evergy's service territory, where few charging stations have been installed[36]. Evergy's initial EV infrastructure strategy relied on providing

[33] Image via the Missouri Public Service Commission. https://psc.mo.gov/CMSInternetData/Electric/Missouri%20Electric%20Service%20Area%20Map%2011-8-19.pdf
[34] See Mo PSC case #ER-2018-0145 and #ER-2018-0146.
[35] Rocky Mountain Institute, 2020. https://rmi.org/taking-a-regional-approach-to-electric-vehicle-readiness/
[36] Mo PSC Case # ET-2021-0151.

customers with access to public L2 chargers under a "top-off" charging model aimed at making charging stations visible and accessible to help encourage EV adoption.

The next phase of the company's strategy is focused on providing a portfolio of programs related to EV infrastructure to incentivize the installation of residential charging infrastructure and encourage private sector investment in EV charging infrastructure, encourage off-peak charging and electrification of commercial and transit fleets, and expand the buildout of the CCN through direct deployment. Evergy is also evaluating gaps in their charging network, with a focus on ensuring equitable access to charging infrastructure. The company is identifying locations where market forces haven't been sufficient to establish necessary charging infrastructure and through the electrification of public transportation for customers who don't have access to personal EVs.

The next phase of Evergy's EV infrastructure programming will become clearer once a decision is reached by the PSC regarding its proposed EV infrastructure pilot programs, which were submitted to the PSC for approval in February of 2021[37]. Evergy's proposed 5-year, $12.8 million EV infrastructure pilot program includes rebates for 240-volt outlets in new and existing homes to encourage installation of L2 chargers, rebates for commercial EV charging stations to encourage private investment in EV infrastructure, new commercial and transit rates designed to incentivize off-peak charging, customer education and outreach initiatives, and the expansion of the CCN through the direct installation and ownership of L2 and DCFC stations.

Evergy cites a variety of customer benefits associated with its proposed programming, including more efficient utilization of underutilized grid infrastructure, greater grid flexibility, local economic development, reduced vehicle emissions, and the opportunity to gain valuable insights to inform future EV-related actions. Evergy is focused on being proactive to plan for the impact of EVs on the grid as car manufacturers increasingly move toward electrification of their product lines. Evergy's Missouri service territory has 3,010 light-duty EVs operating as of September 2020, with over 17,312 expected by 2025 and 53,262 by 2030[38]. In its proposal,

[37] Evergy's application for approval of its proposed transportation electrification portfolio, 2021. https://www.efis.psc.mo.gov/mpsc/commoncomponents/view_itemno_details.asp?caseno=ET-2021-0151&attach_id=2021012844

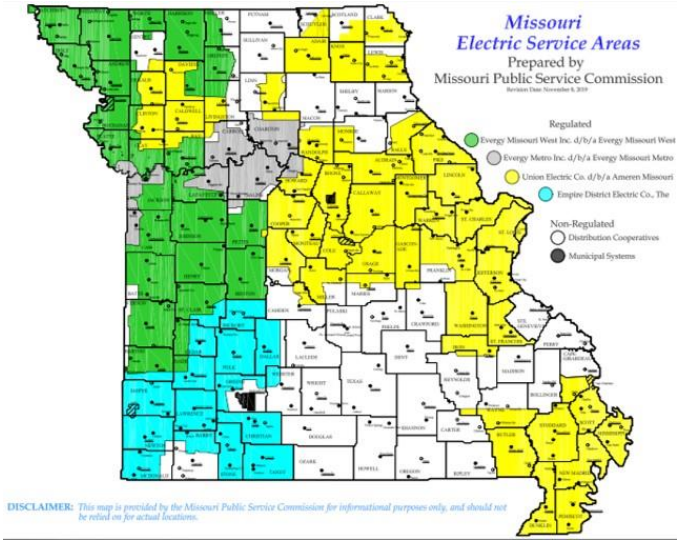
[38] Evergy references the number of EVs expected within their service territory under a variety of adoption scenarios calculated by the Electric Power Research Institute in their filing submitted to the PSC.

Evergy also highlights the lack of DCFC infrastructure deployed within its service territory, especially along secondary and tertiary highways in rural areas, as a gap to be filled by the expansion of their CCN. Additionally, Evergy is part of a team which received a grant from the U.S. DOE for a pilot project to study and install charging units on existing streetlights to provide equitable access to charging infrastructure in underserved communities.

Investor-owned Utility Snapshot: *Ameren Missouri*

Headquartered in St. Louis, MO, Ameren's service territory includes parts of eastern, central, and northwestern Missouri, including the St. Louis metropolitan area, Jefferson City, and Cape Girardeau (yellow areas in **Figure 14**) and serves approximately 1.2 million customers.

Figure 14. Missouri IOU Service Territories



While Ameren has been active in offering EV infrastructure programs on the eastern side of the state, unlike Evergy, it hasn't employed the direct ownership model to grow charging infrastructure in its service territory, instead relying on incentive programs to encourage private investment in the sector. Ameren's $11 million 'Charge Ahead' programing includes its highway corridor charging program focused on incentives to encourage private investment in DCFC infrastructure, as well as its local charging incentive program aimed at encouraging private investment in charging infrastructure for workplaces, multi-family dwellings, and public access locations.

Ameren expects to assist with 1,000 charging station installations at more than 350 locations over the course of the three-year local charging incentive pilot program, which began in 2020. The program is eligible to be renewed for an additional two years should Ameren

https://www.efis.psc.mo.gov/mpsc/commoncomponents/view_itemno_details.asp?caseno=ET-2021-0151&attach_id=2021012844

show positive results in terms of the level of program participation, number of completed projects, and estimated impacts on peak demand due to EV charging. The local charging program offers commercial customers a $5,000 incentive per L2 charging port, as well as a $20,000 incentive for DCFC ports. The incentives can cover up to 50% of the total project cost. 48 station projects (5 multi-family, 20 public, and 23 workplace), providing 156 charging ports (22 multi-family, 53 public, and 81 workplace) have been facilitated as of 9/24/21 via the local charging program. $1 million of the $6 million budgeted for the program have been committed as of 8/20/21, leaving $5 M to be spent through 2023[39].

13 DCFC stations have been deployed throughout Ameren's service territory as part of the company's corridor charging program, with a 14th set to be completed this year. Each station has two DC fast chargers and two L2 chargers. With the completion of the 14th station in Eureka, the corridor charging pilot program will come to an end, as nearly all of the $4 million budgeted for the program have been allocated. The corridor charging program included a competitive bidding process, with charging corridor sites located within one mile of interstate or highway interchanges. Each site was eligible for up to $360,000 in total program incentives towards line extension and upfront equipment installation costs. Actual DCFC project costs averaged $290,000 per site, with variations based on line extension requirements and specific site characteristics. Ameren utilized LilyPad EV, along with project partners ChargePoint and Sachs Electric to work with site hosts to complete project work.

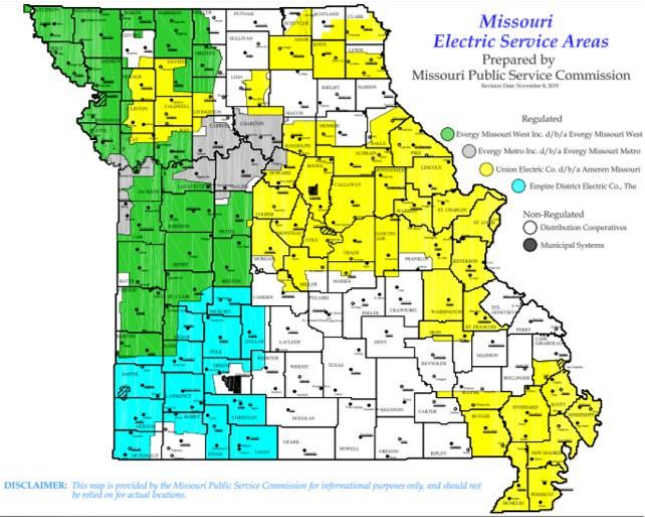
Ameren is also conducting an educational and outreach campaign as part of its Charge Ahead program, including earned media and social media, outreach to municipalities and professional associations, direct email marketing, training sessions for business customers, and virtual community events. In addition to Ameren's incentive programs, the company has committed to electrifying its own fleet, including 100% of new light-duty vehicles purchased by 2030. Additionally, 35% of Ameren Missouri's overall vehicle fleet will be electrified by 2030.

[39] Charging station deployment data obtained from Ameren's 9/17/21 'Charge Ahead' quarterly report. PSC Case # ET-2018-0132. https://www.efis.psc.mo.gov/mpsc/commoncomponents/view_itemno_details.asp?caseno=ET-2018-0132&attach_id=2022004802

Investor-owned Utility Snapshot: *Liberty Utilities, Empire District*

Liberty Utilities (Liberty), which acquired the Empire District Electric Company (Empire) in 2017, is headquartered in Joplin, MO and serves Southwestern Missouri, serving over 175,000 customers in its Missouri service area (blue areas in **Figure 14**).

Figure 14. Missouri IOU Service Territories



Prior to the acquisition by Liberty, Empire launched its EVolve initiative in 2015 focused on encouraging broader adoption of EVs through rebate incentives, educational outreach efforts, and deployment of charging stations within its service territory. Specifically, Empire offered rebates of $1,000 towards the purchase of plug-in hybrid vehicles and $2,000 for fully electric vehicles. Empire also deployed charging stations throughout its service territory, with 29 stations in operation supporting 60 charging ports[40]. The EVolve program was put on hold following the acquisition by Liberty.

Like Evergy, the company currently has a portfolio of proposed EV infrastructure programs under review by state regulators. A decision by the PSC is not expected until 2022, and it will chart the path forward for the next phase of Liberty's programming around EV charging infrastructure. The proposed 5-year pilot program[41] includes a diverse array of programming, including incentives to encourage the installation of residential chargers, direct deployment of charging stations under the utility owner-operator model, pilot commercial rates to reduce demand charges for EV charging, and fleet advising services.

Under the proposal Liberty would offer customers a subscription to cover installation costs and operate smart L2 chargers at single-family residences and encourage off-peak

[40] U.S. Department of Energy Alternative Fuels Data Center, 2021. https://afdc.energy.gov/stations/#/find/nearest
[41] Liberty Utilities proposed EV infrastructure programs. Mo PSC Case # ET-2020-0390, https://www.efis.psc.mo.gov/mpsc/Docket.asp?caseno=ET-2020-0390

charging under its 'Residential Smart Charge Pilot'. The 'Ready Charge Pilot Program' would consist of the direct deployment of public charging stations owned by the utility throughout its service territory to establish a public charging network in the region and attract future private investment in charging infrastructure. With a proposed budget of $2.9 million, the company expects to install 50 dual-port chargers and 15 DCFC chargers across 25 sites. Under the proposed 'Commercial EV Rate', Liberty would offer a voluntary pilot rate to its commercial customers reducing the maximum demand charge associated with EV charging for a minimum of 5 years.

The proposed 'Fleet Advisory Services Pilot' would consist of technical assistance[42] offered to approximately 10 commercial customers interested in electrifying their fleets. Like the 'Ready Charge' pilot program, under the proposed 'Commercial Electrification' pilot Liberty would directly deploy L2 charging infrastructure to support EV charging at fleet yards and work places not accessible to the public. Finally, Liberty would also directly deploy charging infrastructure to support the operation of electric school buses under the 'Electric School Bus' pilot program, reducing administrative and operational burdens for school districts interested in electrifying their bus fleets.

Liberty's EV infrastructure strategy is focused on addressing the key barriers to electrification of transportation in its service territory, including high upfront infrastructure costs and lack of awareness surrounding the benefits of EVs. The company is looking to play an active role in the deployment of charging infrastructure within its service territory in the near-term to establish a baseline level of EV charging infrastructure in southwestern Missouri, fill the gap in private investment in charging infrastructure in the area, and attract future private investment by expanding the charging network. Liberty highlights obtaining data to inform future charging infrastructure planning and placing stations where they are best positioned to take advantage of existing infrastructure, and using resources more efficiently to put downward pressure on customer rates as the primary benefits associated with direct deployment of charging stations[43].

[42] Technical assistance to include infrastructure cost estimates, total cost of ownership modeling, pre & post emissions levels, etc.

[43] Benefits of direct utility deployment of charging stations outlined in Liberty's testimony to the Mo PSC concerning its proposed transportation electrification programs.

Municipal Utilities

Municipal utilities as a group tend to be more reactive to their customers in respect to changes in the energy landscape than IOUs. Rather than driven by profit pressures, municipal utilities are responsive to customer demands and their limited involvement in the development of the state's EV infrastructure network reflects that customer-facing focus. With EV adoption still relatively low in Missouri, most municipal utilities are not being pressured by customers to invest in charging infrastructure and are letting the market drive adoption while looking for ways to foster the industry's growth.

Increased electricity demand associated with EV adoption coupled with charging during off-peak hours can realize benefits for utilities and customers alike, but municipal utilities tend to encounter more obstacles to implement the time-of-use (TOU) rates needed to shift customer usage to off-peak hours as compared to their IOU counterparts. While municipal utilities can offer significant reliability benefits and innovations due to their status as distribution system islands, they lack transmission and control over generation. As a result, municipal utilities don't have the same incentives to implement TOU rates as IOUs, since rates are set by contracts and are typically a static cost. Many municipal utilities have entered into power pools, accessing wholesale rates, but TOU rates to shave peak demand costs for individual utilities could have negative impacts as costs would be transferred to others in the pool.

Municipal utilities are in the position of determining how to help the industry grow, or at the very least not present obstacles to growth, while also making wise investment decisions that don't negatively impact their customers. If utilities don't alter their demand charges, operation of charging stations can be cost-prohibitive for potential site hosts, but if utilities cut those demand charges to incentivize private investment, the providers are in the position of investing in money-losing enterprises in the near-term until EV adoption increases to the point where station utilization make the investments profitable. Municipal utilities, along with their electric cooperative and IOU counterparts, need to have smart meters, also known as advanced metering infrastructure (AMI) in place to take full advantage of the benefits that come with off-

https://www.efis.psc.mo.gov/mpsc/commoncomponents/view_itemno_details.asp?caseno=ET-2020-0390&attach_id=2021006924

peak charging. Until AMIs are more widespread, the benefits of electrification of the transportation industry can't be maximized by electric providers. While municipal utilities haven't had a significant impact on EV charging infrastructure in the state, several utilities are planning for an electrified future.

Municipal Utility Snapshot: *City Utilities of Springfield*

City Utilities of Springfield serves over 110,000 customers in Springfield, MO and the surrounding area, providing electricity, natural gas, water, broadband and public transportation services. City Utilities offers an EV-ready home rebate geared towards the residential sector. Developers have access to a rebate providing up to $100 towards the installation 240-volt outlets to support level-2 chargers for new single-family homes. While EVs can be charged using the standard 120-volt outlet, it takes approximately 8 hours to replenish 40 miles of battery life, replenishing approximately 5 miles of range per hour of charging for most mid-size EVs[44]. Installation of a L2 charger enables the replenishment of up to 25 miles of range per hour. Installation of a 240-volt outlet post-construction is more expensive than including it in the initial construction process, saving customers money on home EV infrastructure costs in the long term. The rebate has been utilized 1-2 times per month over the course of a year and is positioned to be the initial offering of a broader electrification strategy in the future. City Utilities is considering additional rebates for existing homes and business.

The utility is focused on responding to customer needs and being proactive in helping its customers prepare for the EV transition, acting as a trusted source of information on electrification for their customers. The utility was a project partner with LilyPad EV and site hosts for the installation of two DCFC stations within their service territory as part of the VW Settlement-funding process. The company provided infrastructure upgrades and a portion of the funding for the projects. City Utilities also operates the city's transit system and has deployed two electric buses using funds via the VW Settlement Trust.

[44] U.S. DOE Alternative Fuels Data Center. https://afdc.energy.gov/fuels/electricity_infrastructure.html

Electric Cooperatives

Missouri is home to 40 electric distribution cooperatives (co-ops) (**Figure 15**), which are member-owned non-for-profit energy electric providers governed by a board of directors elected from among the membership.

Figure 15. Missouri's electric cooperatives[45]

Co-ops vary in size, from the smallest serving just over 2,000 members, to the largest with more than 40,000 members. There are six generation and transmission co-ops, transferring power from Associated Electric Cooperative in Springfield, MO the wholesale supplier of electricity to the state's distribution electric co-ops. Like municipal utilities, co-ops are extremely responsive to their customers, especially given the member-owner structure and the seven cooperative principles, a selection of which include "Democratic Member Control" and "Concern for Community"[46].

Outside of VW Settlement-funded station projects, Missouri's co-ops, like many of the municipal utilities, haven't contributed significantly to the buildout of public charging infrastructure in the state. Co-ops tend to be located in more rural areas of the state, which have lower EV adoption rates. Challenges associated with EV adoption in rural areas include longer commutes that require battery ranges beyond what is currently available, a lack of vehicle model options and limited supply of vehicles to suit potential EV owners, lack of information related to the economics of EV ownership, and lack of public charging infrastructure to combat range anxiety.

Electric Cooperative Spotlight: *Callaway Electric Cooperative*

Callaway Electric Cooperative (Callaway) serves nearly 13,000 residential, agricultural, and commercial accounts in rural Callaway and Southern Montgomery County, Missouri.

[45] Image via the Association of Missouri Electric Cooperatives. http://www.amec.org/content/our-co-ops
[46] The 'Seven Cooperative Principles' via Co-Mo Connect. https://www.co-mo.coop/how-cooperatives-work/

Callaway owns and operates the charging station, including 2 DCFC and 2 L2 ports, deployed in Kingdom City and funded through the VW Settlement process. Callaway embarked on this project along with site host Warrenton Oil and LilyPad EV to install charging infrastructure at a FastLane gas station. Callaway made the investment opportunistically after being approached by LilyPad EV and working with them to identify the best location. Due to the infrastructure investment required to install the station, ongoing management of the station, upfront financial costs, and opportunity to gain insight into EV charging infrastructure deployment, Callaway decided to own and operate the station directly, as opposed to the site host.

Callaway views the investment as an opportunity to gain insight into the deployment and operation of charging infrastructure, but the economics associated with deploying charging stations don't yet make sense outside of utilizing funding opportunities like the VW Settlement process. In addition to the significant upfront costs of DCFC stations, co-ops must deal with high demand peaks should they install more stations in their service territories coupled with relatively low energy consumption. This can result in sudden spikes in demand, which can stress the system, while the charging stations bring in relatively little in the way of revenue.

While utilization of the charging station has exceeded expectations 4 months into deployment, averaging nearly 2 charging sessions per day, EV adoption is low within Callaway's service territory, with just 23 registered EVs out of nearly 43,000 total registered vehicles. The DCFC station is largely utilized by EV owners traveling through the community via the interstate, rather than by co-op members. Most of Callaway's members have access to home charging, unlike more urban environments where multifamily dwelling residents may lack access to off-street parking, but co-op members typically have long commutes, which can make range anxiety a significant obstacle to EV adoption.

In addition to the investment in the Kingdom City charging station, Callaway offers its residential and commercial members a rebate of up to $250 towards the installation of a L2 charging station. The rebate is offered through the co-op's power provider, Associated Electric Cooperative in Springfield. Callaway has offered the rebate for over a year, but it has yet to be utilized by its members.

Regulatory Spotlight: Missouri Public Service Commission

Unlike municipal utility and electric cooperative programs, EV charging programs implemented by IOUs in Missouri must first be approved by the state's Public Service Commission, which regulates investor-owned electric, natural gas, steam, water, and sewer utilities. While the PSC was slow to approve EV infrastructure programs initially, the Commission has approved programs by Evergy and Ameren that have helped Missouri establish a robust network of publicly-available chargers. Due to the familiarity with charging programming as a result of proactive utilities in this area, a court case placing EV charging infrastructure under the purview of the PSC, and input from various stakeholder groups as part of a PSC-led working group focused on the expansion of EV charging infrastructure, the Commission has adopted a positive stance toward EV charging programs that have the potential to accrue benefits for both utility companies and their customers through more efficient use of grid resources and applying a downward pressure on customer rates.

Prior to its merger with Westar, KCP&L filed a request with the PSC for approval to recover costs associated with its deployment of EV charging stations as part of its Clean Charge Network. The Commission denied KCP&L's request on grounds that it didn't have statutory authority to regulate charging stations. The case was appealed to the Missouri Court of Appeals, which reversed the decision, formally placing charging station programs under the regulatory authority of Missouri's PSC. The Commission then approved rates for Evergy's charging stations in 2018 and required the company to seek approval to build additional stations beyond the 650-station cap it set. Since then, the Commission also approved Ameren's corridor charging and local charging incentive programs as detailed above.

The PSC also initiated a working case[47] to evaluate potential mechanisms for facilitating installation of EV charging stations in the state, which included a stakeholder engagement process. Key takeaways from that process[48] included any action taken by the Commission

[47] Mo PSC Case # EW-2019-0229.
[48] See Mo PSC Staff Report for a detailed summary of the stakeholder engagement process and results of the working case. https://efis.psc.mo.gov/mpsc/commoncomponents/view_itemno_details.asp?caseno=EW-2019-0229&attach_id=2020004866

should allow for flexibility, actions should be technology neutral, robust data collection and eventual use of that data is key to the successful deployment of charging stations, enhanced customer education is a priority, and approval of pilot programs may be the best path forward for the Commission to aid in the expansion of charging infrastructure. Commission staff recommended the following steps should be taken to facilitate EV charging while providing price signals to consumers to charge vehicles during off-peak hours and allow utilities to recover revenue from their investments:

- Improve customer education
- Implement TOU rates to encourage off-peak charging
- Study the use of adding on-peak demand charges for residential customers, while reducing demand charges for commercial customers.
- Encourage strategic placement of EV chargers to reduce overall system investment needs and expenses

The composition of the Commission has changed since some of the earlier decisions and its perspective on the role of utilities in the expansion of charging infrastructure will become clearer once decisions are reached in the Evergy and Liberty electrification transportation portfolio cases currently being reviewed by the Commission and outlined above.

Missouri's regulatory landscape has enabled the state to be well-positioned to take advantage of proactive investments by utilities in charging infrastructure and is a significant reason the state ranks 9th in terms of charging stations per EV. Taking a regional view of the EV policy landscape (**Figure 16**), Kansas ranks just below Missouri, but has half the EVs on the road, while Illinois ranks just 45th in stations per EV, but has over four times the number of EVs on the road. Kansas lacks state or utility incentives focused on charging infrastructure, but the Kansas Corporation Commission is currently reviewing EV-related proposals from Evergy with a decision expected by the end of 2021. While Illinois does have some state incentive programs for the expansion of charging infrastructure, it lacks incentive programs offered by utilities in the state. The state recently passed the Climate and Equitable Jobs Act, which includes incentives for EV ownership and charging Infrastructure. Some Illinois residents also have access to a TOU rate offered by Ameren Illinois for residential customers who own an EV.

Iowa ranks a few spots lower than Missouri at 14th in chargers per EV, but has just a third of the EV adoption of Missouri, while Arkansas ranks 8th in terms of chargers per EV, but near the bottom in EV adoption. MidAmerican Energy in Iowa offers a rebate for residential L2 charging, but lacks incentive programs for public charging infrastructure. Like Kansas, Arkansas lacks state or utility programs focused on EV charging infrastructure, with the exception of funding provided by the state through the VW settlement fund.

Figure 16. Regional EV adoption and charging station deployment[49]

State	EV adoption rank	EV charging rank
Missouri	**33**	**9**
Illinois	19	45
Kansas	36	10
Iowa	41	14
Arkansas	46	8

Funding Spotlight: Volkswagen Settlement

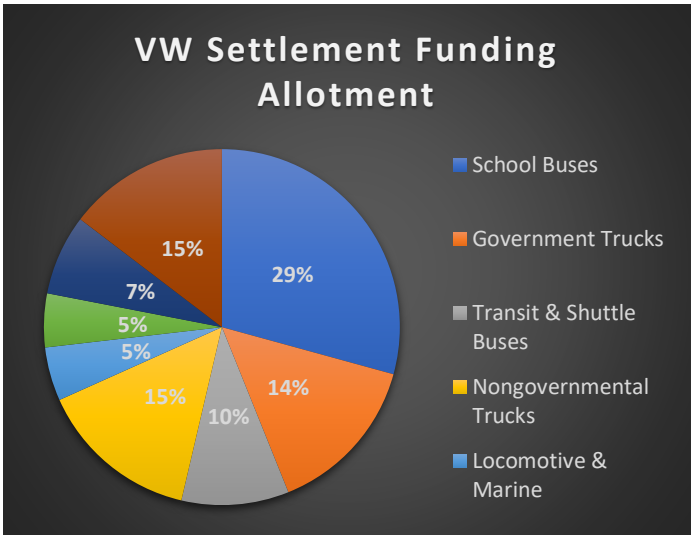
In 2016 and 2017 a variety of settlements were reached to resolve allegations that Volkswagen (VW) violated the Clean Air Act by selling diesel vehicles with 'defeat' devices meant to cheat federal emissions tests. A mitigation trust was set up for each state to fund mitigation activities to replace diesel emission sources with clean technologies. Each state received a specific amount of funding, with funding levels set based on the number of registered VW vehicles affected by the defeat devices. Each state had the opportunity to select from a list of eligible mitigation actions, including replacement or repower of medium and heavy-duty trucks

[49] Rankings based on # of electric vehicles registered per total registered vehicles and # of EVs per chargers deployed. Data establishing rankings obtained from U.S. DOE Alternative Fuels Data Center (https://afdc.energy.gov/data/10962 / https://afdc.energy.gov/fuels/electricity_locations.html#/analyze?fuel=ELEC&region=US-MO) and U.S. DOT (https://www.fhwa.dot.gov/policyinformation/statistics/2017/mv1.cfm)

and school and transit buses, Diesel Emissions Reduction Act (DERA) grants, and EV charging infrastructure.

Missouri is the beneficiary of $41 million to be awarded by the Missouri Department of Natural Resources as part of a 10-year Beneficiary Mitigation Plan[50]. Projects are to be funded by October 2027. Missouri's plan was developed by a VW Trust Advisory Committee and a stakeholder engagement process led by the DNR's Air Pollution Control Program. The plan's award categories and the funding amounts allotted to each through the stakeholder engagement process include (**Figure 17**) School Buses ($12 million), Government Trucks ($6 million), Transit and Shuttle Buses ($ 4 million), Nongovernment Trucks ($6 million), Locomotive and Marine ($2 million), Airport and Cargo Equipment ($2 million), DERA Option ($3 million), and EV Charging Stations ($6 million).

Figure 17. Missouri's VW Settlement Trust Award Categories



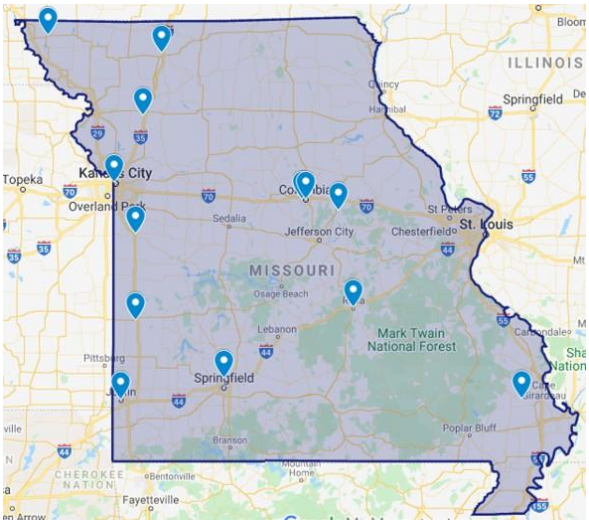
A majority of the settlement funds are targeted for buses, including school, transit, and shuttle, as well as replacement of medium and heavy-duty trucks. Stakeholders strongly supported allotting the entire 15% that could be used for zero emission vehicle supply equipment towards charging stations.

Of the $41 million, only 15% (~$6 million) could be set aside for EV charging infrastructure, with funding up to 80% of eligible station installation expenditures. Through the stakeholder engagement process it was determined that all of the funds for EV charging infrastructure would be allocated for the development of a minimum practical highway-charging network of publicly available DCFC stations along major highways to ensure EV users are able to drive across the state without losing a charge. The stakeholder process identified 13 locations for the deployment of DCFC stations (**Figure 10**), including Bethany,

[50] Missouri's VW Settlement Beneficiary Mitigation Plan, 2018. https://dnr.mo.gov/document-search/missouri-beneficiary-mitigation-plan

Cameron, Columbia, Concordia, Harrisonville, Joplin, Kingdom City, Nevada, Perryville, Rock Port, Rolla, Sikeston, and Springfield.

Figure 10. VW Settlement EV Charging Station Sites



Applications were received and funding awarded for 9 of the locations in 2020 totaling $1,746,453. No applications were received for Harrisonville, Nevada, Perryville, and Rolla during the first round of funding due to the difficulty in finding interested site hosts. The business case for the installation of DCFC stations, even with 80% of the upfront costs covered by VW Settlement funding is difficult to make with low EV adoption rates in more rural parts of the state.

Project costs vary for each project based on unique site characteristics and infrastructure needs, but funding requests averaged ~ $200,000 per station for the 9 awarded locations. Business owners need to be willing to make a big investment they may not see a return on for years, redesign parking spaces, and deal with the complexities of working with their local utility and local permitting processes. Project partners, such as Kansas City-based LilyPad EV have been instrumental in smoothing out some of those complexities to bring some of these projects to fruition. The VW Settlement funds have been pivotal in filling gaps in the market to deploy publicly available DCFC stations across Missouri to ensure a minimum charging network is in place to support EV users traveling across the state. The lack of applications received during the first round of funding awards for the four remaining station locations points to the need for proactive utility action, policies, and funding opportunities in areas where EV adoption isn't yet driving the market as the industry continues to mature.

The application period for the four remaining locations closed on 10/12/21 and the DNR expects each location to be awarded a station. All funded charging station projects are expected to be complete by June of 2022. The DNR will begin to reconvene stakeholders at the end of 2021 to determine how the remaining ~ $3 million set aside for charging infrastructure and remaining funds for other award categories will be spent. The original mitigation plan

called for any funds remaining to be used for L2 stations at workplaces and multi-unit dwellings, while assessing the L2 charging needs in the state.

Obstacles, Gaps & Solutions

Through engagement with stakeholders across a variety of sectors related to EV charging infrastructure in Missouri, several key obstacles to the expansion of EV charging infrastructure were identified. What follows is a discussion of those obstacles, as well as potential solutions being implemented in Missouri and across the country.

High Upfront Costs

The significant cost of deploying charging stations was the most frequent obstacle highlighted during stakeholder interviews. Costs associated with equipment, infrastructure upgrades, labor, permits, and taxes all combine to make the deployment of public and workplace L2 and DCFC stations expensive undertakings. L2 chargers cost between $2,000 and $5,000, while DCFC stations can range from $20,000 to $150,000 per station[51]. In addition to the significant upfront costs associated with DCFC stations, the 6–18-month time frame to install DCFC stations is dependent on site-specific infrastructure upgrades, as well as permitting processes, which can be delayed in locations that have little experience reviewing charging station projects. Project development requires coordination with electric providers and local governments, which can be a complex undertaking.

Financial assistance, in the form of grants, rebates, tax credits, and financing can help overcome upfront costs. As detailed previously, several Missouri utility companies offer incentive programs to facilitate the deployment of charging stations in their service territories. At the federal level, there are a variety of programs offering financial assistance for the installation of charging infrastructure[52]. Businesses can claim a tax credit for 30% of the total cost of purchase and installation of charging stations. The credit is capped at $30,000 and is set to expire at the end of 2021 unless it is extended by congress. A credit of up to $1,000 is offered for installation of residential chargers as well. The Infrastructure Investment & Jobs Act,

[51] Union of Concerned Scientists, 2021. https://ucsusa.org/sites/default/files/2021-03/federal-ev-charging-policy.pdf

[52] U.S. DOE, Alternative Fuels Data Center list of federal laws and incentives related to alternative fuels and vehicles. https://afdc.energy.gov/laws/fed_summary

includes $5 billion for the deployment of EV charging stations, as well as $2.5 billion in grants to facilitate investment in charging projects. Missouri is expected to receive approximately $99 million over a period of 5 years to further the expansion of its charging network[53].

The U.S. Department of Transportation (DOT) offers Rebuilding Infrastructure with Sustainability and Equity (RAISE) grants for a variety of project categories, including the installation of EV charging infrastructure. RAISE grants are available for state and local governments, transit agencies, port authorities, and metropolitan planning organizations. U.S. DOT also offers Infrastructure for Rebuilding America (INFRA) grants to states, metropolitan planning organizations, and local governments for the installation of EV charging stations along the National Highway System. The U.S. DOE provides loan guarantees through the Loan Guarantee Program for a variety of projects that reduce emissions, including EV charging stations.

While Missouri doesn't offer statewide tax credits, incentive programs, or financial assistance for EV charging outside of the VW Settlement Trust, many states offer tax credits and incentive programs to spur private investment in charging infrastructure. Also, states like Connecticut and others have set up green banks, which can provide financial assistance towards the installation of charging stations. In Maine, the Clean Energy and Sustainability Accelerator provides loans for alternative fuel projects, including EV charging stations, with 40% of funds required to be used towards low-income communities and communities of color. Maryland's Energy Administration runs the state's Smart Energy Communities Program, which offers grants to local governments for charging infrastructure.

In addition to the upfront costs associated with DCFC stations in particular, are the long project timelines required to deploy them. It can take 6-18 months to install DCFC stations, depending on the infrastructure upgrades needed on site, as well as the permitting processes in place. Project development requires coordination with local governments, electric providers, and site hosts, which can be a complex undertaking requiring the assistance of experienced charging station project developers. Poorly structured permitting processes that cause lengthy delays can force developers to avoid certain locations, impacting local economic development

[53] The Missouri Times, 2021. https://themissouritimes.com/what-does-the-federal-infrastructure-package-mean-for-missouri/

opportunities and appropriate coverage. Local governments can standardize the permit review process, amend local ordinances to count EV parking spaces toward minimum parking requirements, and make the permitting process transparent and straightforward. States like California and New Jersey have passed legislation to streamline permitting processes surrounding the installation of charging stations statewide. On a more localized level, local governments can remove existing barriers for EV charging projects by reviewing local ordinances and building codes to plan for future EV charging projects.

"EV-ready" ordinances, like those passed in St. Louis City, St. Louis County, and Richmond Heights in Missouri can reduce high upfront costs and reduce red tape by requiring either the installation of charging stations at the time of construction or the infrastructure to make installation possible and more cost-effective in the future. Just as EV battery technologies continue to advance and costs decline, it's expected that charging station equipment costs will decline over time as demand increases and manufacturing operations continue to grow in scale.

Return on Investment & EV Adoption Issues

In addition to the significant investment required to install L2 and DCFC stations, stakeholders repeatedly highlighted the difficult economics associated with operating charging stations, especially the more expensive DCFC stations. Until EV adoption levels increase, charging station operators face an unprofitable short-term investment dependent on long-term market transformation. Charging station ownership scenarios generally fall within one of three categories: utility ownership, third-party ownership, or site host ownership.

Utility companies, such as Evergy, that have made the leap into direct EV station ownership are in a position to weather short-term financial difficulties as the industry matures. Electric providers can deploy stations in locations that limit negative impacts to the grid and take advantage of existing infrastructure to reduce infrastructure costs. Electric providers also stand to increase revenues with the deployment of charging stations as EV adoption increases and utilization picks up. Additionally, as smart meters and TOU or EV-specific rates become more common, charging during off-peak hours has the potential to more efficiently utilize existing infrastructure and lower fixed costs relative to overall revenues generated.

Third-party investors generally lease space from property owners and operate stations in high-traffic areas, where they have the greatest opportunity to maximize their ROI. This limits third-party participation to urban areas with the greatest population densities and levels of EV adoption. Site hosts that choose to install EV charging stations generally do so for a variety of reasons, as the stations themselves are not yet a profitable investment, given current usage levels. Data shows that a 30% usage rate, which is considered a high usage market, is required to make the operation of DCFC stations profitable[54].

Site hosts may install charging stations to increase foot traffic in their establishments, open a future revenue source, realize a competitive advantage, or meet the demands of current and future customers. For DCFC stations, utility demand charges can quickly put a project in the red. Demand charges are typically paid by commercial and industrial utility customers based on the highest peak demand for power within a billing cycle. For DCFC stations with multiple charging ports, the simultaneous use of those ports can incur costly monthly charges well in excess of revenues brought in through station user fees. DCFC station ports can operate between 50 kW and 350 kW, depending on the capacity of the port. The greater the capacity, the faster the charge. While 150 kW ports are the most common, 350 kW ports are under development to future-proof stations as battery technologies continue to advance.

The average EV battery can currently accept a 50-kW charge, with some able to accept over 250 kW. As charging station capacities continue to increase, demand charges will have an increasingly significant impact on the economics of operating fast-charging stations. Great Plains Institute found that 50 kW charging ports can generally break even, depending on the utility rate, as long as there are at least 10 charging sessions per day[55]. Charging capacities above 150 kW are unprofitable given average demand charges found across the country. Rates that reduce or eliminate demand charges are needed for DCFC stations to be profitable at low usage levels. In some cases, stations can be ramped down to a level just below what would incur demand charges. Demand charges have the potential to kill the viability of a project, with or without financial assistance to cover upfront equipment and installation costs.

[54] Rocky Mountain Institute, 2020. https://rmi.org/wp-content/uploads/2019/09/DCFC_Rate_Design_Study.pdf
[55] Great Plains Institute, 2019. https://www.betterenergy.org/blog/demand-charges-and-dcfc/

In Missouri, Evergy and Liberty have pilot commercial rates as part of their proposed electrification programs, which include greatly reduced demand charges for stations to make them more attractive investments over the next several years as the market develops. Other utilities, like Columbia Water & Light, a municipal utility in Columbia, MO, are evaluating potential rate designs that could be used to help make charging station projects viable, while balancing the need for the utility to limit losses in the short-term. Stakeholders face the 'chicken and egg' problem of trying to make projects profitable by spurring investment in charging infrastructure before the demand exists, while the EV adoption required to make stations profitable is dependent on the deployment of publicly available charging infrastructure to combat range anxiety. The process of IOUs reducing demand charges until the market matures has the potential to attract investment into the charging station space, while also providing a blueprint for Missouri's municipal electric utilities and electric co-ops to follow as data is collected and best practices are developed.

Until Missouri's level of EV adoption increases, both DCFC and L2 charging projects will be difficult to develop without significant financial assistance and electric rate adaptations. While expanding public charging stations can help increase adoption levels, affordability, availability, awareness, and convenience all influence consumer interest in EVs. Currently, EVs are priced at a premium, with models generally running 10-40% more than similar gas-powered models. Sticker shock alone can deter prospective buyers and price out segments of the population, but some EV models are expected to reach cost parity with gas-powered vehicles by 2025[56]. The lack of a robust secondary market for EVs also limits affordable options for consumers, as most gas-powered cars are purchased pre-owned.

Increased awareness of the total cost of ownership and available incentives can help bridge the cost gap. Most studies find that total cost of EV ownership is less than gas-powered vehicles, which can make up for the higher EV purchase price. Compared to equivalent gas-powered models, owning an EV saves the typical driver between $6,000 and $10,000 over the

[56] Inside Climate News, 2020. https://insideclimatenews.org/news/30072020/inside-clean-energy-electric-vehicle-agriculture-truck-costs/

life of the vehicle[57]. These savings come from reduced fueling costs, and a reduction in repair and maintenance. EVs cost less to maintain because they have fewer moving parts than vehicles powered by internal combustion engines, resulting in a 30% average savings[58]. While the majority of studies show lower fueling costs for EVs as well, a recent study found it could be more expensive to charge an EV over time than to fill up a gas-powered vehicle if charging cost variability and the time it takes to find reliable public chargers is taken into account[59].

Along with total cost of ownership, awareness of available incentives that close the price gap is an important factor in EV adoption. At the federal level, a tax credit of up to $7,500 is available for new all-electric or plug-in hybrid cars. While Missouri doesn't have additional state-sponsored incentives, state and local incentives can be paired with the federal tax credit. This credit is only available for the first 200,000 vehicles sold for any given manufacturer, with both Tesla and GM having crossed that threshold, making the incentive unavailable for cars manufactured by those companies.

The budget reconciliation bill, known as the Build Back Better framework currently being debated in congress at the time of this report's publication, calls for the continuation of the $7,500 tax credit, along with a $2,500 credit if the EV is made in America and an additional $2,500 credit if the EV is manufactured using union labor. Many states offer incentives on top of the federal credit. For example, Arizona offers tax benefits, insurance discounts, access to car pool lanes, and parking privileges to encourage EV purchases. Oregon offers rebates for the purchase of EVs, with specific rebates targeting low- and moderate-income households.

In addition to sticker price and total cost of ownership, vehicle model availability can play a role in EV adoption rates. While the number of models on the market continues to grow year to year, there are still a dearth of options available outside of sedans and hatchbacks. SUVs and trucks are the next market segment set to grow as technological advancements in batteries make it more affordable to electrify heavier vehicle models. Pickup trucks and SUVs are the best-selling models in the U.S., so as options continue to increase more consumers may

[57] Consumer Reports, 2020. https://www.consumerreports.org/hybrids-evs/evs-offer-big-savings-over-traditional-gas-powered-cars/
[58] Forbes, 2021. https://www.forbes.com/sites/jimhenry/2021/10/28/electric-vehicle-service-costs-30-lower-than-gasoline-vehicles-says-research-firm-we-predict/?sh=792ce59d13c2
[59] Anderson Economic Group. 2021. https://www.andersoneconomicgroup.com/wp-content/uploads/2021/10/EVtransition_FuelingCostStudy_10-21-21.pdf

gravitate toward electric options. In addition to Tesla's Model X and Y, a variety of automakers have released SUV models, including Audi, Nissan, Volkswagen, Hyundai, Kia, and Volvo, with more on the way.

Recently, Ford announced the all-electric F-150, set to be released in 2022, Rivian, a new EV manufacturer, plans to release a pickup truck, Tesla will release its Cybertruck, and GM has an electric Hummer, among other models entering the market. Even if models are on the market, they aren't always available to prospective EV owners in Missouri. Not all markets are created equal, with the 15 states that have signed onto California's Zero Emission Vehicle (ZEV) program, which sets annual sales goals for zero emission vehicles, accounting for two thirds of EV sales nationwide[60]. ZEV states tend to have greater access to EV models, as those states offer manufacturers the strongest potential sales.

Lack of Statewide Coordination

Stakeholders also highlighted the need for more coordination at the statewide level to facilitate the deployment of a charging network that meets the needs of current and future EV users, while also helping to fill access gaps. The stakeholder engagement process facilitated by Missouri DNR and associated with the VW Settlement Trust was one such statewide effort, which led to the goal of developing a minimum practical network of charging stations to make cross-state travel possible. While stakeholders will be reconvened to continue that process and determine how the remaining VW Settlement funding set aside for charging infrastructure will be used, it represents only a small fraction of the of the charging infrastructure expected to be deployed in the coming years. Depending on the speed with which EV adoption in Missouri reaches a critical mass, stakeholders may be scrambling to play catch-up to meet demand.

The Missouri Division of Energy, within the DNR is currently engaging stakeholders across Missouri in a State Energy Planning effort. It remains to be seen if EV infrastructure planning will be a component of the planning process, but initial regional meetings did not indicate EV infrastructure would be a primary focal point. The state of Missouri will also be embarking on an effort to determine the impact of electric vehicles on transportation funding

[60] International Council on Clean Transportation, 2019. https://theicct.org/publications/ev-us-market-growth-cities-sept21

stemming from the passage of Senate Bill 262[61]. The legislation raises Missouri's gas tax for the first time in 25 years and increases EV fees by 20% annually for 5 years, with fees varying by vehicle size. The bill also creates an electric vehicle task force meant to analyze and make recommendations regarding the impact of EVs on transportation funding. Those recommendations are due by December 31, 2022. Other states have embarked on statewide EV infrastructure planning efforts.

In Rhode Island, the Department of Transportation, Division of Motor Vehicles, and the Office of Energy Resources are required to develop a statewide plan, including a focus on equitable access to charging technology, by the beginning of 2022 as a result of legislation passed in 2021[62]. The plan is meant to close the EV adoption and charging infrastructure deployment gap compared to neighboring states and provide access to charging for the hard-to-reach multifamily property sector. In Minnesota, the Department of Transportation, the Pollution Control Agency, and Great Plains Institute developed a statewide plan meant to achieve an EV adoption rate of 20% by 2030[63]. The plan includes an overview of the challenges the state faces in terms of expanding its EV charging network. The governors of Illinois, Indiana, Michigan, Minnesota, and Wisconsin have joined to create the Regional Electric Vehicle (REV) Midwest Coalition to plan a network that supports medium- and heavy-duty electric vehicles and to capture a large share of electric vehicle production as the industry develops. California, Colorado, New York, Oregon, and Washington have also created plans for EV infrastructure.

In addition to statewide planning efforts, some states have set EV infrastructure goals. In 2021's House Bill 433, the Vermont legislature included a goal of at least one DCFC state port to be available to the public within five miles of every interstate exit and within 50 miles of another DCFC charging port along state highways. California aims to have 250,000 charging stations in place by 2013.

[61] Missouri Senate Bill 262, 2021. https://www.senate.mo.gov/21info/bts_web/Bill.aspx?SessionType=R&BillID=54298589
[62] Rhode Island House Bill 5031. http://webserver.rilin.state.ri.us/BillText21/HouseText21/H5031.pdf
[63] Accelerating Electric Vehicle Adoption: A vision for increasing EV use. 2019. https://www.dot.state.mn.us/sustainability/docs/mn-ev-vision.pdf

Deployment Gaps

As a result of the high upfront costs and difficult economics of operating charging stations, several gaps have developed in Missouri's network of public charging stations.

Rural Areas

While urban areas in Missouri, like Kansas City, St. Louis, Springfield, and Columbia have attracted investment in charging infrastructure from various sources, more rural areas in the state are being left behind. Missouri ranks 20th in terms of the most rural states in the country, with nearly 30% of the population living in rural areas[64]. Outside of VW Settlement-funded DCFC stations catering to motorists passing through Missouri's rural communities, electric providers and private companies have been reluctant to spend significant resources in areas that have yet to experience significant levels of EV adoption. The classic chicken and egg problem pervades planning transportation electrification decisions in low EV adoptions areas, where consumers are reluctant to purchase EVs due to a lack of charging infrastructure, and investors are reluctant to deploy charging stations that won't be profitable for years. Charging stations can offer economic development opportunities for local communities, attracting tourism dollars as EV drivers choose to travel to and through towns with charging infrastructure and can boost local businesses by increasing foot traffic during charging sessions.

Compounding the EV adoption issue is the greater EV range needed to support rural residents traveling longer distances than their urban counterparts. Battery technologies continue to improve, with the median estimated range for all 2020 model EVs exceeding 250 miles and some models achieving up to 400 miles[65]. Yet, that range continues to fall short of internal combustion engine (ICE) vehicles, with a median estimated range north of 400 miles all the way up to 700 miles for gas-powered vehicles. Battery range can also be negatively impacted by cold weather and spending more time on highways rather than stop-and-go city driving. In addition to range anxiety, the variety of vehicle models continues to be limited, with the diversification from passenger vehicles to light-duty trucks and all-wheel drive models still in its infancy. Over a quarter (28%) of light-duty registered vehicles in Missouri are trucks, with

[64] Stacker, 2019. https://stacker.com/stories/2779/states-biggest-rural-populations
[65] U.S. Department of Energy, 2021. https://www.energy.gov/eere/vehicles/articles/fotw-1167-january-4-2021-median-driving-range-all-electric-vehicles-tops-250

rural communities showing a greater percentage of truck ownership compared to their urban counterparts. The demand for Ford's all-electric F-150 shows the potential for growth in this vehicle class, but the market remains narrow, making EV ownership less accessible to drivers of trucks and SUVs.

One means of increasing the density of charging infrastructure outside of urban and suburban areas in Missouri is through the infusion of funding for the installation of charging stations. As mentioned above, VW Settlement funding has been used to deploy charging stations across the state to ensure a minimum practical charging network for cross-state travel. Time and again stakeholders interviewed for the development of this paper highlighted the need for funding or incentive programs to make investments in charging infrastructure viable in areas where high EV adoption levels and population densities aren't already attracting private investment. At the federal level, the Infrastructure Investment & Jobs Act contains funding set aside for EV infrastructure, specifically targeting rural areas. In Missouri, IOUs are filling some of the gaps in rural communities through the buildout of charging networks along highway corridors. A budget measure signed by the governor may also improve access to charging infrastructure in some rural areas through the installation of charging stations in some state parks. The measure sets aside $1 million for the Missouri DNR to install a network of charging stations in the park system, with deployment details yet to be released.

In other states, coordinated efforts are targeting rural communities to improve access to charging infrastructure. In the Western U.S., Tri-State Generation and Transmission Association is helping its member cooperatives with the costs of installing L2 and DCFC stations, as well as facilitating EV loaner programs, allowing member cooperatives to provide employees and members the opportunity to gain experience with EVs before purchasing[66].

Multifamily Dwellings

With 80% of charging taking place at home, access to home charging is a significant determining factor in whether or not a consumer chooses to purchase an EV. Residents in multifamily dwellings, especially those renting, often lack access to dedicated off-street parking

[66] Tri-State Generation and Transmission Association, 2020. https://tristate.coop/co-op-utility-offers-successful-electric-vehicle-ride-and-drive-experience

and the ability or incentive to install charging stations. The multifamily property sector presents a variety of challenges to installing EV charging stations, including electric metering complexities, permitting issues, and equity concerns. The charging access problem for multifamily dwelling residents is a national issue, which has been tackled from a variety of angles. Without focused programming, multifamily residents are largely blocked from the opportunity to own and benefit from EVs.

Here in Missouri, Ameren offers incentives for the deployment of charging stations at multifamily properties. Ameren's incentive program has resulted in the funding of 5 multifamily projects since its inception in 2020, with additional projects expected to be funded through 2023. Yet, this is just a fraction of the projects facilitated through Ameren's local charging incentive program. In Kansas City, the Metropolitan Energy Center is partnering with a variety of stakeholders, including Evergy, NREL, and others to deploy charging stations at streetlights to provide charging access to multifamily residents and others who lack access to charging infrastructure. A similar project in Portland, Oregon focused on the installation of chargers directly on existing utility or light poles to reduce installation costs and permitting requirements. Pacific Gas & Electric, a project partner, found that utility and light pole installations were a cost-effective way to increase access to public EV charging to those without access to off-street parking.

Other pilot projects in other states are also tackling the multifamily charging gap. In Minnesota, the HOURCAR[67] EV carshare pilot program includes the deployment of charging stations at multifamily properties and provides shared electric vehicles for residents. The two-year pilot program, funded by the U.S. DOE, is expected to be operational by 2023 and will introduce residents to the possibility of EV ownership and will educate property owners on how to increase utilization of charging equipment.

In some states, legislation has been passed with components focused on increasing access to EV charging for residents of multifamily dwellings. In Vermont, legislation passed in 2021 requires the state's transportation agency and Department of Housing & Community Development to establish a pilot program to provide $1 million in grant funding to facilitate the installation of charging stations at multifamily dwellings and affordable housing units.

[67] Visit HOURCAR.org for more information.

Moving forward

With automotive manufacturers increasingly investing in electrification, it's a matter of when, not if the transition to electric vehicles will occur. Missouri finds itself ahead of the pack in terms of the deployment of charging infrastructure to support EVs on the road today, but with a low statewide EV adoption level relative to other states, deployment of hundreds of charging stations is on the horizon to meet expected demand. Electric utility companies and charging station equipment providers have led the deployment of charging infrastructure in Missouri thus far, but it will take a coordinated effort by a variety of stakeholders across the state to prevent gaps in the public charging network from growing and to provide equitable access to the benefits of electrification of the transportation sector. With funding acting as the greatest obstacle to expanding charging infrastructure, the influx of federal dollars for charging stations via the 2021 Infrastructure Investment & Jobs Act is an opportunity to chart a path forward for Missouri's EV industry that attracts investment to the state, boosts local economic development, and ensures access to the benefit of electrification to all Missourians.

Appendix A

List of stakeholders interviewed in the development of this paper.

- Ameren Missouri
- Bi-State Development Agency
- Black & Veatch
- Callaway Electric Cooperative
- ChargePoint
- City of Columbia Water & Light
- City of Kansas City
- City Utilities of Springfield
- Consortium for Battery Innovation
- Edison Electric Institute
- Electrical Connection
- Electrify Missouri
- Enterprise Holdings
- Evergy
- Liberty Utilities
- LilyPad EV
- MC Power
- Metropolitan Energy Center
- Missouri Department of Economic Development (Mo DED)
- Missouri Department of Natural Resources (Mo DNR)
- Missouri Public Utility Alliance (MPUA)
- Missouri Public Service Commission (Mo PSC)
- Natural Resources Defense Council (NRDC)
- Renew Missouri
- Southeast Metropolitan Planning Organization (SEMPO)
- St. Louis & Kansas City Regional Clean Cities
- University of Missouri Science & Technology (Mo S&T)

- U.S. Green Building Council (USGBC)-Missouri Gateway Chapter