2025

Kansas City

Regional Electric Vehicle Readiness Plan

MARC
MID-AMERICA REGIONAL COUNCIL

wsp

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At the time of this report's conclusion, many Federal funding programs related to Electric Vehicles and associated charging infrastructure were under review for possible revision. MARC and regional stakeholders will continue to monitor these programs as potential adjustments are made and funding programs related to EVs are made available in the future.

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1. EXECUTIVE SUMMARY AND INTRODUCTION

Overview

The goal of this project is to support plug-in electric vehicle (EV) readiness in the Kansas City area with a plan that provides a vision for EV readiness, identifies key partnerships and actionable strategies needed to achieve the vision, and prepares for and stimulates community adoption of electric vehicles. The Kansas City Regional Electric Vehicle Readiness Plan was developed through coordinated engagement with partners and stakeholders and is intended to complement other regional strategies aimed at decreasing greenhouse gas emissions in the transportation sector. It is also intended to inform future implementation requests made through multiple federal funding sources, such as the Charging & Fueling Infrastructure (CFI) program, by identifying specific locations in the Mid-America Regional Council (MARC) planning area that would most benefit from EV charging infrastructure.

Purpose and Approach

This electric vehicle readiness plan is intended to be used by planners, government officials, and other interested stakeholders to inform where to focus their resources and funding to best support EV growth in the Kansas City region. The plan consists of six parts:

1. **Assessment of Existing Conditions**
   The study reviewed existing plans and programs undertaken by public and private organizations over the last 10 years. Existing EV infrastructure was also assessed through the lens of equitable access for disadvantaged populations.
2. **Utility & Electric Grid Analysis**
   Utilities in the MARC region were studied to determine their preparedness for increased EV adoption, the reliability of their grid, their planning processes, and the cost of electricity to their customers. The multi-state regional grid planning process was also evaluated in the context of EVs.
3. **Stakeholder & Community Engagement**
   Working with a steering committee of EV stakeholders from across the region, the study team blended technical knowledge with community input to identify barriers, opportunities, and priority recommendations for EV readiness. This was complemented by two rounds of public surveys and in-person pop-up engagement events.
4. **Identification of Needs**
   The study team developed a model to predict how many drivers will purchase EVs over the next ten years and where they live in KC. It was then expanded to determine what areas in KC have the greatest need for EV charging infrastructure, with an emphasis on public fast chargers.
5. **Strategic Recommendations**
   Locations for EV chargers were prioritized according to need, with an emphasis on underserved communities. The study team also looked at various funding strategies and made suggestions for policy changes at the local level.
6. **Implementation Resources**
   An outline was provided for a Request for Proposal (RFP) intended to support a regional CFI grant application. Additionally, an online mapping tool was developed to integrate with existing MARC GIS tools for use in future planning and implementation efforts.

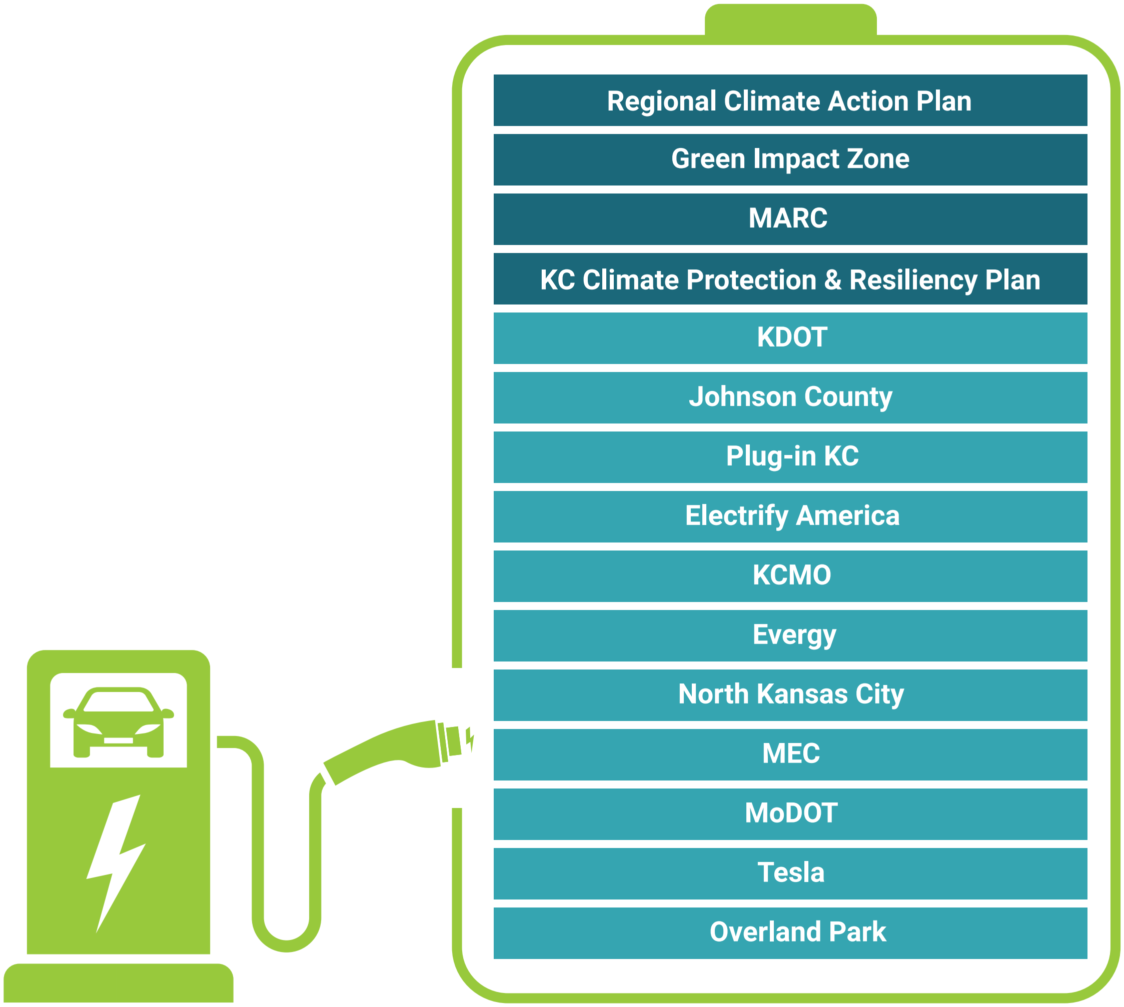
Background and Summary

MARC serves as the association of city and county governments and as the Metropolitan Planning Organization (MPO) for the bistate Kansas City region. The MPO is made up of 9 counties: five in Missouri and four in Kansas, as shown in **Figure 1**.

Figure 1: MARC MPO Member Counties

This study builds upon the work of many dedicated individuals and organizations in Kansas City across both public and private sectors. A review of **existing plans and programs** revealed a variety of stakeholders that have made an impact on planning, funding, and building the zero-emissions infrastructure in place today –some of which are shown below.

Figure 2: Existing Plans & Programs



An investigation into existing charging infrastructure looked at both level 2 and direct current fast charging (DCFC) infrastructure. Level 2 chargers typically recharge a modern EV overnight, while DC fast chargers can recharge some vehicles in as little as 15 minutes. Kansas City has one of the most extensive Level 2 charging networks in the country, thanks primarily to Evergy's Clean Charge Network, which was spearheaded in 2015. However, much has been learned about EV driver behavior in the last 9 years, and modern EVs have much larger batteries than early models. Some charging locations have seen a high amount of use, such as those in office parking garages and hospitals, while others are rarely used at all, most likely due to their location and slow charging speeds.[1] Currently, the Kansas City metro has very few DC fast charging stations – which are much more analogous to gas stations as they can recharge a vehicle quickly. As of early 2024, the entire Kansas City metro area only had 12 modern DC fast charging stations that are open to the public[2], are compatible with any vehicle, and are designed for public use.

Most of these charging stations only have 4-6 plugs, meaning the Kansas City region has fewer than 100 fast-charging plugs for a metro region of over 2 million people. While only about 13,000 people in Kansas City drive EVs today, this study predicts that total to rise to 53,000 in 2030 and almost 100,000 people by 2035. The MARC region does not currently have the charging infrastructure in place to support the anticipated number of EVs on the road in the years ahead.

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1 Clean Charge Network charger utilization data was provided by Evergy and analyzed for this study with permission. Raw data remains confidential.

2 PlugShare, locations with power levels of 100 kW and greater, excluding car dealerships and Tesla-only stations.

This study primarily focused on DC fast charging stations, which are much more convenient and can recharge far more vehicles in a given day than a Level 2 charger. This is important when providing access to drivers who are away from home or do not have access to home charging. In this respect, DC fast charging stations are similar to a traditional gas pump which is why this study focuses primarily on how to increase the deployment of DC fast chargers that would allow for more reliable and convenient charging facilities for the greatest number of EV drivers.

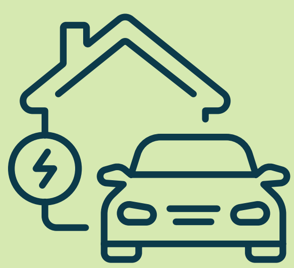
Kansas City has fewer than 100 fast-charging plugs in a metro area of over 2 million people.

Figure 3: EVGo charger in Johnson County, KS

This plan includes a desktop study of the regional electric grid, including the eleven electric utilities in the MARC region. It reviewed their structure, planning processes, and rate plans. Evergy, an investor-owned utility, serves the vast majority of customers in the Kansas City area and has the most advanced electrification strategy – including a team dedicated to EVs and rate plans designed to benefit EV drivers while maintaining grid reliability. As a public company with a strong credit rating, Evergy has shown it can easily raise private capital to fund needed grid enhancements and has invested over $1 billion over the last few years.

Utility rate plans varied widely throughout the metro – and so did the cost to charge an EV. The cost to recharge a typical vehicle at home ranged from a low of $2.38 when charging overnight to as high as $38.67 when charging during afternoon peak times. Evergy has several residential plan options to choose from, while most other utilities only offer one or two options for residential customers. Most municipalities and cooperatives haven't embraced time-of-use (TOU) rate plans currently (plans that charge different rates depending on the time of day) but some are exploring such programs.

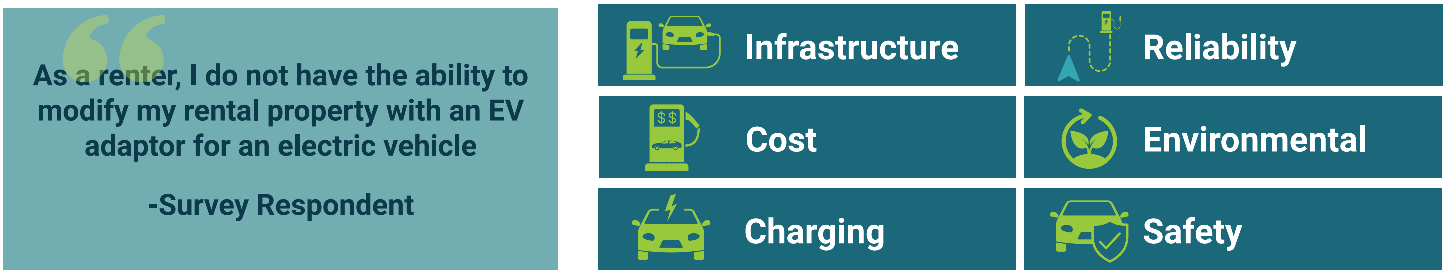
Cost is only one factor, and this study **identified other barriers and perceived barriers** that influence buying behavior using a combination of surveys and direct engagement with stakeholders and members of the community. A steering committee was formed, made up of representatives from local governments, utilities, and other local stakeholder organizations. The project team met with the steering committee four times throughout the project and incorporated their feedback into the study methodology and analysis. Two rounds of surveys and multiple public pop-up engagement sessions helped elicit current barriers to EV adoption as well as concerns.



The cost to recharge a typical vehicle at home ranged from a low of $2.38 when charging overnight to as high as $38.67 when charging during afternoon peak times.

Most concerns fit into six categories – with infrastructure, cost, and charging concerns emerging as top perceived barriers identified in public outreach efforts.

Figure 4: EV Barriers to Adoption



Two of these categories: infrastructure and charging can be directly impacted at the local level by planning and development efforts. While vehicle cost cannot be directly impacted locally without purchase subsidies, this study found that initial vehicle costs have already decreased significantly and are expected to drop further in the future. Unsubsidized price parity with gas vehicles across all vehicle classes may still be several years ahead.

Vehicle registration data provided by the states of Kansas and Missouri revealed that there were 13,736 on the road in the MARC region at the end of 2023. This study predicts that number to rise to 53,323 in 2030 and 95,475 in 2035.

Figure 5: 10-Year Estimated EV Growth in MARC Region

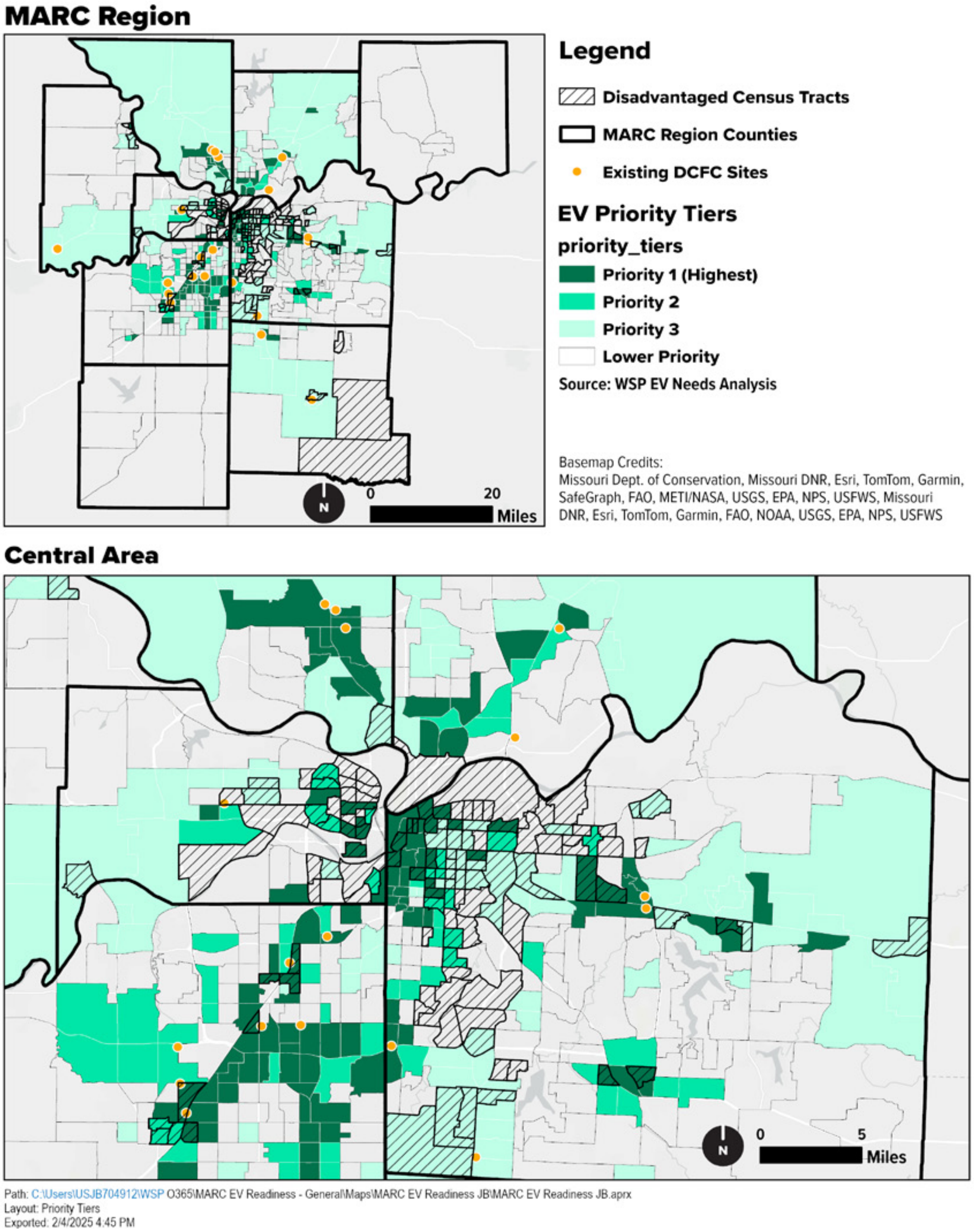
With fewer than 20 high-power charging stations in Kansas City and almost 100,000 expected EV drivers by 2035, almost every zip code in the region would benefit from additional public charging locations. However, this study is intended to identify the areas in the metro region that would benefit most from public investment in DC fast charging infrastructure over the next 10 years to make the most effective use of available federal funding opportunities.

To identify these priority locations, this study developed a needs analysis model. It blends input data from a variety of sources to answer the following questions:

1. Where do people go, especially those with long commutes or visiting KC from out of town?
2. Who is least likely to have access to EV charging at home, such as those renting their homes?
3. Where will EV drivers live, especially those in disadvantaged communities?

By initially placing DC fast chargers at locations that meet all three of these criteria, the Kansas City metro will begin building an EV fast charging network that meets the needs of current and future EV owners while also enabling disadvantaged communities to drive cleaner vehicles.

Figure 6: Identified Areas of Need



Where are chargers needed?

Priority charging areas are located in almost every county in the MARC region and are concentrated in parts of the metro where people live, work and visit.

Weight is given to areas that are near major highways and have a relatively high density of multifamily housing units.

Table 1: DCFC Priority Locations by County

MARC Member County	Number of Priority Locations
Johnson County, KS	10
Wyandotte County, KS	5
Leavenworth County, KS	0
Miami County, KS	0
Platte County, MO	2
Clay County, MO	4
Jackson County, MO	13
Cass County, MO	2
Ray County, MO	0
Total	**36**

The benefits of these fast charging locations should be multiplied by strategically expanding access to Level 2 chargers in these same areas, with particular focus given to disadvantaged communities living in rental housing or homes without access to garages. Many vehicle manufacturers subsidize home chargers for customers who purchase new vehicles, but this is not true for customers who purchase used vehicles, or for customers who do not own their own homes. Finally, recommendations are made on local policy changes, such as zoning and building codes, to encourage developers to add EV charging to their projects.

2. ASSESSMENT OF EXISTING CONDITIONS

It is important to do a thorough assessment of the current conditions before making suggestions for improvement of EV charging infrastructure. In this case, the study team needed to understand the following questions:

- What organizations have addressed EVs previously, and what were their findings?
- What does existing EV charging infrastructure look like, and who are the major players and stakeholders?
- Who currently drives EVs in the Kansas City region, and where do they live?
- Is existing EV infrastructure serving disadvantaged communities?
- What barriers currently exist that may inhibit EV adoption?

2.1 Existing Plans and Programs

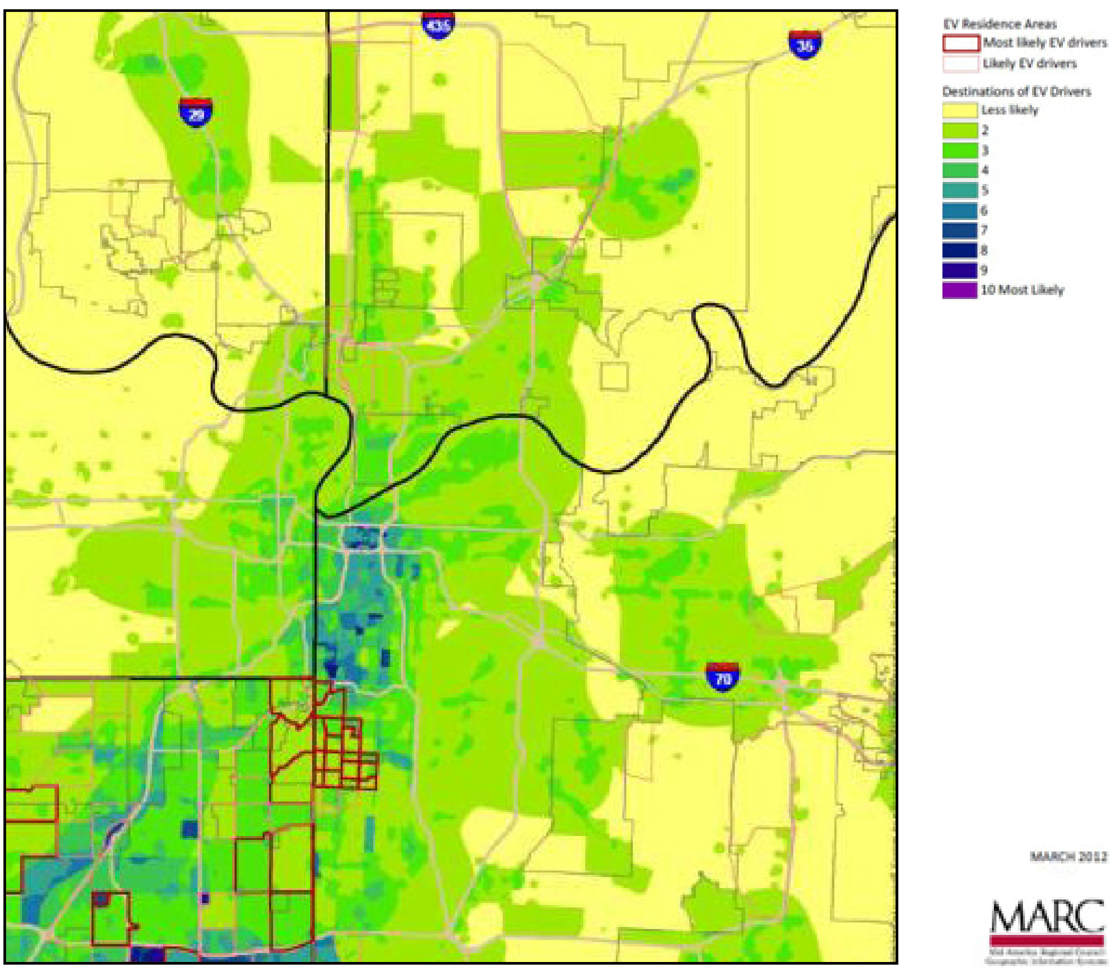
This section looks at studies, plans, and programs that other organizations have undertaken over the last 10-15 years that impact the Kansas City area regarding EVs to understand their successes and lessons learned. Some of these directly relate to electric vehicles, while others are aimed at broader greenhouse gas reductions or climate benefits.

2.1.1 Electrify Heartland (2012)

This was a study of existing conditions locally in the Kansas City region as well as policies locally and state level to evaluate the steps necessary to build out an initial electric vehicle charging network. It was developed in 2012 by the Metropolitan Energy Center and a broad stakeholder group. Smart grid, microgrids, and renewable generation were all a part of the broad review of potential projects that could lead to a more effective electric vehicle charging infrastructure implementation. The Electrify Heartland Plan studied various electrical impacts on the local grid. MARC provided modeling assistance to produce approximations of where EV ownership existed by proxy, as well as the destinations that many of the drivers of the EVs would drive to, as shown in **Figure 7 - MARC produced forecasts of EV destinations based on employers, the density of higher-paid employees, and MARC EV origin modeling from 2012, Electrify Heartland Study**.

This plan reviewed regulatory challenges that existed at the time related to 3rd parties installing charging infrastructure as well as other existing issues.

Figure 7: MARC produced forecasts of EV destinations based on employers, the density of higher-paid employees, and MARC EV origin modeling from 2012, Electrify Heartland Study



2.1.2 Green Impact Zone (2012-2014)

A precursor to Evergy's electric vehicle charging infrastructure, this document gives a high level of the smart grid efforts that included some of the first electric vehicle charging infrastructure in the Midwest and region. The SmartGrid Innovation Park was a demonstration element of the project that was located within the area termed the "Green Impact Zone". The SmartGrid Innovation Park housed a large, utility-scale battery as well as some of the first public electric vehicle chargers in the MARC region. Figure 8 illustrated how the EV charging infrastructure was only an element of the larger utility-scale integrations that KCP&L at the time and now Evergy hoped to demonstrate within this Department of Energy grant demonstration.

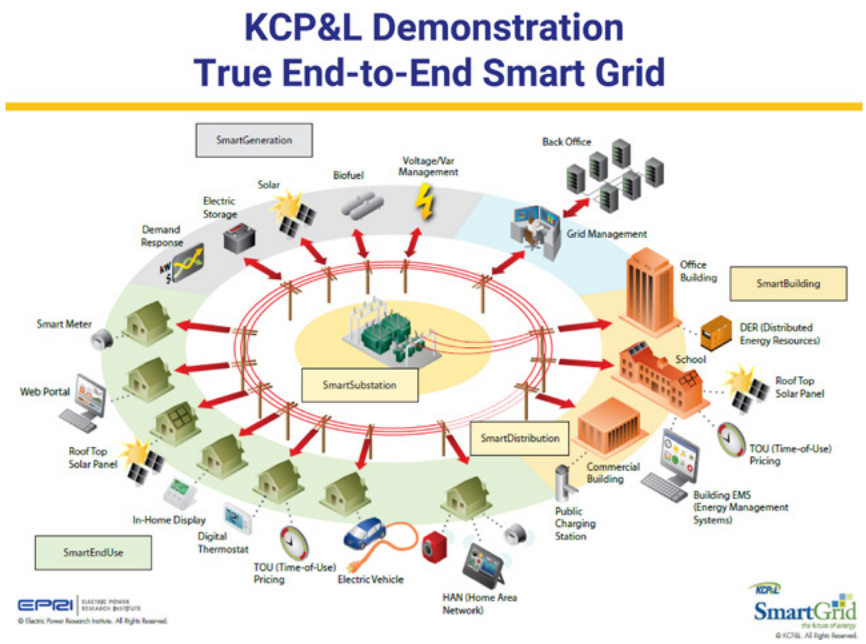


Figure 8: Illustration depicting the integration of some of the initial electric vehicle charging infrastructure in the MARC area in the Green Impact Zone project at the SmartGrid Innovation Park

2.1.3 MARC Regional Climate Action Plan (2021)

The Climate Action Plan has a larger focus on sustainability across the Kansas City region and focuses on several elements that would impact Kansas City's EV Readiness plans. It aims to look at ways to shift private, commercial, and municipal fleets to low and no-emission fleets in terms of electric vehicles. It also tries to aim strategies to bridge the economic gap that is experienced in purchasing electric cars, trucks, and larger vehicles.

The Climate Action Plan goes a step further than many plans currently addressing EV readiness and addresses the accessibility of electric bikes as another electric mode. It aims to find modes appropriate for different trips in contemplating transit and electric bikes as alternatives to single occupant cars for trips.

2.1.4 MARC Connected KC 2050

This long-term transportation plan is in process. Elements of all modes of transportation projects and priorities are being requested by MARC. Public outreach started in October 2023 and continues through the mid-2024. There will be electric vehicle infrastructure projects identified within this process. This process was previously an effort undertaken in 2020. The 2025 update that is underway involves updating assumptions and attempting to address or account for various potential growth futures for the MARC region. **Figure 9** illustrates different disbursements of people, jobs, and households from 2020 until the forecasted future in 2050. Some more dense development patterns as they've seen in recent history, while others could be more dispersed. These changes make certain transportation projects and make those efforts more or less effective. Electric vehicle charging infrastructure would be more cost-effective with consolidation.

Figure 9: Community Growth Modeling that MARC completed as part of the Connected 2050 plans

2.1.5 Kansas NEVI Plan (2023)

The Kansas Department of Transportation (KDOT) submitted its initial National Electric Vehicle Infrastructure (NEVI) plan in 2022 after the Kansas Legislature passed legislative changes to allow for 3rd Party resale (someone who was not a public utility) of electricity in the 2021 legislative session. The initial 2 years consisted of public outreach and the development of an RFP process to assist in the build-out of the Alternate Fuel Corridors (AFC) identified for Kansas. The current work KDOT is completing focuses more on transitioning towards funding electric vehicle charging infrastructure within communities to serve local or commuter needs, rather than long-distance traveling public who are driving electric vehicles.

Total NEVI funds in Kansas are estimated at $40 million over five years. To date, NEVI funds have not been directed toward the MARC region but have been focused on rural parts of the state that do not have any existing charging infrastructure, as shown below.[3]

3 ike.ksdot.gov/charge-up-kansas, *image created by KDOT*

Figure 10: Kansas NEVI Priority Locations

2.1.6 Missouri NEVI Plan (2023)

With similar goals and parameters to Kansas, Missouri has been primarily focused initially on the AFCs across Missouri, with the priority to move towards addressing commuting or intrastate EV needs within Missouri as well. Figure 11 captures the primary goals of the Missouri NEVI Deployment Plan (NDP). Also not listed but mentioned as further intentions include using renewable and sustainable technologies in the process of implementing this NDP, including looking at existing electrical grid capacity. There was a particular emphasis on travel from Missouri's urbanized areas. Those areas include Cape Girardeau to St. Louis, as well as the Corridor between St. Joseph to Kansas City to Joplin on the west end of Missouri.

Missouri is expected to receive approximately $98 million in NEVI funds over five years.[4]

Figure 11: Missouri NEVI Deployment Plan (NDP) Goals taken from the 2023 Update

Missouri NDP Goals	
Goal 1:	An EV charging network that serves Missouri's communities and travelers
Goal 2:	A corridor-based EV charging system that leverages existing transportation and utility infrastructure for regional and interstate travel.
Goal 3:	A comprehensive system that supports transportation choices for all of Missouri's residents and builds on existing state-level planning efforts related to EVs.
Goal 4:	A resilient, economically sustainable vehicle fueling system that can adapt to changes in market conditions and transportation technologies.

4 *MoDOT Electric Vehicle Deployment Plan, Revised September 2023, obtained from modot.org*

2.1.7 Kansas City Missouri Climate Protection & Resiliency Plan (2022)

This plan had a broad scope covering many elements of sustainability and environmental impacts for the whole of Kansas City, Missouri. Consistent across several of the final recommendations is the suggestion to reduce emissions through low and no-emission vehicles. Specifically, the plan proposed community-wide EV adoption, as well as car share options for populations with lower income levels. This second option does not specifically address implementing electric vehicles but offers a pathway toward electric vehicle implementation in lower-income neighborhoods. The program could start with affordable, used gas vehicles as a pilot and transition to electric vehicles with minimal operating costs in the longer term.

2.1.8 City of Overland Park EV Readiness Plan (2023)

This plan identifies needs for one of the municipalities within the MARC planning region. Overland Park, KS lies in Johnson, County, KS. This plan addresses needs both on the public and private side of the infrastructure development. It identifies Overland Park's efforts at electrifying its fleet. Further, the plan reviews incentives and policies surrounding vehicles and charging infrastructure available on the local public side as well as private.

The plan identifies priority locations like corridors as well as local hubs and spots within Overland Park that make sense to establish a focal point of charging. This plan had a broad approach to looking at many facets not only of the public charging infrastructure and implementation of electric vehicles but various elements of the Overland Park municipal fleet.

Several of the study's 20 recommendations relate specifically to charging infrastructure development or funding of public electric vehicle charging infrastructure.

The EV related sections fall into the following categories:

- City Fleet
- City Facilities
- Community
- Utility Coordination
- Funding
- Implementation

There seemed to be a large focus on the municipal transition to a higher proportion of an electric fleet, rather than being so strongly focused on NEVI-related facilities for public consumption. The community recommendations relate most directly to this regional planning effort, and address property owner coordination for NEVI sites, public outreach materials about EVs, guidelines for developers, and standards related to accessibility requirements at charging stations.

2.1.9 North Kansas City Electric Vehicle Infrastructure Plan

This study has recently been completed by the City of North Kansas City. Figure 12 illustrates the 5 different locations that were identified within North Kansas City that are optimal for charging. One of these sites includes both Direct Current Fast Charging (DCFC)and Level 2 charging infrastructure, while the other four are proposed to be just Level 2 charging infrastructure.

The DCFC station location was identified aligned with a NEVI corridor, as well as a newer destination museum in the community. The Level 2 charging stations were located with the goal of providing shorter, lesser volumes of charge for more localized travel or commutes to North Kansas City.

The authors of the study worked with the North Kansas City Council to try and prepare the city for the upcoming August 2024 Charging and Fueling Infrastructure (CFI) grant from the US Department of Transportation (DOT). The local 20% match was said to equate to roughly $350,000, with the other 80% to be covered by the USDOT's grant funds.

Figure 12. North Kansas City Proposed Locations and Location Scoring

2.1.10 Other City Initiatives

In 2011 KCP&L at the time, now Evergy, piloted an investment in electric vehicle charging with ChargePoint and several others. This included 8 different locations and types of charging locations for data collection and industry learning in the region. The program was funded by a U.S. Department of Energy award.[5], an American Recovery and Reinvestment Act grant project awarded to the Metropolitan Energy Center.

In 2015, KCP&L, now Evergy, partnered with vendor ChargePoint to install nearly 1,000 electric vehicle chargers in the area. At the time it was said that Kansas City had around 40, the state of Texas had 500 and the state of California had 2,000[6]. Many of these chargers were Level 2, 6 kW rated capacity chargers good for slower, daytime or overnight charging. Almost 10 years later, these chargers are

5 www.ChargePoint.com/about/news/kcpl-begins-electric-vehicle-charging-pilot-program-using-coulomb-technologies
6 www.kansascity.com/news/business/article8179314.html

now being updated and upgraded for various reasons including communications updates to the network connections with the original 3G communications links. This investment by Evergy spurred much discussion in the MARC region about electric vehicles that likely would not have occurred without this investment.

2.1.11 Local Legislation

EV-related laws and regulations are still uncommon in the Kansas City area but are starting to appear in several MARC member cities, typically addressing repercussions for drivers that park in EV charging spaces. This may create confusion in the Kansas City metro since some municipalities have enforceable rules while others do not.

In June 2024, the Overland Park City Council approved (10-0) a law to require vehicles parked at its city-owned EV charging infrastructure to be plugged into the chargers while parked in front of them.[7] Failure to plug in could result in a ticket from $100 to $1,000.[8] The ordinance is a part of Overland Park's traffic code, and it allows for private electric vehicle charging station owners to opt their sites into the ordinance as well.

The Merriam City Council also recently adopted a new ordinance in August of 2024 that allows drivers to be fined for parking in an EV charging spot while not actively charging a vehicle (whether or not that vehicle is an EV)[9]. The minimum fine is $100 and the maximum fine is $500.

Further impacts on public charging infrastructure could be minimum setbacks for development. Commonly communities allow "parking lots" to be closer, with a lesser setback, will make the charging locations more effective and used. Many existing fast-charging units are being located in existing parking lots and commercial or retail spaces. The logistical challenges are typically more related to physical improvements for electrical connections, rather than zoning challenges or constraints.

Other complications could include fencing and masking requirements of electrical equipment. Some charging vendors seem to inherently include fencing in their designs, while others do not.

2.1.12 State Legislation

With MARC communities being located in both Kansas and Missouri, the Kansas communities have contended with a conflict caused by electric utility regulation and the provision for monopolies amongst the electric utility providers or public utilities. These laws suggested that unless an entity that desired to sell electricity for electric vehicle use was regulated and provided all the reporting and efforts that go into being a public utility, then that entity could not sell electricity for electric vehicles. In Kansas, this changed in 2021 with the passage of House Bill 2145 and Senate Bill 133. These bills stated:

(d) The term "public utility" shall not include any activity of an otherwise jurisdictional corporation, company, individual, association of persons, their trustees, lessees, or receivers as to the marketing or sale of: [...]

(2) electricity that is purchased through a retail electric supplier in the certified territory of such retail electric supplier, as such terms are defined in K.S.A. 66-1,170, and amendments thereto, for the sole purpose of the provision of electric vehicle charging service to end users."

7 johnsoncountypost.com/2024/06/27/overland-park-ev-parking-rules-236524/
8 opkansas.civicweb.net/document/350344/Ordinance%20No.%20TC-3452%20(Option%20B).docx?handle=C07136B7BA64444EA644881E889FBB0B
9 johnsoncountypost.com/2024/08/13/merriam-ev-charging-fines-239728/

From this legislative change, utilities do not have to be the owner or operator of public charging stations. This statutory language allows them to not have to play that role, and instead only providing power if that is their priority.

A remaining challenge is this legislation forces EV charging companies to purchase electricity from an existing retail electric supplier to not be construed as a public utility. A situation could exist where a potential electric vehicle charging provider might want to take their charging facilities off-grid and supply their energy from renewable or other isolated energy resources like a generator. Without becoming a public utility, the provider would not be allowed to do this without further legislative changes in Kansas. The reason this issue is of concern is that various electric vehicle charging companies may desire to provide electricity independent of utility-supplied energy sources in the MARC region. It has been requested by other charging companies in Kansas previously.

2.1.13 Other Initiatives

2.1.13.1 Climate-Action KC / Plug-in KC

Plug-In KC is a new initiative by Climate Action Kansas City launched in March 2024. Plug-In KC's programs are designed to scale up both the electric vehicle market and the infrastructure needed to support a transformation in both the public and private sectors. Plug-in KC will focus on education about electric vehicles, advocacy for greater funding for EV infrastructure, and aggregation of demand to encourage automakers to sell more EVs in Kansas City.[10] In partnership with Evergy, Plug-In KC manages the website pluginkc.org. The site operates as a resource portal for new and potential EV buyers and provides news and updates about the EV markets. Plug-In KC will identify market gaps and will create partnerships and resources within to maximize funding and tax credits and other incentive programs.

Figure 13: Plug-in KC Event, October 2024

Plug-in KC held an "EV Tailgate" event in October of 2024 in partnership with Olathe Ford

10 *Photos provided by Plugin-KC and used with permission*

2.1.13.2 Metropolitan Energy Center

The Metropolitan Energy Center (MEC) continues to be active in furthering electric vehicle charging infrastructure in the region and electric vehicle fleet deployments. As a Department of Energy Clean Cities Coalition, the MEC is regularly involved in projects in the MARC region in assisting in funding, initial information and education, studies, and networking among EV fleet and personal users.

A more recent example of this work is the 2021 project called the Streetlight Charging Pilot Project. Coordinated by MEC, the project was an innovative effort to expand public charging, despite whether the user has a garage, or a single-family dwelling, or not. The project included coordination with the City of Kansas City, MO, Evergy, and MEC to install EV charging infrastructure at 23 different public street light locations adjacent to parking on a public street. This project gained both regional accolades in the MARC region as well as more broadly with promotion by the Department of Energy.[11] This project developed the concept that there are multitudes of public spaces to install charging infrastructure that is readily available if stakeholders create innovative methods of sharing community infrastructure. Figure 14 shows an example installation of the streetlight-based EV charging installations in Kansas City, MO.

Figure 14: An example installation from the MEC, City of KC, MO, and Evergy street light installation project. Source: Metropolitan Energy Center

2.1.13.3 Building Codes

Building codes impact the basic requirements to which a structure is constructed. In order for many of the electric vehicle charging stations to be used there is the need for a larger gauge wire and overcurrent protection or a new circuit to be installed. Being proactive in foreseeing the need for these chargers in the future, various building code authorities have studied the common needs related to electric vehicle charging infrastructure. The next step was adding relevant requirements to new housing and commercial construction standards that would automatically build in the necessary basics like wiring for electric vehicles in certain contexts. This means homes built after the adoption of this code will already be wired for an EV charger. This will simplify the process and make electric vehicle adoption simpler.

A review was conducted of several MARC municipalities, which represent 75% of the metro population. These communities also represent 75% of the most densely populated areas in the MARC region, or the potentially more developed portions of the region that are more likely to have continued to update their code references based on resources and building construction.

Table 2 shows the varying codes under which the various MARC communities are governed. As with any governing text, there is a consistent lag of adoption to maintain consistent expectations of the impacted parties, construction contractors in this context. There is typically a lag of adoption due to entities learning how to interpret new language after it has been published, but perhaps not practiced in the real world.

11 *metroenergy.org/kansas-citys-innovative-streetlight-ev-charging-pilot-a-blueprint-for-the-future*

Table 2: Building Codes in the Kansas City Area

City	County	2022	% of Population	IECC	NEC	IBC
Kansas City, MO	Cass/Clay/Jackson/Platte	509,297	22.37	2021	2017	2018
Overland Park, KS	Johnson (KS)	197,726	8.68	2018	2017	2018
Kansas City, KS	Wyandotte	153,345	6.73	2018	2017	2018
Olathe, KS	Johnson (KS)	145,616	6.39	2018	2017	2018
Independence, MO	Clay/Jackson	121,202	5.32	N/A	2017	2018
Lee's Summit, MO	Cass/Jackson	103,465	4.54	N/A	2017	2018
Lawrence, KS	Douglas	95,794	4.21	2018	2017	2018
St. Joseph, MO	Buchanan	70,656	3.10	N/A	2017	2018
Shawnee, KS	Johnson (KS)	69,198	3.04	2018	2017	2018
Blue Springs, MO	Jackson	59,518	2.61	N/A	N/A	2018
Lenexa, KS	Johnson (KS)	58,617	2.57	2012	2017	2018
Leavenworth, KS	Leavenworth	37,081	1.63	2018	2018	2018
Leawood, KS	Johnson (KS)	33,713	1.48	2018	2017	2018
Liberty, MO	Clay	30,775	1.35	2012	2017	2018
Raytown, MO	Jackson	29,312	1.29	2018	2017	2018

Many of the jurisdictions in the MARC region still have the National Electric Code (NEC) 2017 adopted. This code requires a branch circuit for electric vehicle charging. This means in the future if a house or facility wants to charge there will be a circuit in place to wire up an electric vehicle charger. There will be additional costs associated with the decision to adopt and implement this version of the NEC. This offers an opportunity for MARC to potentially offer or seek funding to support an incentive to minimize the costs associated with the NEC 2017 and related EV adoption. There could be an incentive developed to defray the costs associated with the additional circuit costs of wiring, breakers, conduit, etc.

The codes that were commonly adopted in these communities were the International Energy Conservation Code (IECC), the National Electric Code (NEC), and the International Building Code (IBC). Table 3 shows the various code requirements related to EVSEs and public charging. These are the three codes relevant to electric vehicle charging infrastructure. There were three contexts of requirements found in these codes that related to electric vehicle infrastructure:

1. Requirement for residential Electric Vehicle Equipment (EVSE) circuit
2. Requirement for commercial Electric Vehicle Equipment (EVSE) circuit
3. Requirement for multifamily Electric Vehicle Equipment (EVSE) circuit

Table 3: Code Requirements that Impact Electric Vehicles

	Building Code	Year	Requirement for residential EVSE circuit	Requirement for commercial EVSE circuit	Requirement for Multifamily EVSE circuit
International Energy Conservation Code	IECC	2021	Yes, 5% of parking if EVSE is present, 10% of parking otherwise	Yes, 5% of parking if EVSE present, 10% of parking otherwise	
	IECC	2018	Doesn't have minimums	Doesn't have minimums	Doesn't have minimums
National Electric Code	NEC	2020	**DEDICATED EV WIRING OPTIONAL** 625.40 Electric Vehicle Branch Circuit. Each outlet installed for the purpose of charging electric vehicles shall be supplied by an individual branch circuit. Each circuit shall have no other outlets.		
National Electric Code	NEC	2023	**DEDICATED EV WIRING OPTIONAL** 625.40 Electric Vehicle Branch Circuit. Each outlet installed for the purpose of supplying EVSE greater than 16 amperes or 120 volts shall be supplied by an individual branch circuit. Exception: Branch circuits shall be permitted to feed multiple EVSEs as permitted by 625.42(A) or (B).		
		2017	Yes	Yes	Yes
International Building Code	IBC	2021	**406.2.7 Electric vehicle charging stations and systems.**		
			Where provided, electric vehicle charging systems shall be installed in accordance with NFPA 70. Electric vehicle charging system equipment shall be listed and labeled in accordance with UL 2202. Electric vehicle supply equipment shall be listed and labeled per UL 2594. Accessibility to electric vehicle charging stations shall be provided in accordance with Section 1108.		

2.2 EV Infrastructure Equity Analysis

The Mid-America Regional Council's Equity and Title VI program is designed to ensure that people have equal access to MARC's programs and activities and that the transportation improvements it plans are distributed fairly across racial and socioeconomic groups[12]. The United States Department of Transportation's Equity Action plan and the Justice40 initiative seek to further Federal Civil Rights and Environmental Justice laws by addressing barriers to transportation and investing in historically disadvantaged communities[13].

The USDOT's Equitable Transportation Community Explorer is an interactive dashboard and data tool designed to explore the particular disadvantages communities may face, including climate and disaster risks, environmental burdens, health vulnerabilities, social vulnerabilities, and transportation insecurity. Each census tract has a percentile ranking of multiple indicators in each category. If the overall index score (a sum of indices in each category) is above the 65th percentile, that census tract is considered disadvantaged by USDOT standards14. This tool has been used throughout the EV Readiness planning process to understand the unique needs of various locations across the MARC region. Disadvantaged census tracts are also used to help understand the current and potential future sites of EV charging throughout the region.

The federal DOT publishes a map that identifies disadvantaged census tracts, showing communities experiencing

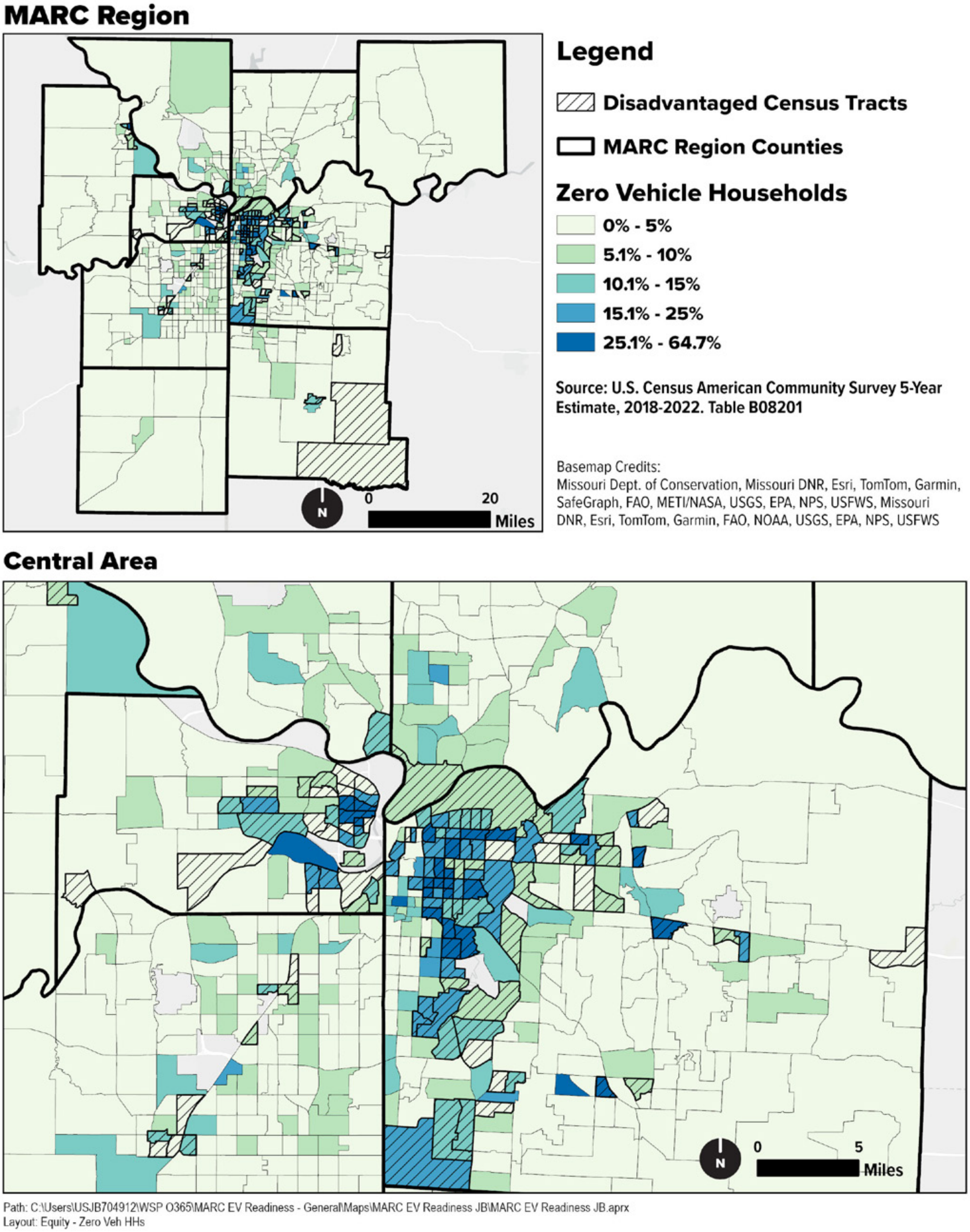
- burdens in climate change
- health
- housing
- legacy pollution
- transportation
- water
- wastewater
- workforce development

12 Mid-America Regional Council, Title VI Program 2023-2025. www.marc.org/sites/default/files/2022-11/Title-VI-2022.pdf

13 At the time of this report's conclusion, many Federal funding programs related to Electric Vehicles and associated charging infrastructure were under review for possible revision. MARC and regional stakeholders will continue to monitor these programs as potential adjustments are made and funding programs related to EVs are made available in the future.

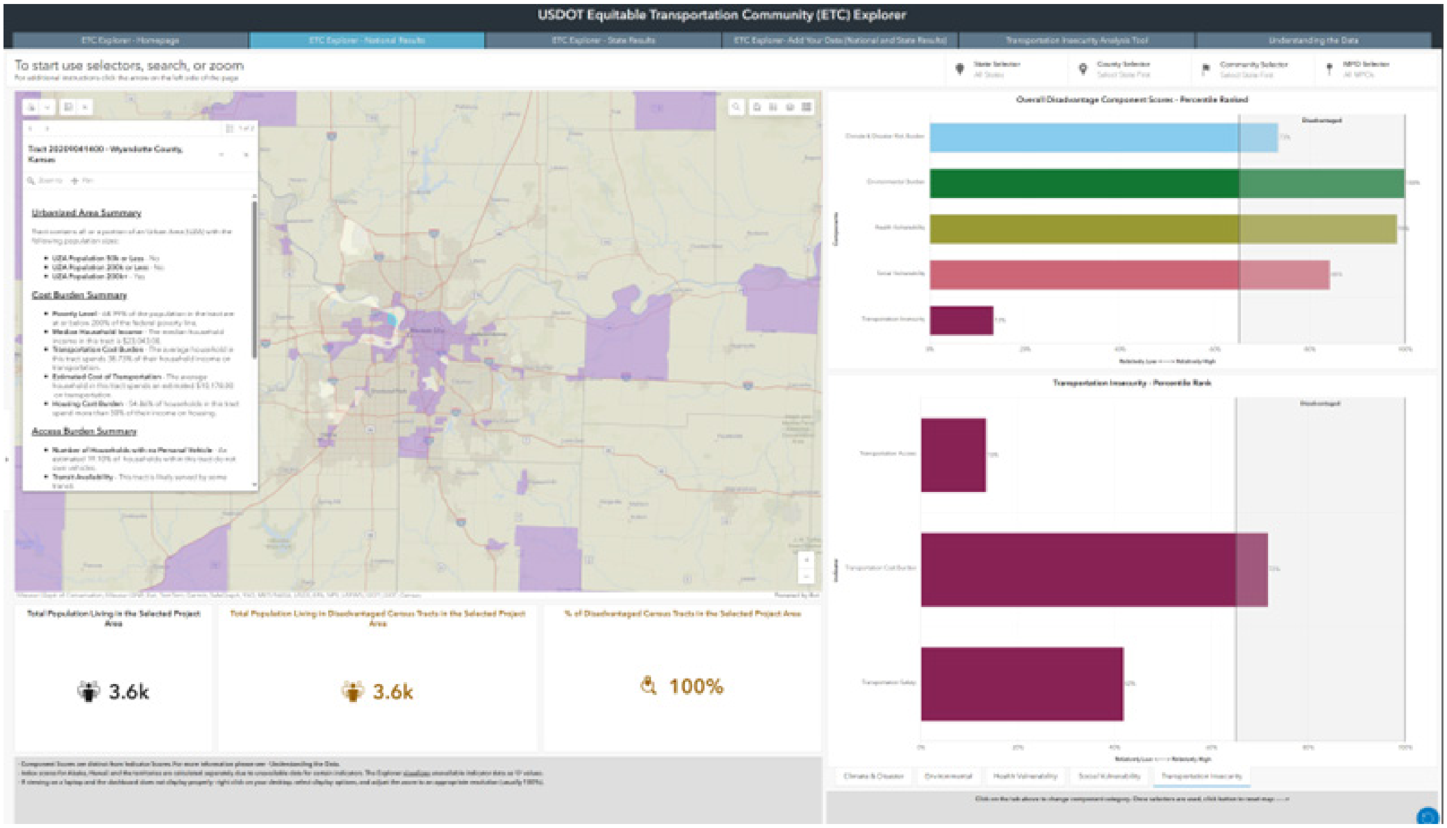
14 United States Department of Transportation, Equitable Transportation Community Explorer. experience.arcgis.com/experience/0920984aa80a4362b8778d779b090723/page/ETC-Explorer---Homepage

Figure 15: Map of Zero Vehicle Households and Disadvantaged Census Tracts in the MARC Region[15]



15 *U.S. Census American Community Survey 5-Year Estimates, 2018-2022.*

Figure 16: USDOT Equitable Transportation Community Explorer showing the MARC Region[16]



2.2.1 Equity Analysis of Buying & Driving an EV

According to the American Automobile Association, the 2024 cost of driving a typical vehicle was $12,297 per year[17]. These costs vary by the body type and fuel of the vehicle. For medium sedans and compact SUVs, AAA estimates that the annual cost of electric vehicles is around $2,000 per year more than a gas vehicle[18]. Electric medium SUVs and pickup trucks have lower ownership and operating costs than gas-powered vehicles, due to lower fuel efficiency for larger gas-powered vehicles.

16 At the time of this report's conclusion, many Federal funding programs related to Electric Vehicles and associated charging infrastructure were under review for possible revision. MARC and regional stakeholders will continue to monitor these programs as potential adjustments are made and funding programs related to EVs are made available in the future.
17 American Automobile Association (AAA), Your Driving Costs. newsroom.aaa.com/2024/09/aaa-your-driving-costs-the-price-of-new-car-ownership-continues-to-climb
18 Ibid.

Figure 17: National Average Annual Ownership Costs by Vehicle Body and Fuel Type (AAA, 2024)[19]

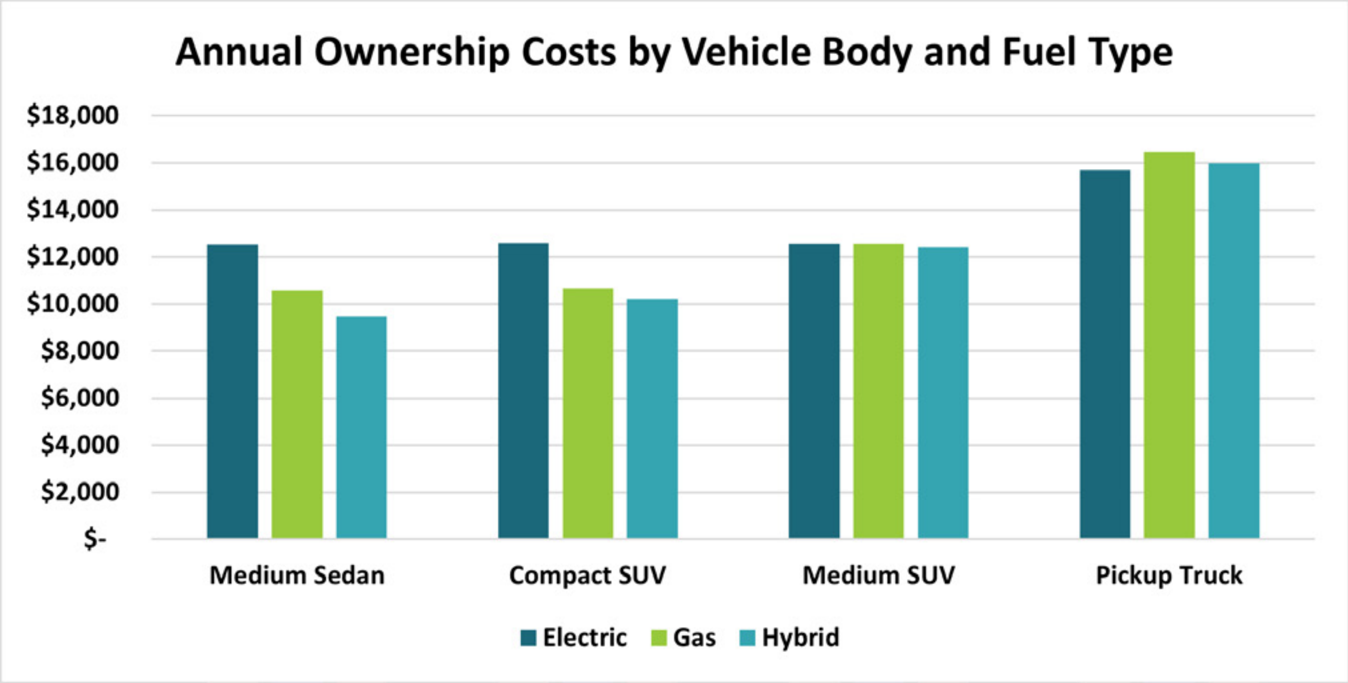
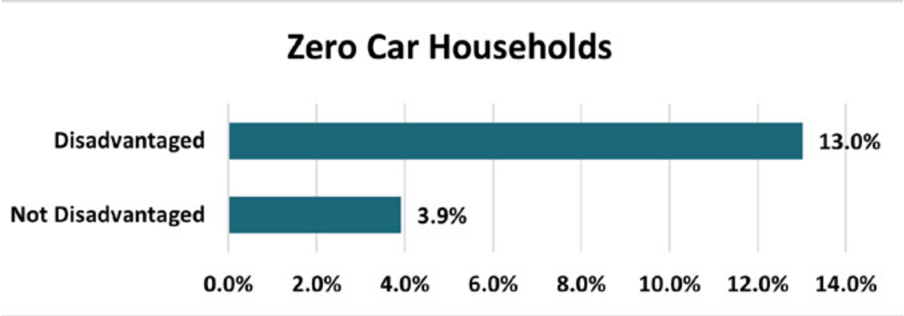


Table 4: Annual and Per-Mile Ownership Costs by Vehicle Body and Fuel Type (AAA, 2024)[20]

	Cost Per Year			Cost Per Mile		
	Electric	**Gas**	**Hybrid**	**Electric**	**Gas**	**Hybrid**
Medium Sedan	$12,527	$10,557	$9,476	$0.835	$0.704	$ 0.632
Compact SUV	$12,581	$10,656	$10,215	$0.839	$0.710	$0.681
Medium SUV	$12,558	$12,576	$12,414	$0.837	$0.838	$0.828
Pickup Truck	$15,698	$16,453	$15,971	$1.047	$1.097	$1.065

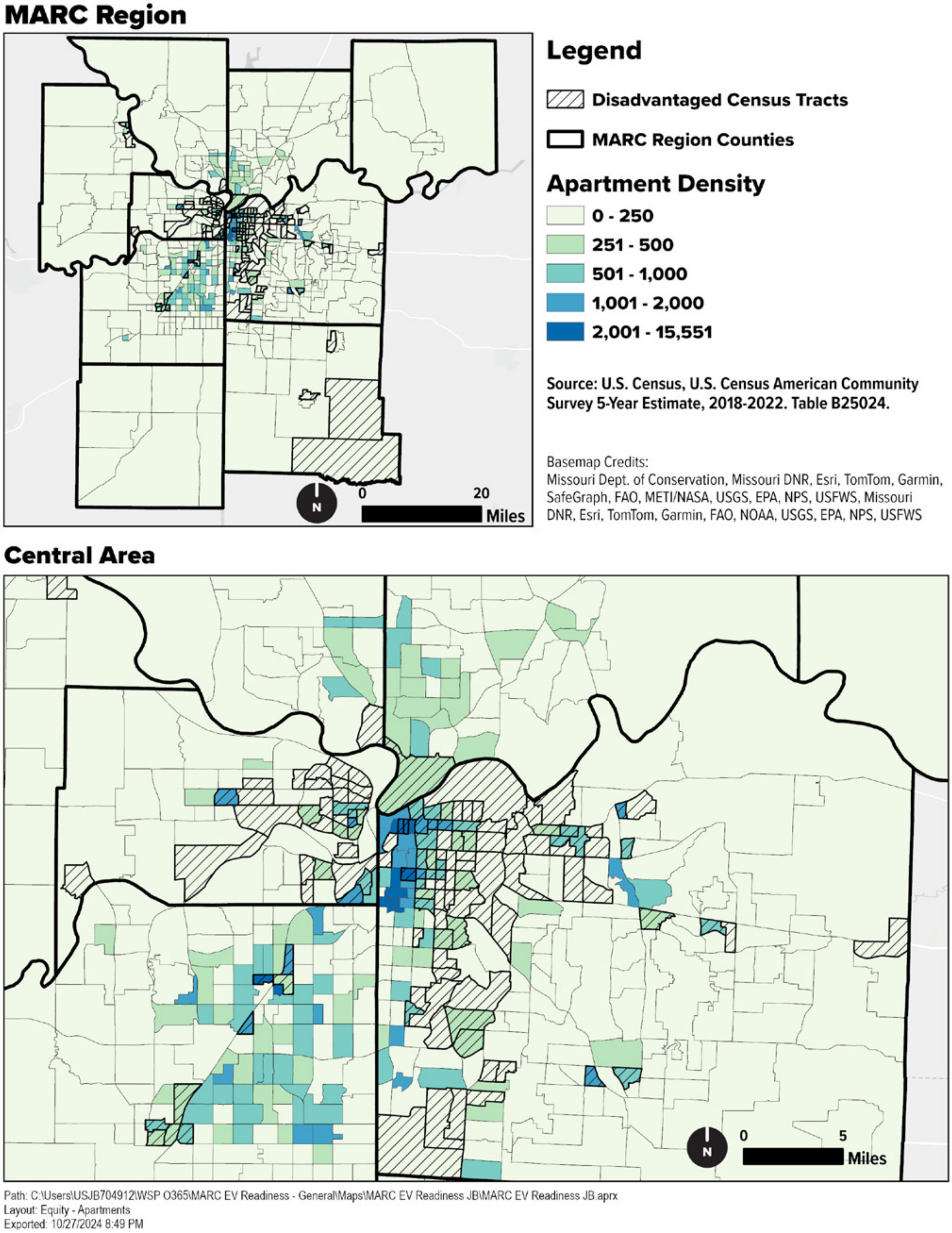
Owning and operating a motor vehicle is a significant household expense – one which many households in the MARC region are unable to afford. Approximately 6 percent of households – 47,729 in total – do not have access to a personal automobile[21] at all. Notably, Disadvantaged Census Tracts have over 3x the share of zero-vehicle households.

Figure 18: Zero Vehicle Households in Disadvantaged vs. Not Disadvantaged Areas



19 *Ibid.*
20 *Ibid.*
21 *U.S. Census American Community Survey 5-Year Estimates, 2018-2022. Table B08201.*

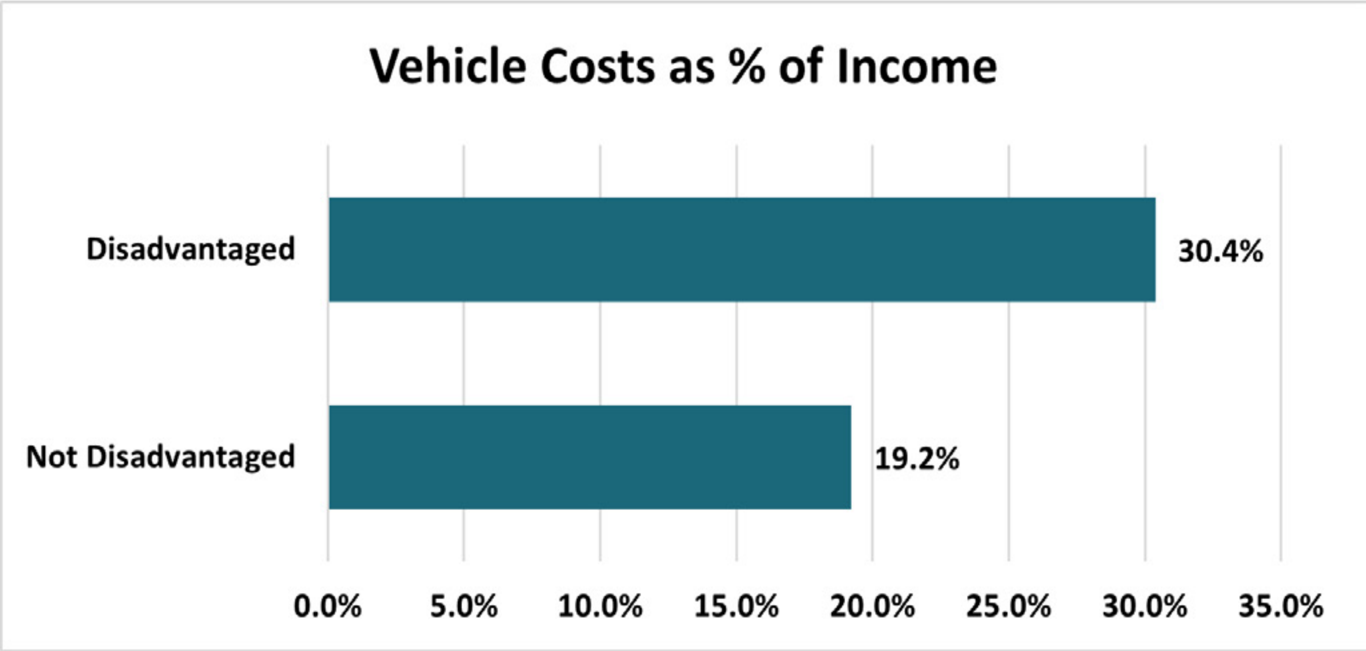
Figure 19: Vehicle Costs as a Share of Income[22]



22 *Vehicle costs as a share of income is calculated using the aggregate vehicles available in an area (ACS table B25046) multiplied by the average cost of driving (AAA Your Driving Costs data from 2024), all divided by aggregate income for the area (ACS Table B19313)*

Within the MARC Region, vehicle costs average approximately 20% of the average household's income. For households in disadvantaged areas, that cost is approximately 30% of income and only 19.2% for non-disadvantaged areas.

Figure 20: Vehicle Ownership Costs as a Percentage of Household Income



Higher ownership costs for electric vehicles are largely driven by the cost of vehicles and insurance, not by the cost of fuel, as shown in **Figure 21** and **Figure 22**[23]. Additionally, there is a limited used vehicle market for electric vehicles compared to gas or hybrid vehicles. Eventually, as EV adoption grows, used vehicles will filter into the EV market. Manufacturers are also beginning to produce less costly vehicles available to a broader market, with some estimates suggesting that EVs will be cheaper on average than ICEs by 2027[24]. With lower fuel costs than gas or hybrid vehicles, electric vehicles could eventually lead to cheaper annual costs for households (Figure 21), which will be a benefit to lower-income households.

23 American Automobile Association (AAA), Your Driving Costs Brochure. newsroom.aaa.com/wp-content/uploads/2024/08/YDC-Brochure-FINAL-9.2024.pdf

24 Gartner Outlines a New Phase for Electric Vehicles

Figure 21: Ownership Costs by Category of Medium Sedan by Fuel Type (AAA, 2024)[25]

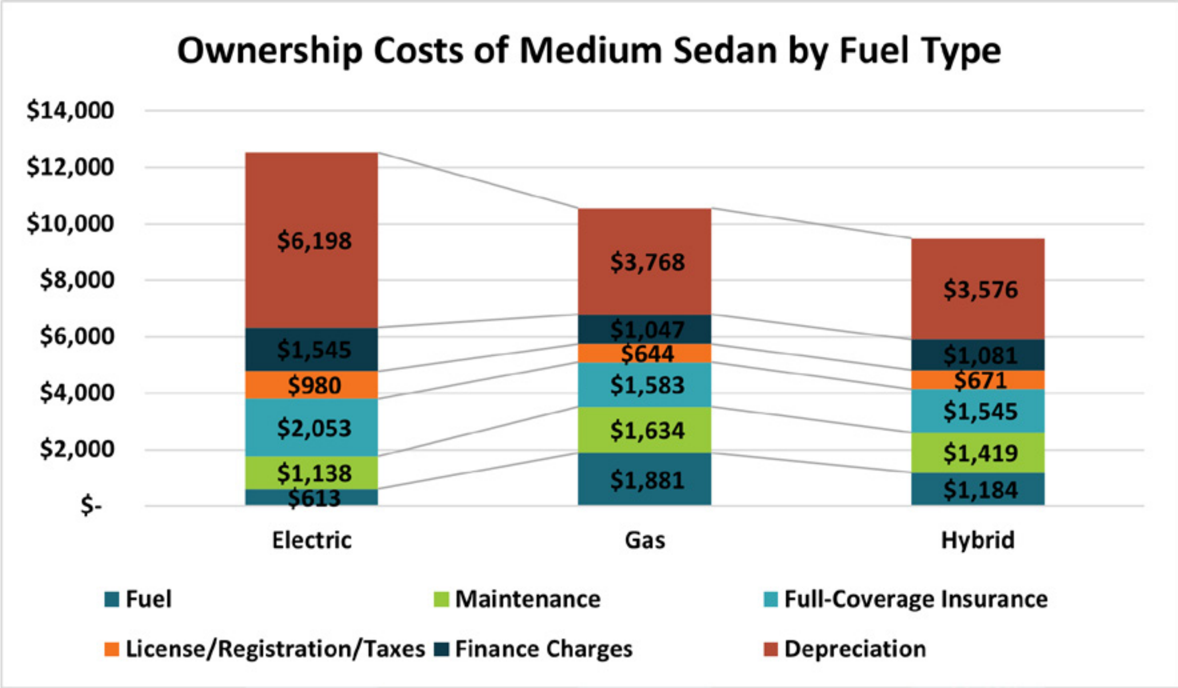
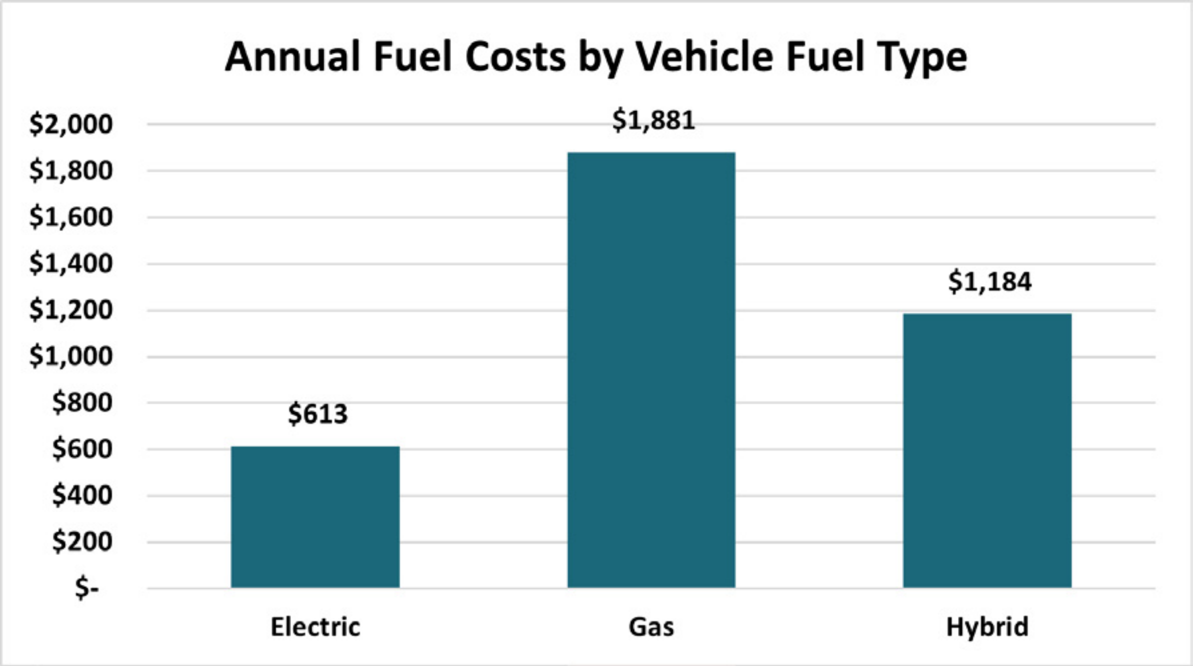


Figure 22: Fuel Costs of Medium Sedan by Fuel Type (AAA, 2024)[26]



2.2.2 Existing EV Charging Infrastructure

Some electric vehicle owners charge their vehicles at home using a standard outlet/electric plug (typically a "Level 1 charger") or a higher voltage outlet ("Level 2") installed at their cost. Others charge at public chargers, which are either Level 2 chargers or Level 3 / DC fast charger locations. Notably, vehicle owners who do not have a private garage or driveway (that is, people living in older

25 American Automobile Association (AAA), Your Driving Costs Brochure. newsroom.aaa.com/wp-content/uploads/2024/08/YDC-Brochure-FINAL-9.2024.pdf
26 Ibid.

single-family homes or people living in apartment units) must rely on public chargers, or chargers that are incorporated into their multifamily building or complex. Older housing and multifamily housing are concentrated within the urban core and inner ring suburbs in the MARC region, according to data from the U.S. Census.

Figure 23: Pre-World War 2 (1940) Housing Units per Square Mile

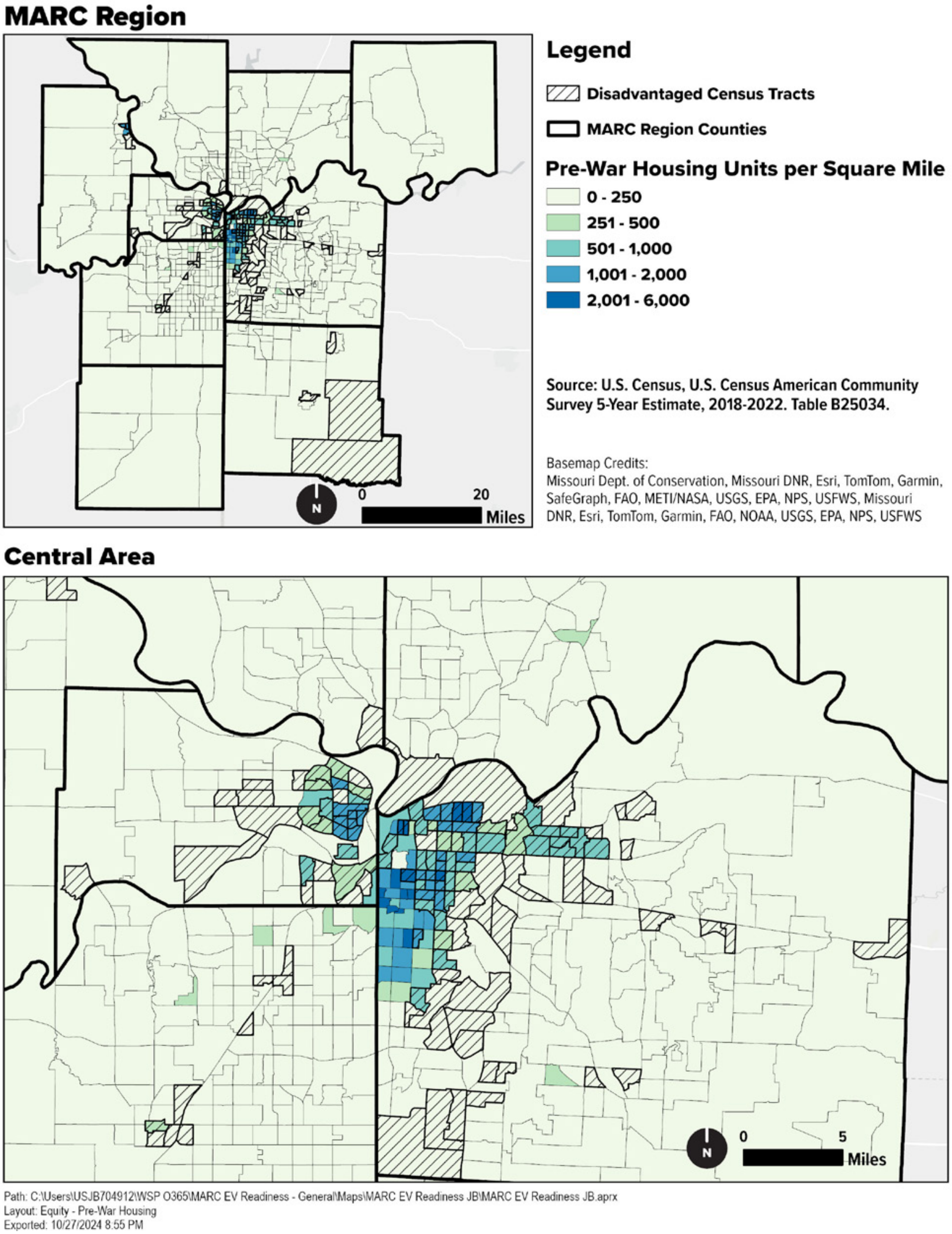
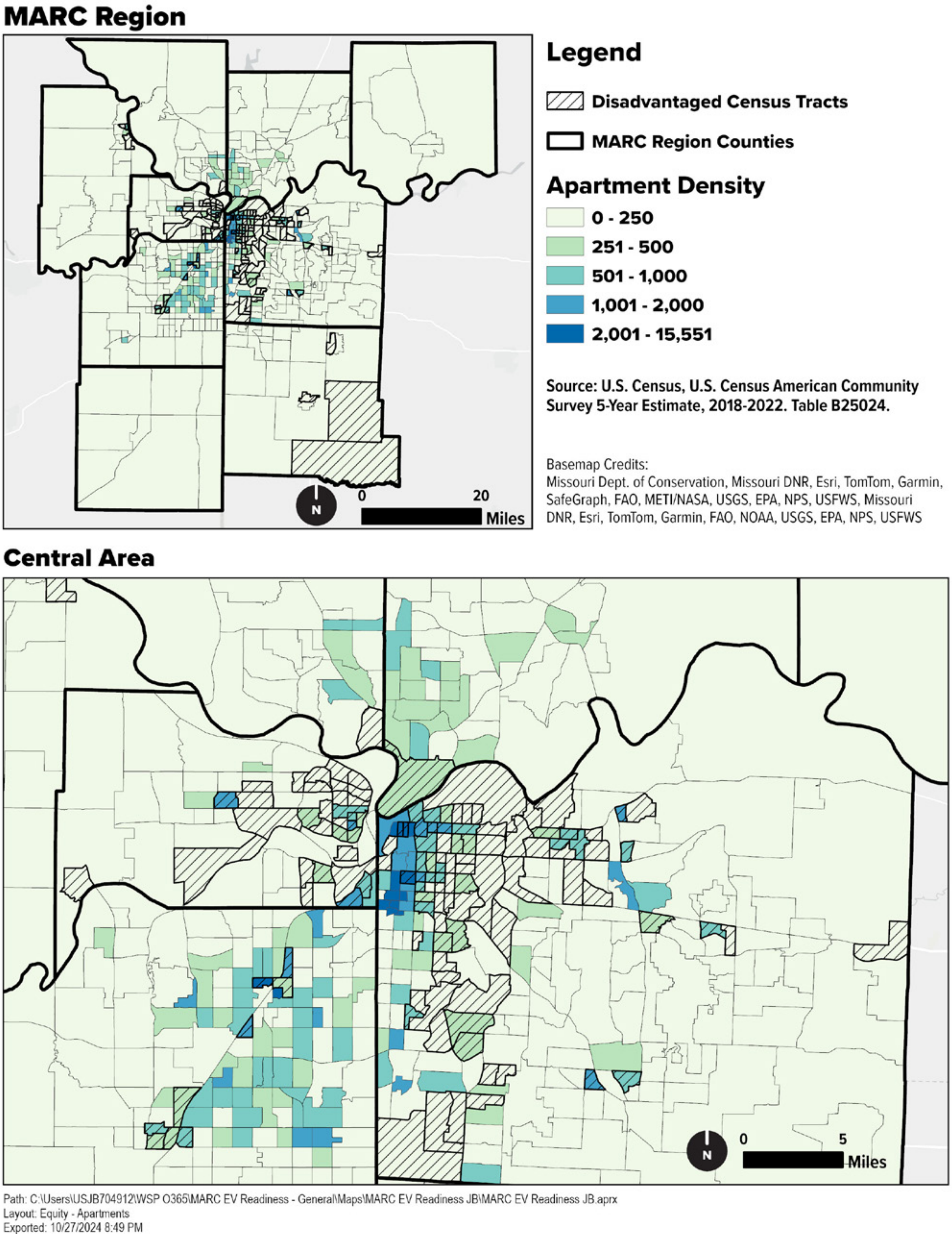


Figure 24: Housing Units in Apartments per Square Mile



Electric vehicle charging concentration varies across the region and by charger type. There are more Level 2 chargers near disadvantaged census tracts, and more DC fast chargers within non-disadvantaged areas.

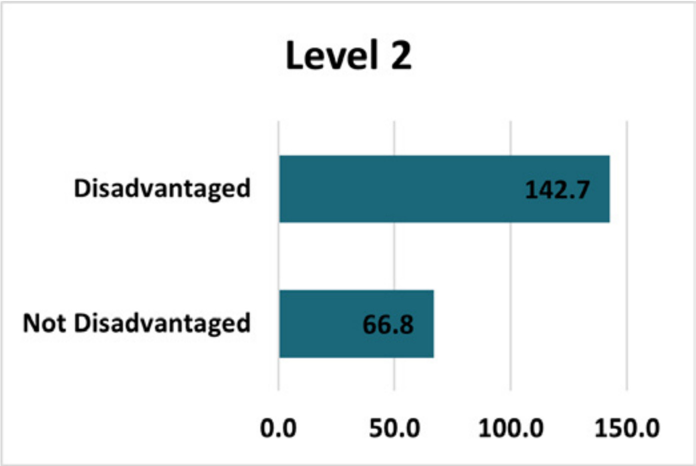


Figure 25: Average Level 2 chargers within 3 miles of tract

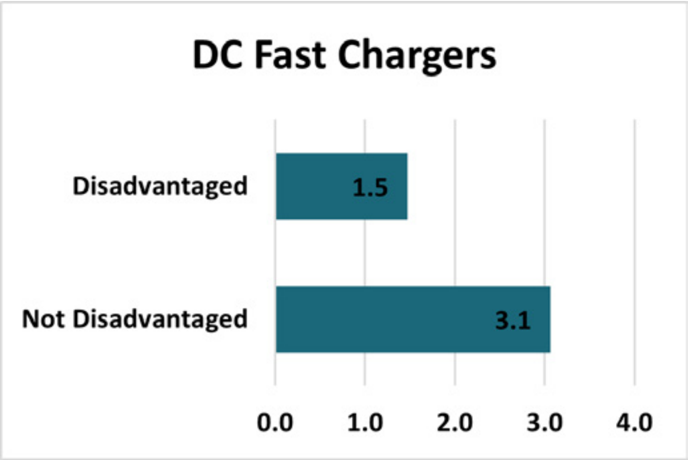
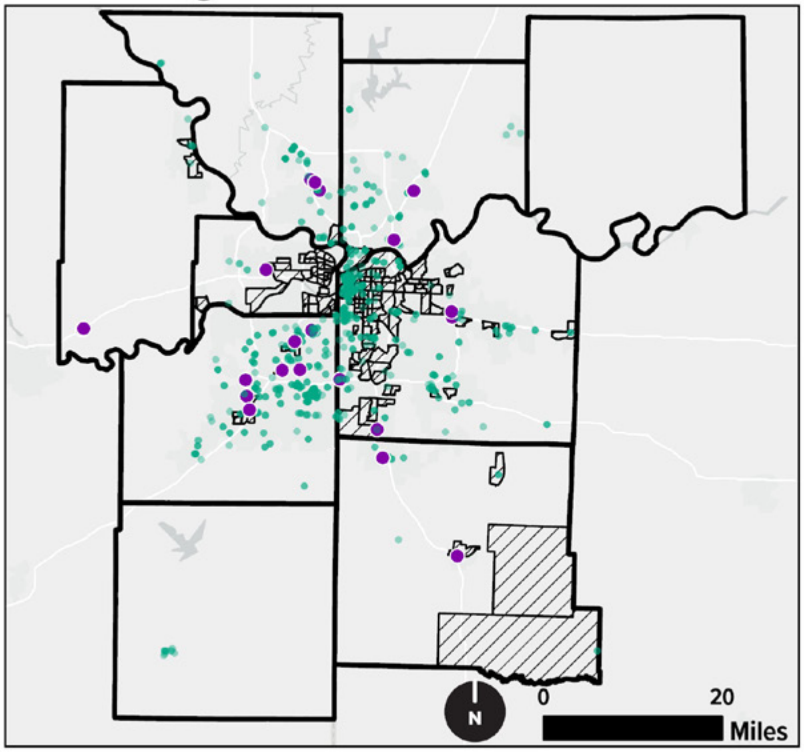


Figure 26: ADC fast chargers within 3 miles of tract

The distribution of Level 2 and DC fast chargers can be seen in Figure 25 and Figure 26. Notably, there are no DC fast chargers located within the Central Business District or urban core of Kansas City, Missouri, despite there being many EV owners in this area. There is, however, a significant concentration of Level 2 fast chargers.

Figure 27: Electric Vehicle Charging Locations compared to Disadvantaged Census Tracts

MARC Region



Legend

EV Charger Locations

Charging Level

- **Level 2 Charger**
- **DC Fast Charger**

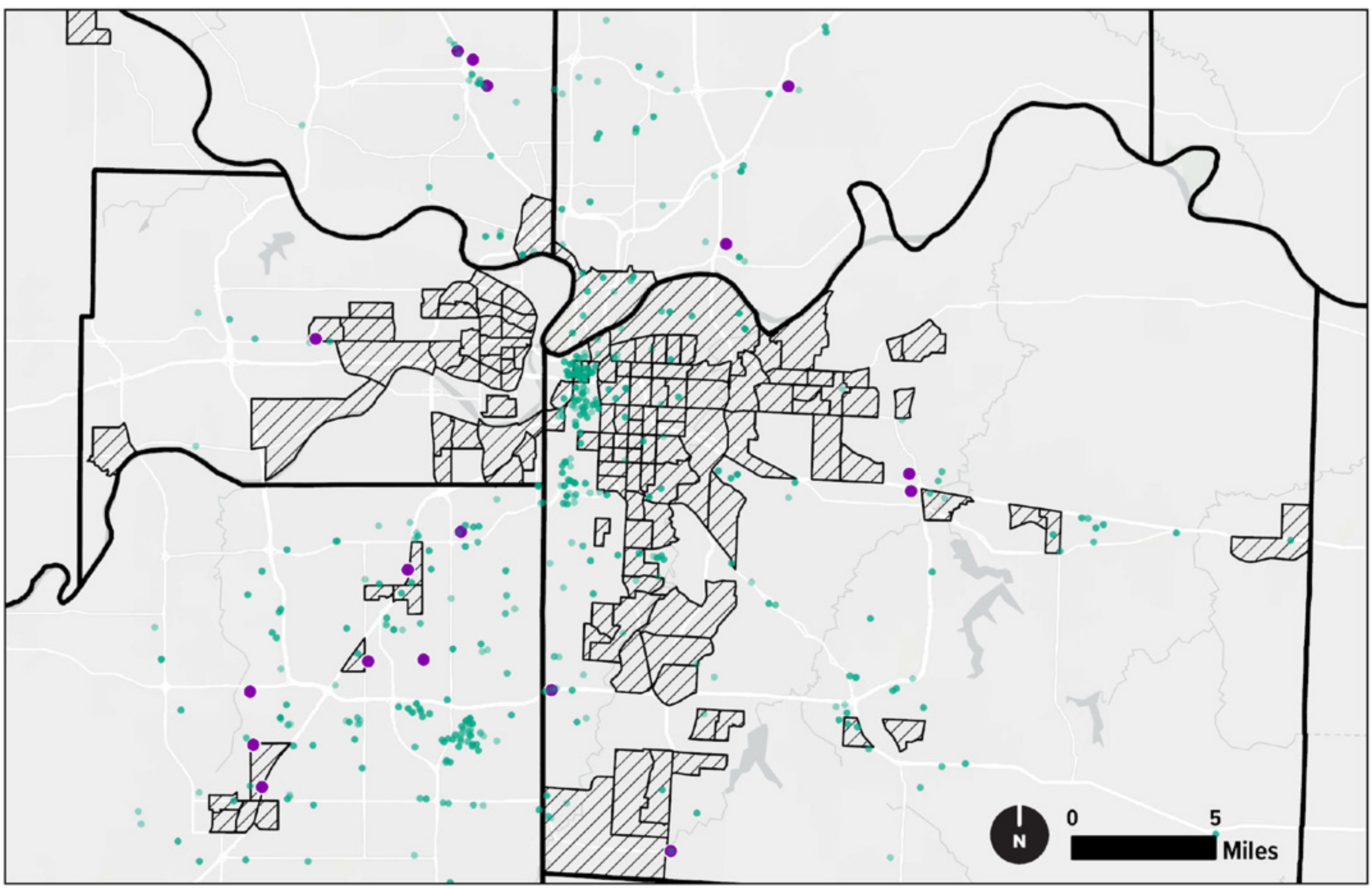
Disadvantaged Census Tracts

MARC Region Counties

Source: U.S. Department of Energy Alternative Fuels Data Center. Electric Vehicle Charging Station Locations (2024); USDOT Disadvantaged Census Tracts (2024).

Basemap Credits:
Missouri Dept. of Conservation, Missouri DNR, Esri, TomTom, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NPS, USFWS, Missouri DNR, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, NPS, USFWS

Central Area



Path: C:\Users\USJB704912\WSP O365\MARC EV Readiness - General\Maps\MARC EV Readiness JB\MARC EV Readiness JB.aprx
Layout: Equity - Chargers by Level
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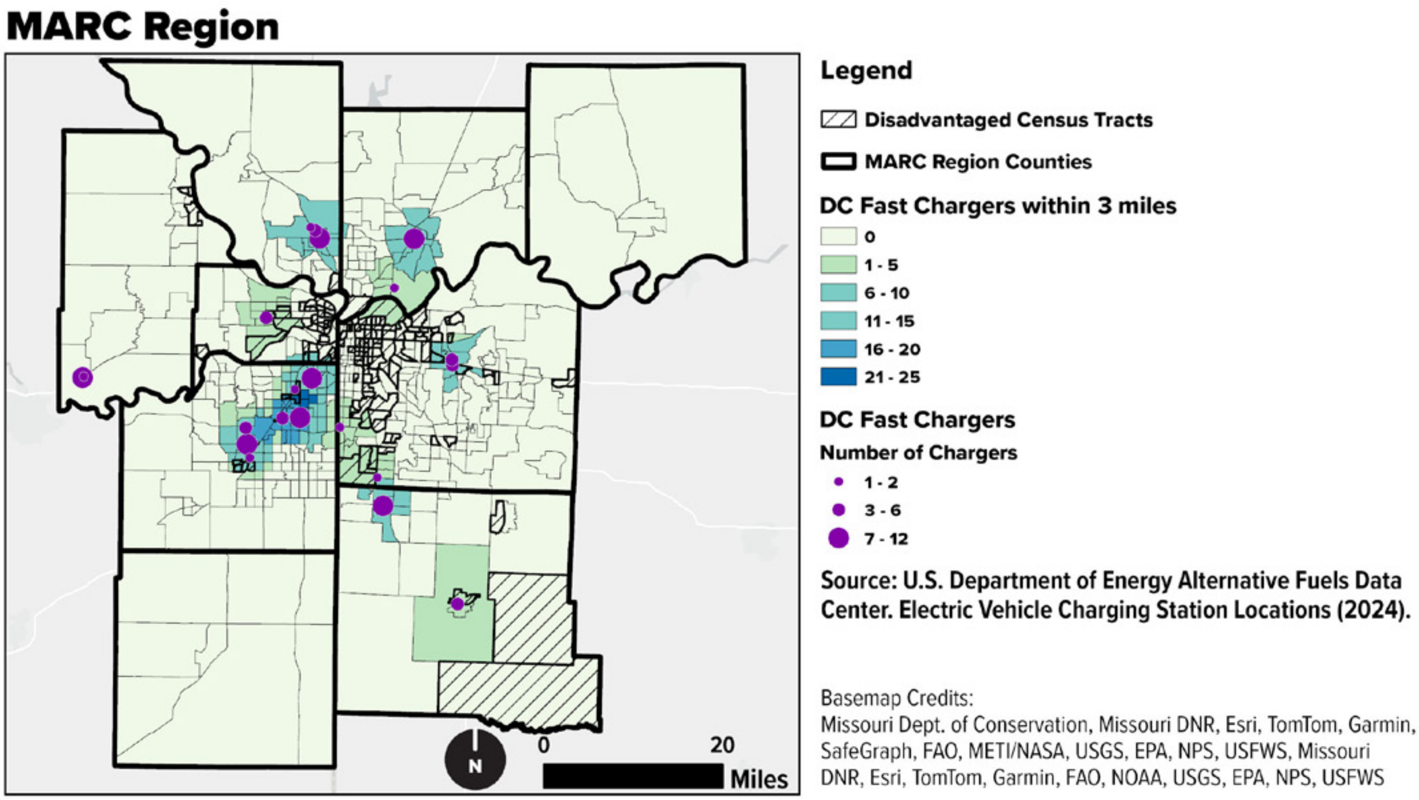
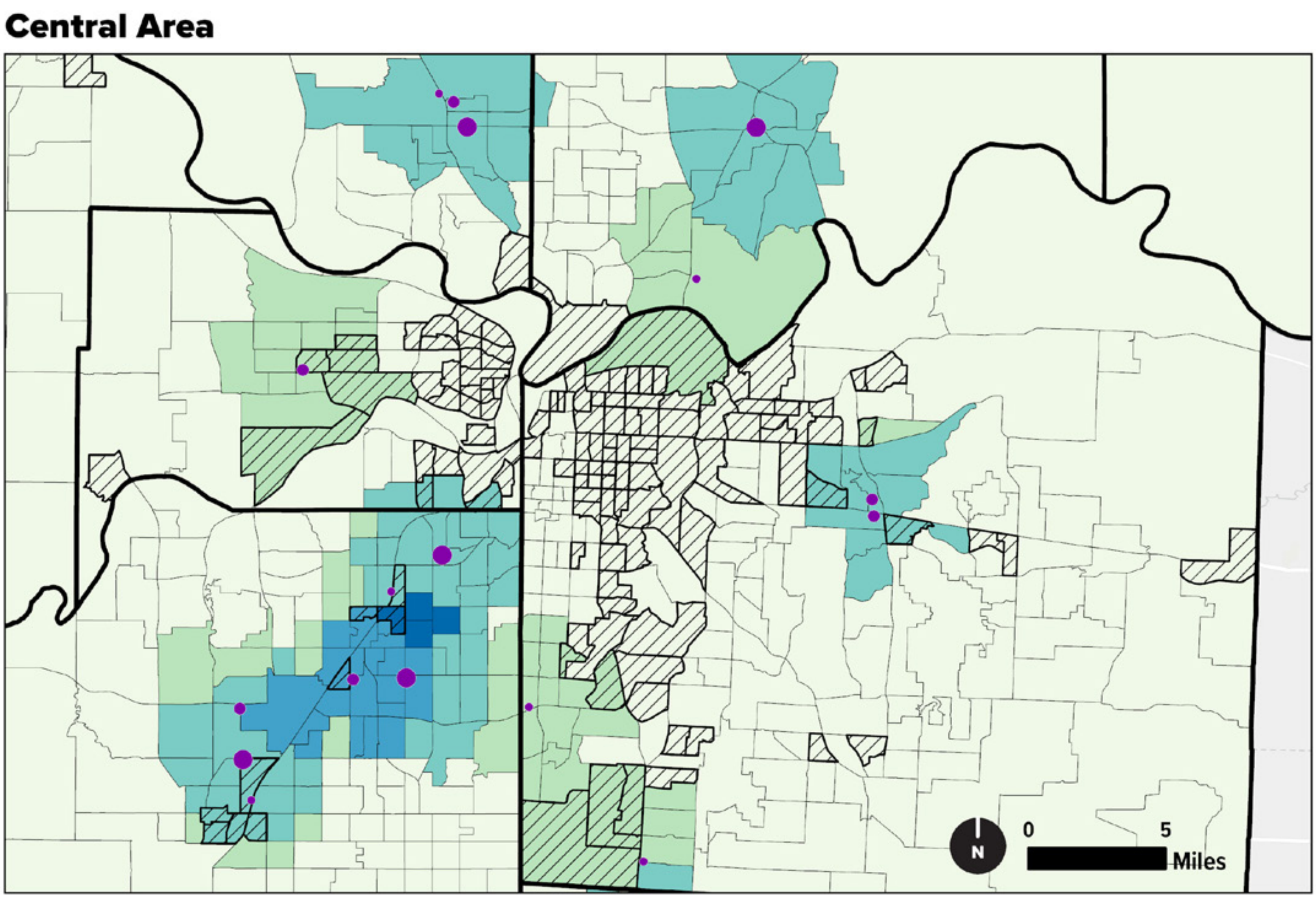
Figure 28: Location of DC fast chargers; DC fast Chargers within 3 miles





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Descriptive statistics from the Census/ACS, Missouri and Kansas Departments of Revenue, and U.S. Department of Energy help to illustrate some of the major differences between disadvantaged and non-disadvantaged census tracts within the MARC region.

Table 5: Comparison of Selected Metrics for Disadvantaged and Non-Disadvantaged Census Tracts

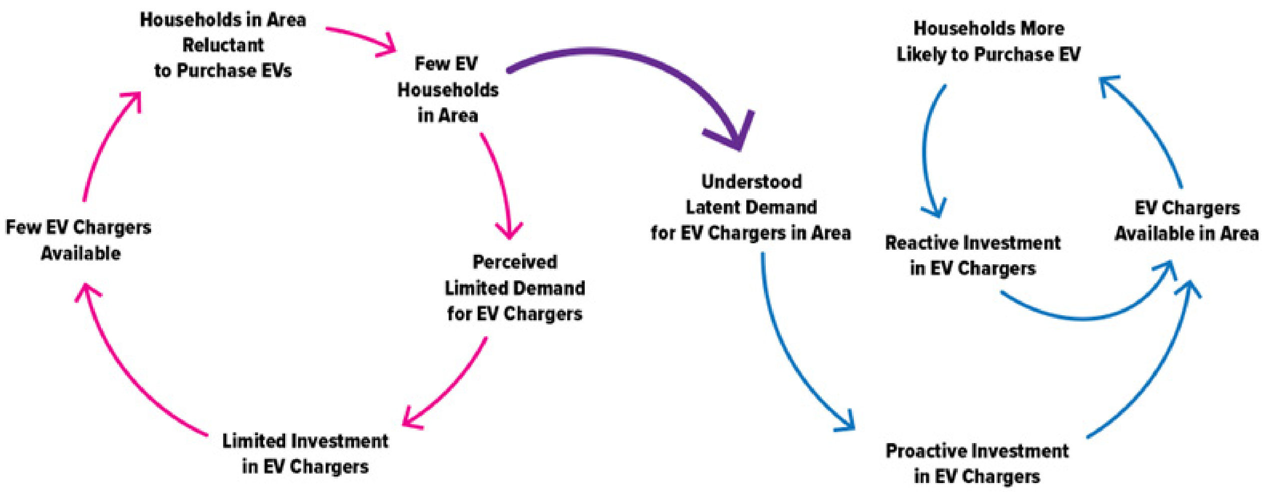
Metric	Not Disadvantaged	Disadvantaged
Total Population*	1,782,076	379,551
Total Households*	704,571	155,242
Zero Vehicle Households*	27,521	20,204
% Zero Vehicle Households*	3.9%	13.0%
Aggregate Vehicles Available*	1,293,941	241,097
Vehicles Available per Household*	1.84	1.55
Electric Vehicles^	12,967	1,207
% Electric Vehicles^*	1.00%	0.50%
Mean Household Income*	$117,428	$62,845
Total Number of Level 2 chargers within tracts&	1,464	432
Total Number of DC fast chargers within tracts&	95	13
Level 2 chargers per 1,000 residents&*	0.82	1.14
DC fast chargers per 1,000 residents&*	0.05	0.03
Average Number of Level 2 chargers in 3 miles&	66.8	142.7
Average Number of DC fast chargers within 3 miles&	3.1	1.5

***Census/ACS; ^Missouri and Kansas Department of Revenue; &U.S. Department of Energy**

2.2.3 Methodology for Equity Considerations in Plan Development

Market-oriented EV charger deployment will result in the development of chargers in and around areas where EV ownership is higher. However, the accessibility of EV charging locations will in part determine a household's decision to purchase an electric vehicle. Without intentional investment in charging infrastructure in key under-served areas, this could become a self-reinforcing cycle.

Figure 29: Reinforcing Cycle of Disinvestment vs. Proactive Investment



This cycle could be broken by intentional and proactive EV charger development that anticipates latent demand, unlocking new market potential. Furthermore, while some disadvantaged areas may appear to lack some demand for residential EV charging, there are still other EV charging needs that could be addressed. For example, commercial areas, employment hubs, and locations near an Interstate highway (especially NEVI routes) overlap or are nearby many disadvantaged areas.

Furthermore, the development of charging stations (in particular DC Fast Charge locations) has not emphasized residential charging. More thoughtful attention to concentrations of multifamily residential housing could lead to more equitable access to electric vehicle charging. T**he Needs Analysis** and **Prioritization of New Charging Station Locations** sections further outline our recommendations for equitable charging access.

2.3 Existing Infrastructure

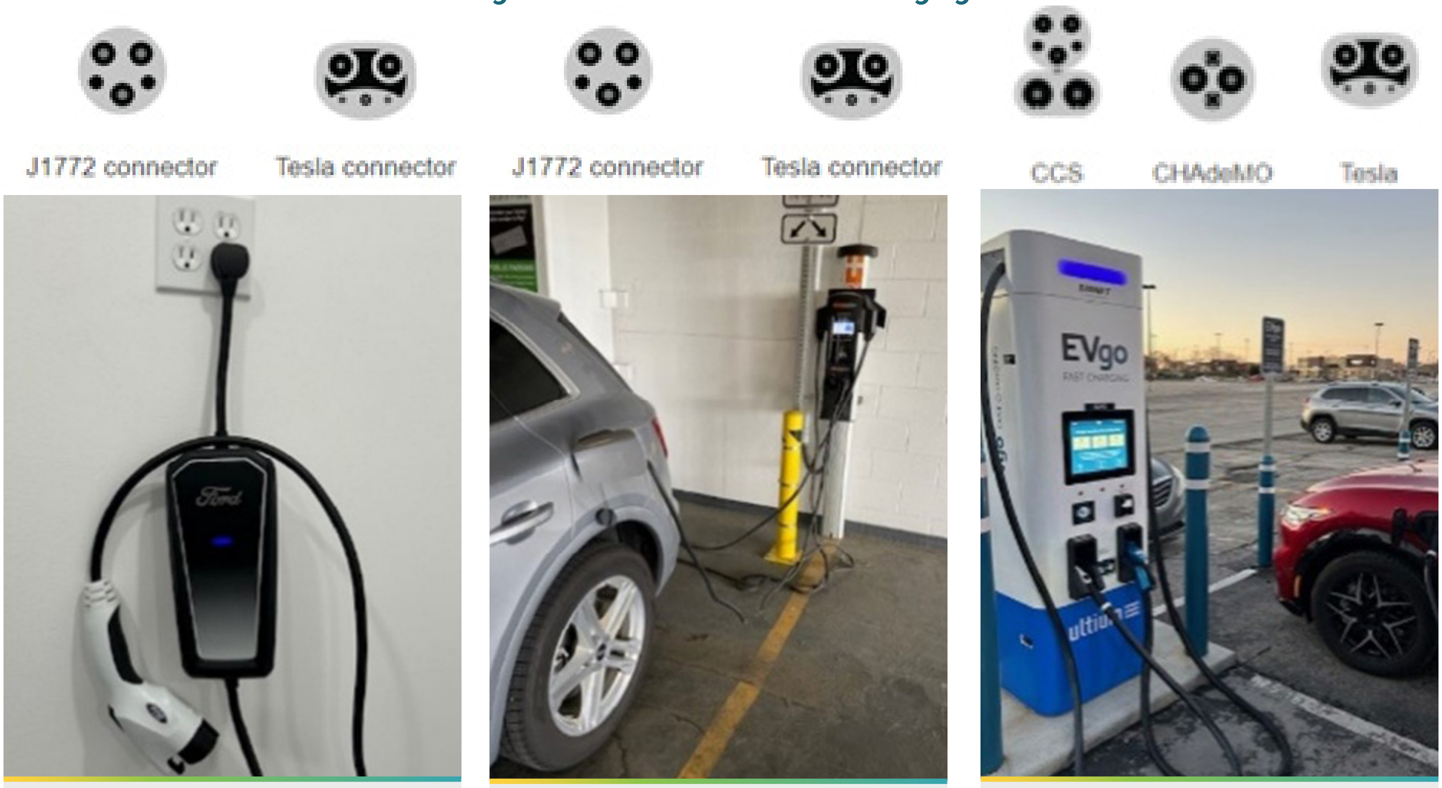
2.3.1 Background

It is important to have a background understanding of the different types of EV charging. Chargers are typically categorized as either Level 1, Level 2, or DC fast chargers (sometimes called Level 3). Level 1 chargers are the slowest but are portable and able to plug into a standard household 120V outlet. It can take more than 48 hours to fully charge an average EV. Level 2 Chargers provide charging through 240-volt service in residential applications or 208-volt service in commercial applications. Some can plug into a 50A household outlet, similar to that used for an electric range or oven. Level 2 charging stations provide 15 to 30 miles of range per hour of charging and are commonly used for home charging as well as public and workplace charging.[27] DC fast chargers are most analogous to traditional gas pumps. They are larger, much more expensive, and require a 480V industrial three-phase power connection from the electric utility. Several plug shapes have been used. CCS is the most common at existing public fast chargers and was first adopted as the preferred standard in North America, but most manufacturers have announced they will be switching to the North American Charging Standard (NACS), also known as the Tesla plug because it is simpler, smaller, and easier to

27 Kansas City Clean Charge Network: Case Studies: ERIT: Environmental Resilience Institute: Indiana University (iu.edu)

handle. The newest vehicles can add significant charge (20-80%) in less than 15 minutes using the most powerful DC fast chargers. Figure 30 outlines these differences.

Figure 30: Three Levels of EV Charging



Level 1 Charging

- 2-4 miles per hour of charging
- 1.5 kW max power level (12 A)
- Uses standard 120V household outlets

Level 2 Charging

- 15-30 miles per hour of charging
- 19.2 kW max power level (80 A)
- Typically hardwired, but some can be plugged in to appropriately rated outlets
- Portable or permanently installed

DC Fast Charging

- Up to 300 miles per hour of charging
- Many newer EVs can add significant charge in under 20 minutes
- 50 - 350 kW max power level
- Requires 480 V, three-phase (industrial) power connection

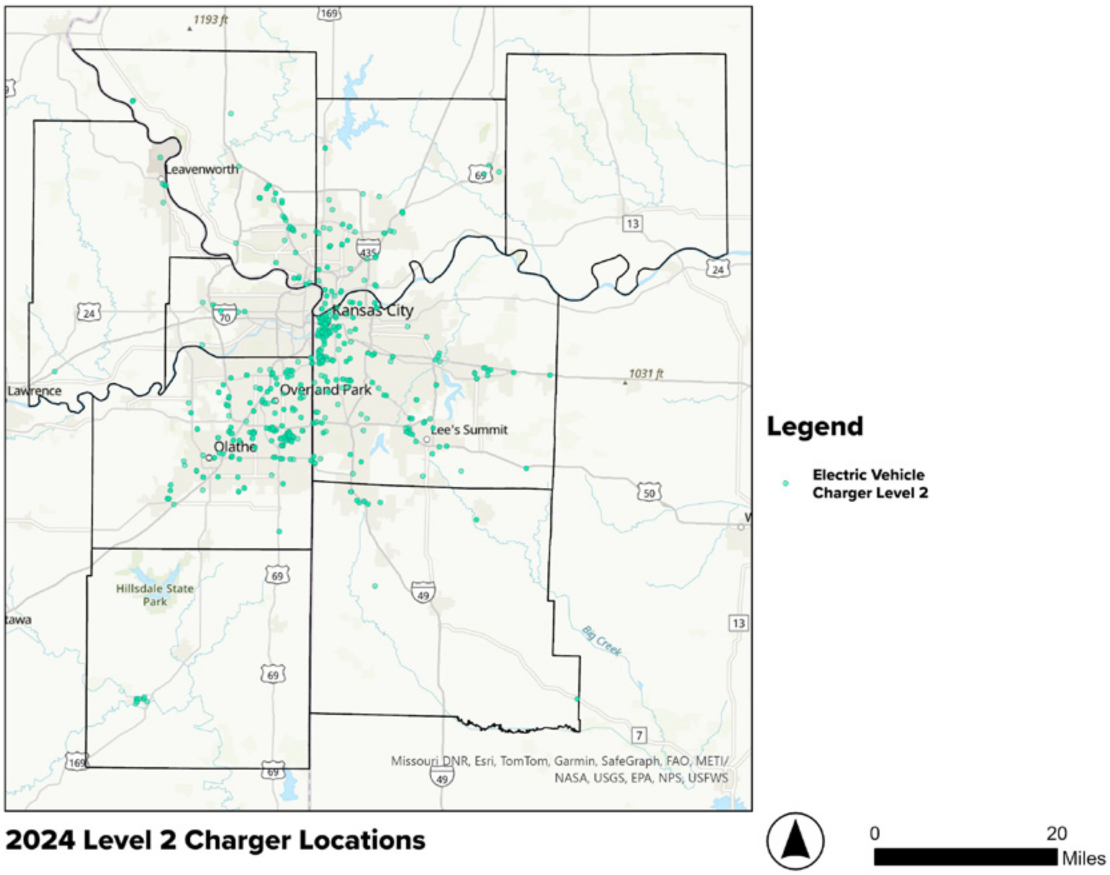
2.3.2 Existing EV Charging Network

The MARC region has a strong network of Level 2 chargers, the majority belonging to Evergy's Clean Charge Network. This network of chargers enables electric vehicle owners to charge their vehicles over a longer period, such as overnight or during the workday. While this network is substantial, the MARC region is missing a network of DC fast chargers, which allow for rapid charging. The section below details the existing EV infrastructure in the region.

2.3.2.1 Level 2 Chargers

The Kansas City region has an extensive network of Level 2 charging. Since they only add 15-30 miles of range per hour, they are mostly useful for drivers who are spending several hours at their destination.

Figure 31: Level 2 Charger Locations



2.3.2.1.1 Evergy's Clean Charge Network

Evergy is largely responsible for the region's extensive Level 2 charging network. Evergy serves approximately 1.7 million customers in Kansas and Missouri. The company was created in 2018 when long-term local energy providers KCP&L and Westar Energy merged. Before 2015, the Kansas City region had a limited number of EV charging stations available to community members. In response, Evergy decided to establish the Clean Charge Network to increase electric vehicle adoption, reduce range anxiety, and advance clean energy in the Kansas City region[28].

By 2021, Evergy installed over 1,000 charging stations in the Clean Charge Network, making it one of the largest in the United States. The company partnered with ChargePoint Inc. to supply the charging hard and software, including payment processing and network management functions. Evergy selected the locations and level of charging stations. Around 98% of Evergy's charging stations are Level 2 with the remainder being Direct-current fast charging stations[29].

28 Kansas City Clean Charge Network: Case Studies: ERIT: Environmental Resilience Institute: Indiana University (iu.edu)
29 Kansas City Clean Charge Network: Case Studies: ERIT: Environmental Resilience Institute: Indiana University (iu.edu)

The total cost of building the Clean Charge Network was $25 million. There are varying costs associated with the charging stations, their installation, and their operations and maintenance. Evergy funded the Network using its capital budget[30].

Additionally, all public charging stations in the network are powered by renewable energy sources, contributing to a reduction in carbon emissions. Users can join the network by creating a ChargePoint account, which allows them to start charging using the ChargePoint app and receive RFID cards for easy access[31].

Table 6 below shows the number of charging events at Evergy's Clean Charge Network for all of 2023, summarized by day of the week and the hour of the day in which charging started. The highest usage days were Thursday to Friday with an average of 425 charging events per day. Sunday was the least busy day, with an average of 315 charging events. Peak hourly usage was from 8 AM to 9 AM Monday to Friday, with an average of 40-50 charging events starting during that hour each day. While this was the busiest hour, usage was consistently high across the day, with more than 20 charging events beginning each hour between 6 AM and 6 PM Monday to Friday and between 10 AM and 6 PM on the weekends. Hourly charge starts were much lower in the evening and overnight period every day.

Table 6: Clean Charge Network Utilization

Time	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
12am	176	133	122	138	142	157	199
1am	152	103	94	89	81	87	138
2am	138	107	87	70	90	118	134
3am	105	87	46	57	56	58	114
4am	101	97	77	79	83	115	134
5am	193	337	340	313	363	361	244
6am	293	906	980	1078	1042	1076	376
7am	422	2085	2217	2189	2180	2064	635
8am	661	2431	2753	2668	2702	2228	770
9am	958	1531	1728	1733	1655	1553	1149
10am	1266	1042	1133	1192	1211	1211	1395
11am	1336	1197	1217	1263	1274	1252	1436
12pm	1401	1298	1382	1459	1472	1445	1434
1pm	1455	1299	1316	1317	1365	1437	1391
2pm	1342	1039	1024	1115	1045	1178	1366
3pm	1139	1011	972	1015	988	1112	1300
4pm	1089	1095	1078	1122	1116	1196	1180
5pm	1058	1344	1360	1478	1408	1384	1160
6pm	925	1081	1184	1296	1208	1293	1047
7pm	721	738	756	880	912	960	917
8pm	549	545	632	646	648	640	607
9pm	411	415	436	435	424	505	484
10pm	305	296	334	357	334	416	369
11pm	168	186	215	211	215	272	265

2.3.2.2 DC Fast Chargers

Direct Current (DC) Fast Chargers, also called Level 3 chargers, are available from 25kW to 350kW for passenger EVs—with even higher-powered chargers for heavy-duty electric vehicles like semis-trucks[32]. Charge rates for many EVs currently on the road are limited to less than 100 kW, regardless of the capability of the charger, but many new models are being delivered with the ability to accept

30 Kansas City Clean Charge Network: Case Studies: ERIT: Environmental Resilience Institute: Indiana University (iu.edu)
31 About the Network | Clean Charge Network
32 Electric Vehicle Charging Guide | EV 101 EVgo

higher charge rates. The first DC fast chargers that were installed in the MARC territory can typically add 60-80 miles of range per 20 minutes of charging. Newer, higher power chargers add 200 or miles range per 20 minutes of charging to vehicles equipped to accept the higher charge rates[33].

DC chargers are necessary for a successful charging network. They significantly reduce charging times compared to Level 2 chargers, which helps remove charging as a barrier for wider EV adoption. They are important for visitors and drivers who don't have access to home or workplace charging – and are much more analogous to a traditional gas station. A reliable network of DC fast charging stations provides certainty to drivers that they will be able to charge their vehicles wherever they go – even if most of their charging happens overnight.

DC fast chargers are usually classified according to their power level, which is inversely correlated to recharge time. Early DC fast chargers tended to have power levels between 25 kW and 50 kW. This is 2-4 times more powerful than a Level 2 charger but still takes two or more hours to recharge modern EVs. The newest DC fast chargers tend to have power levels from 100 KW to 350 kW, which can charge some modern EVs in as little as 15 minutes and most vehicles in under 45 minutes. Kansas City has very few high-power DC fast charging stations, as shown in **Table 7** below[34].

Table 7: Existing DC fast chargers in the MARC Region

	High Power (100kW – 350kW+)	Low Power (50-100 kW)	Total
Designed for Public Use	12	12	24
Car Dealerships (semi-public)	4	9	13
Tesla-Only[35]	2	0	2
Total	**18**	**21**	**39**

Most of the high-power stations installed to date are part of nationwide charging networks, such as those installed by Tesla, Electrify America, and EVgo, which are each discussed in detail below. Evergy installed a limited number of 50 kW DC fast charging stations around the metro as part of the Clean Charge Network beginning in 2015. At the time, these chargers were considered extremely fast, and most vehicles couldn't accept a faster charge due to limited battery technology. However, technology advanced quickly and many of the 50 kW stations installed by Evergy are now obsolete. Evergy has been in the process of replacing the 50kW stations with newer 62.5 kW stations. In some locations power from two of these newer units can be combined to charge a single vehicle at up to 125 kW.

Pricing at DC fast charging stations is generally more expensive than charging at a public Level 2 charger, and much more expensive than overnight charging at a home or business. The pricing rate of DC charging varies based on location, type, and other factors. Several examples are included below in **Table 8** to provide a snapshot of pricing in the MARC region.

33 *Kansas City Clean Charge Network: Case Studies: ERIT: Environmental Resilience Institute: Indiana University (iu.edu)*
34 *Plugshare data is crowd-sourced and may not include every available station. Stations currently under construction were excluded.*
35 *Some, but not all, Tesla stations are open to non-Tesla vehicles such as Ford and Rivian with use of an adapter.*

Table 8: Example Pricing

Location	Maximum Charge Rate	Price	Address
Reed Hyundai	62.5 kW	$0.30 / minute	7050 W Frontage Rd, Merriam, KS
Evergy – Harley Davidson	62.5 kW	$0.26 / kWh	5900 E MO-150, Grandview, MO
EVGo – Target	100 kW	$0.45 / kWh + $0.99 session fee	9040 N Skyview Ave, Kansas City, MO
Tesla Supercharger	250 kW	$0.37 / kWh	9545 Antioch Rd, Overland Park, KS

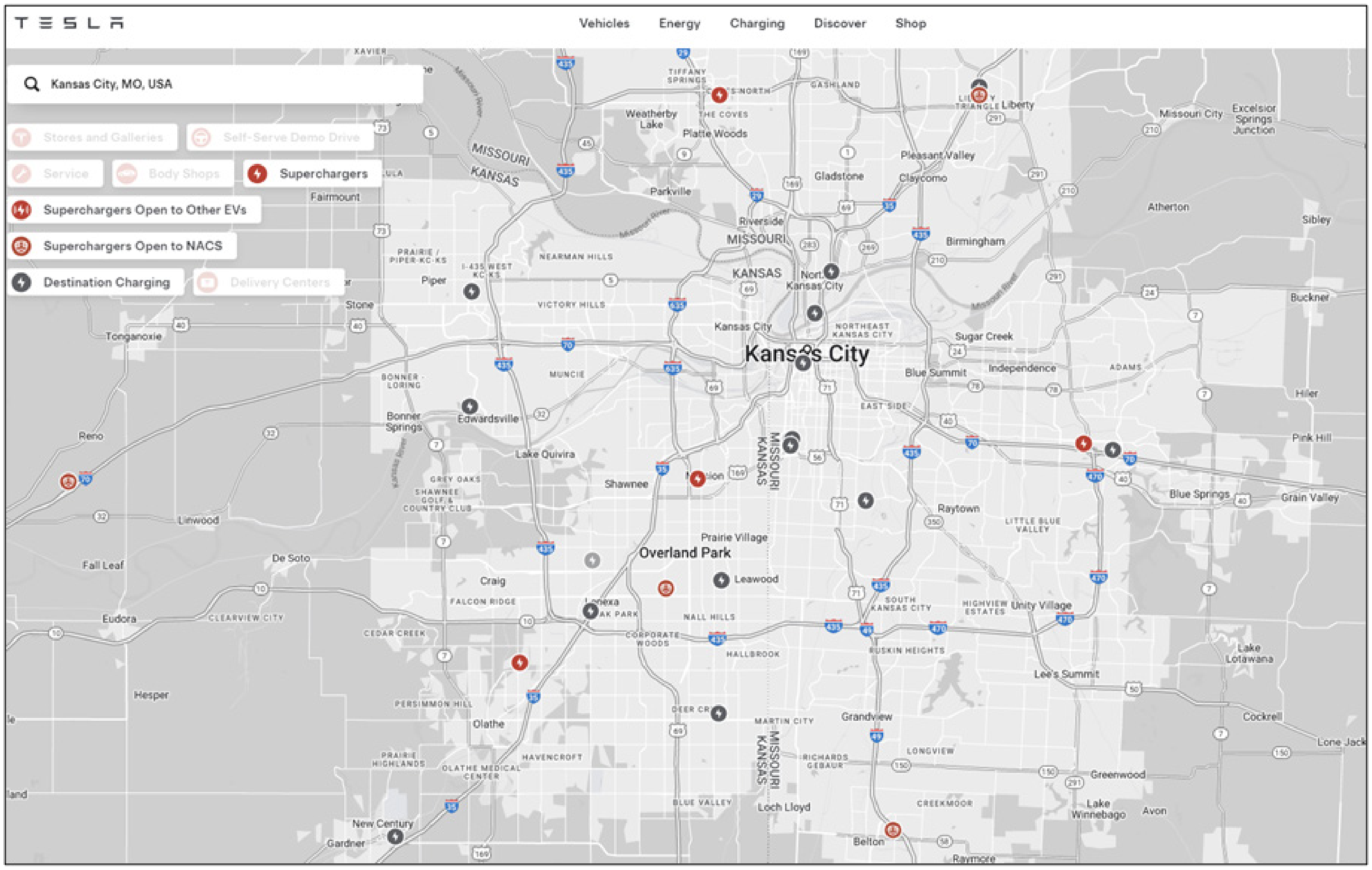
2.3.2.2.1 Tesla

Tesla, Inc. is a multinational electric vehicle and clean energy company headquartered in Austin, TX. Tesla has an EV charging network made up of Superchargers (DC fast chargers) and Destination charging stations (Level 2). These stations are located along highways and in urban areas to facilitate long-distance travel and provide a quick charging option for Tesla owners.[36]The Superchargers were originally designed exclusively for Tesla vehicles, but the company has recently allowed some non-Tesla EVs access to some of their Supercharger network using charge plug adapters. Virtually every EV manufacturer has adopted the North American Charging Standard (NACS / Tesla) charging plug for new vehicles sold beginning in 2025 or 2026. All new vehicles sold with NACS charging ports will be allowed access to the Tesla network. Tesla has also been awarded several stations under the NEVI program. All EVs (including existing older EVs) will be allowed to use Tesla stations funded by NEVI.

Tesla Destination chargers are slower Level 2 chargers. They are also designed for Tesla vehicles but are often equipped with a standard connector which allows other electric vehicles to use them. These chargers are installed at various longer-term parking locations such as hotels, restaurants, shopping centers, and parking facilities.[37]

36 Supercharging Other EVs | Tesla Support
37 Tesla Destination Charger: Network, How It Compares to Superchargers - Business Insider

Figure 32: Tesla Charging Network in Kansas City[38]



2.3.2.2.2 Electrify America

Electrify America is a subsidiary of Volkswagen Group of America. It was established in 2016 as part of Volkswagen's settlement with the U.S. Environmental Protection Agency (EPA) and the California Air Resources Board (CARB) relating to diesel emissions violations[39]. The company focuses on building a nationwide network of electric vehicle (EV) charging stations across the United States. Electrify America is wholly owned by Volkswagen Group of America, which is a subsidiary of the Volkswagen Group, a global automotive manufacturer headquartered in Germany.[40]

Electrify America's funding primarily comes from Volkswagen as part of the settlement agreement. The company has committed to investing $2 billion over ten years (2017-2027) to develop EV infrastructure and promote zero-emission vehicle adoption in the United States. This investment is divided into four 30-month cycles, with each cycle focusing on different regions and aspects of EV infrastructure development[41].

Electrify America currently has 2 charging stations in the Kansas City region. One is located at a Target in Independence, MO[42] at 17810 E 39th St, near I-70. It has 4 stations with 7 CCS1 plugs and 1 CHAdeMO plug type. The CCS1 plugs range from 150-350kW and the CHAdeMO has a charge rate of 50kW. The cost is $0.56 per kWh, 1-350 kWh with a parking cost of $0.40 per hour.

38 www.tesla.com/supercharger
39 Learn About Volkswagen Violations | US EPA
40 Volkswagen Clean Air Act Civil Settlement | US EPA, About Volkswagen Group of America, Inc. - Volkswagen Group of America
41 Our Zero Emission Vehicle Investment Plan| Electrify America
42 Electrify America in Independence, MO, 17810 E 39th St

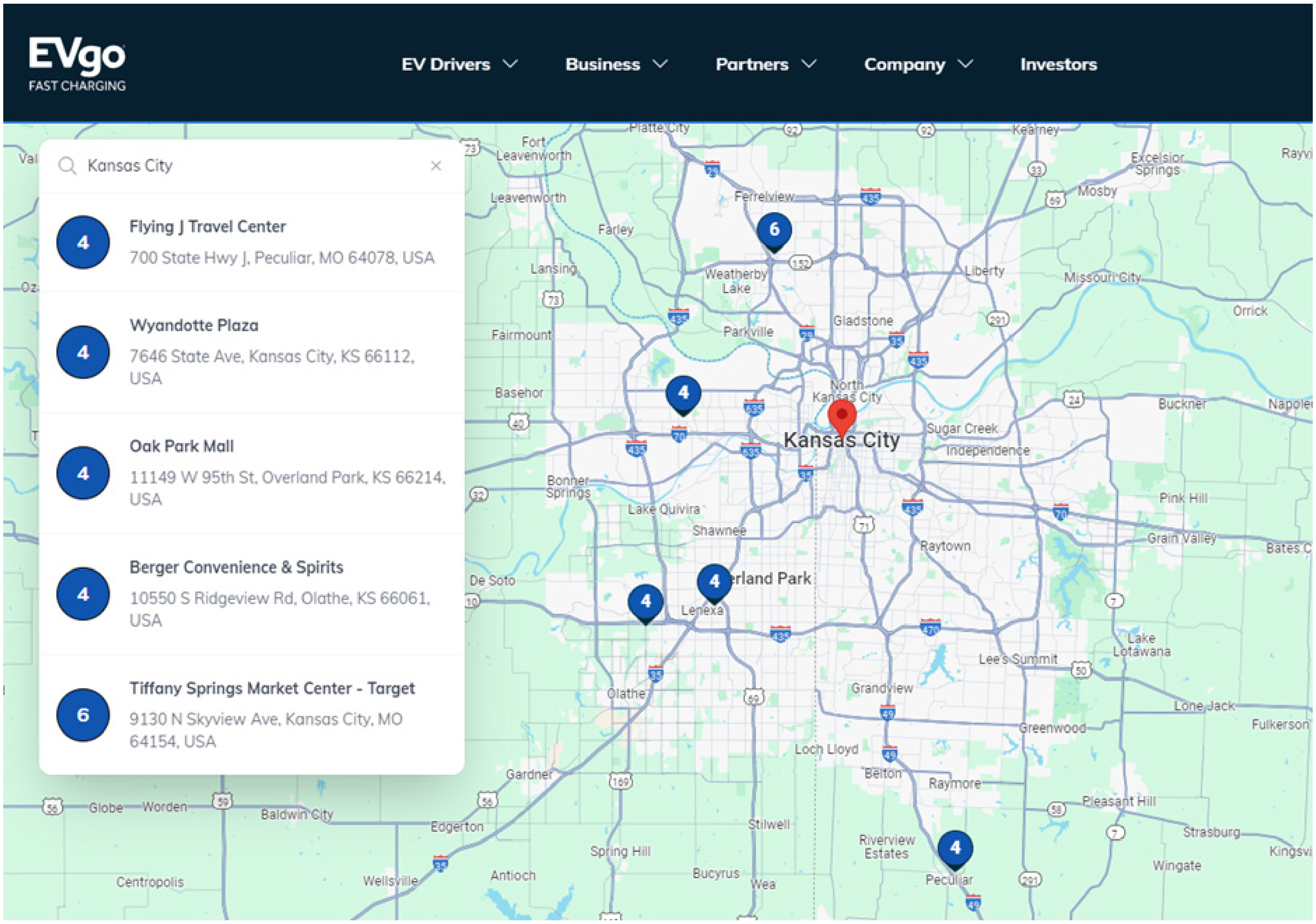
The second station recently opened near the County Club Plaza in Kansas City, MO at 4706 Broadway Blvd. There are 8 chargers all with CCS1 plug types and a charge rate of 350kW. The cost is $0.56 per kWh, 1-350 kWh with parking costing $0.40/hour.

2.3.2.2.3 EVgo

EVgo is one of the largest fast-charging networks for electric vehicles in the United States. The company operates a public network of DC fast chargers that are compatible with all major EV models. Their charging network provides over 1,000 fast-charging locations in 35 states.[43]

EVgo was originally founded in 2010. In 2016, it was acquired by Vision Ridge Partners, a sustainable asset investment firm.[44] In 2019, EVgo became the first EV charging network in the U.S. to be powered by 100% renewable energy. In 2020, it was acquired by LS Power, a US power and energy infrastructure company.[45] The map below shows the current stations in the Kansas City region.[46]

Figure 33: EVGo Charging Network in Kansas City[47]



43 [About EVgo | America's Largest Public EV Fast Charging Network]
44 [Vision Ridge Partners Closes on Acquisition of EVgo, Nation's Leading Electric Vehicle Fast-Charging Network (prnewswire.com)]
45 [LS Power Completes Acquisition of EVgo | EVgo]
46 [Find Electric Vehicle Charging Near You | EV Charging Stations Map (evgo.com)]
47 [evgo.com/find-a-charger]

2.3.2.2.4 Automobile Manufacturers & Dealerships

Vehicle manufacturers are increasingly mandating that car dealers install DC fast chargers to support the sales and service of electric vehicles (EVs), with some manufacturers requiring the practice for dealers to continue to sell electric vehicles.

For example, Ford has committed to installing at least one public-facing DC Fast charger with two ports at 1,920 Ford dealerships. This was initially slated to happen by January of 2024, but some participating dealerships in Kansas City are still in the process of installing their chargers due to equipment procurement delays. Dealership fast chargers are intended to be open to the public and are part of Ford's Blue Oval Charge Network.

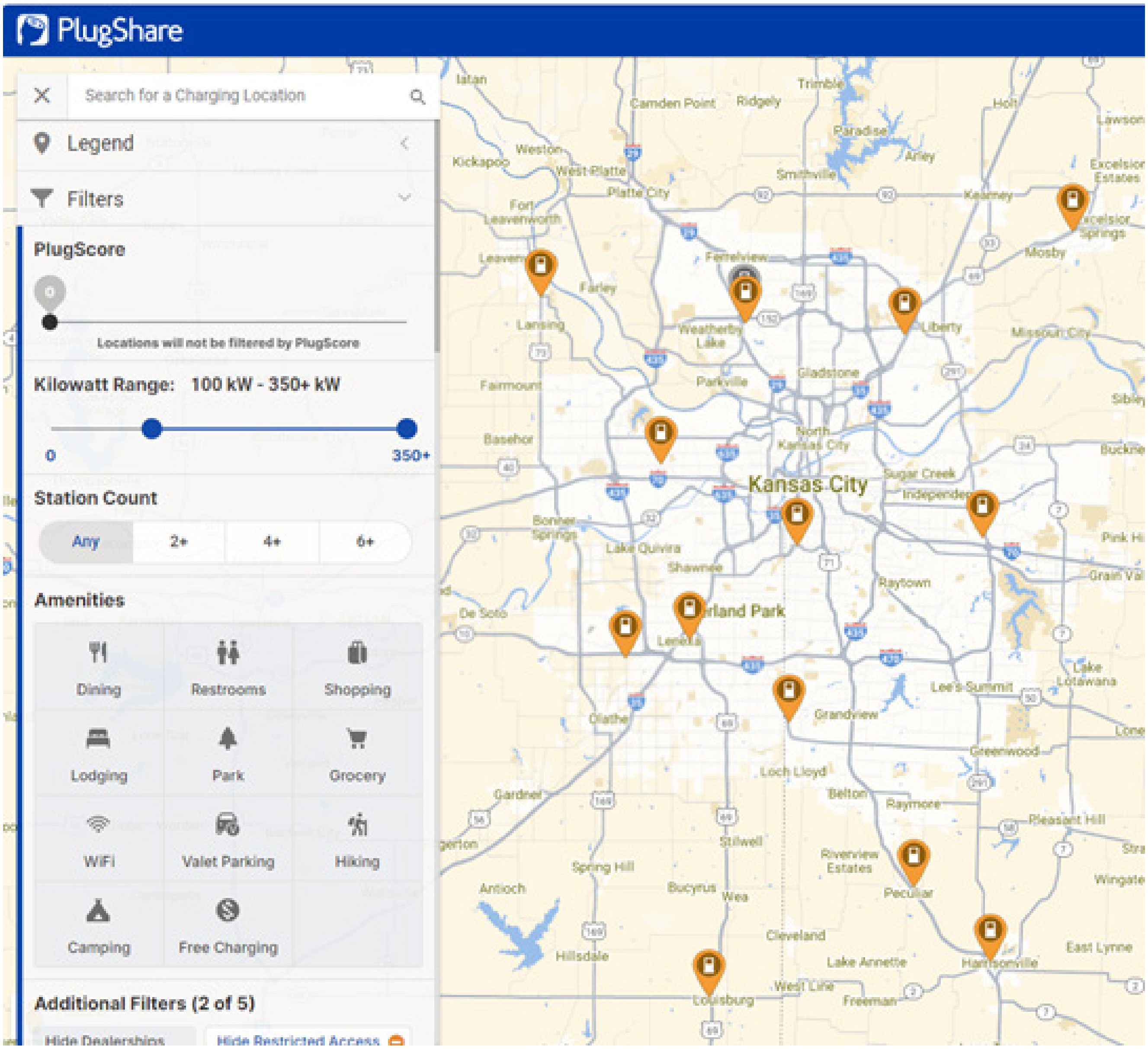
General Motors also announced a collaborative effort with dealers to install up to 40,000 public Level 2 EV chargers in local communities by 2026 through GM's Dealer Community Charging Program[48].

Figure 34: Recently Installed DC fast chargers at a Ford Dealership in KC[49]

48 [FACT SHEET: Biden-Harris Administration Announces New Standards and Major Progress for a Made-in-America National Network of Electric Vehicle Chargers | The White House]

49 DC fast chargers located at Rob Sight Ford, 13901 Washington St, Kansas City, MO 64145. Photo taken on October 13th, 2024.

Figure 35: DC Fast Chargers at Car Dealerships[50]



The map above shows the existing chargers in the Kansas City region that are listed on Plugshare, filtering for CCS DC fast chargers – this map does not include Tesla chargers. The dealership locations include Zeck Ford in Leavenworth, KS, Heartland Chrysler Dodge Jeep Ram in Excelsior Springs, MO, Gary Crossley Ford in Kansas City, MO, Rob Sight Ford in Kansas City, MO, and Louisburg Ford in Louisburg, KS.

Several vehicle manufacturers have announced partnerships to build charging stations. BMW, GM, Honda, Hyundai, Kia, Mercedes-Benz, and Stellantis announced a joint venture called IONNA in 2023 that aims to install 30,000 DCFC ports in North America[51].

50 www.plugshare.com
51 www.ionna.com

Additionally, the federal government has announced new standards and commitments from various companies, including Tesla and GM, to expand public charging networks. This includes thousands of new public charging ports to support the transition to electric vehicles[52].

2.3.2.2.5 Other Organizations with Fast-Chargers

Several other organizations have announced plans to add DC fast chargers to some of their nationwide locations. The list below includes companies that have made public statements in support of adding charging stations, but not necessarily in Kansas City. Most major gas station brands have entered the EV charging business in some way, but most do not have any chargers in the Kansas City area.

- Wal-Mart[53]
- Casey's[54]
- Buc-ees[55]
- BP[56]
- Flying J[57]
- Phillips 66[58]
- Pilot[59]
- Shell[60]
- Starbucks[61]

Of these, Flying J has installed DC fast-chargers chargers in several locations in Kansas and Missouri, while Buc-ees recently announced the construction of a new location in Kansas City, Kansas. It is unclear if this location will include DC fast chargers, but a location opened recently in Springfield, MO did include them. Casey's has one location in Kansas that includes DC fast chargers, although it is not in Kansas City. Wal-Mart hosts many of Electrify America's DC fast chargers, as discussed earlier, and has announced it will add them to thousands of its stores by 2030. Starbucks is partnered with Volvo, but so far only at 15 locations between Denver and Seattle.

2.3.3 Existing EV Ownership in the Kansas City Metro

Vehicle registration data for 2023 was provided by the Kansas Department of Revenue and the Missouri Department of Revenue via open records requests. The table below shows the breakdown of electric vehicle registration by county in the MARC region as of December 2023. Only fully electric vehicles are included in this chart.

52 At the time of this report's conclusion, many Federal funding programs related to Electric Vehicles and associated charging infrastructure were under review for possible revision. MARC and regional stakeholders will continue to monitor these programs as potential adjustments are made and funding programs related to EVs are made available in the future.

53 corporate.walmart.com/news/2023/04/06/leading-the-charge-walmart-announces-plan-to-expand-electric-vehicle-charging-network

54 www.caseys.com/products-and-services/ev-charging-stations

55 www.cspdailynews.com/fuels/buc-ees-mercedes-benz-creating-ev-charging-network

56 www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/news-and-insights/press-releases/bp-boosts-ev-charging-network-with-100-million-dollar-order-of-tesla-ultra-fast-chargers.pdf

57 pilotflyingj.com/ev-charging

58 www.phillips66gas.com/ev-charging

59 www.pcmag.com/news/ev-fast-charging-network-from-gm-evgo-pilot-goes-live-in-17-locations

60 www.shell.us/media/2023-media-releases/shell-usa-inc-finalizes-acquisition-of-volta-inc.html

61 www.volvocars.com/us/l/starbucks-partnership

Table 9: Existing EVs in MARC Counties

County	Number of EVs	Percent of Total Vehicles
Cass, MO	424	0.28%
Clay, MO	1,310	0.41%
Jackson, MO	3,613	0.38%
Platte, MO	1,426	0.90%
Ray, MO	56	0.002%
Johnson, KS	6,393	0.61%
Leavenworth, KS	224	0.14%
Miami, KS	77	0.09%
Wyandotte, KS	213	0.06%
Total	**13,736**	

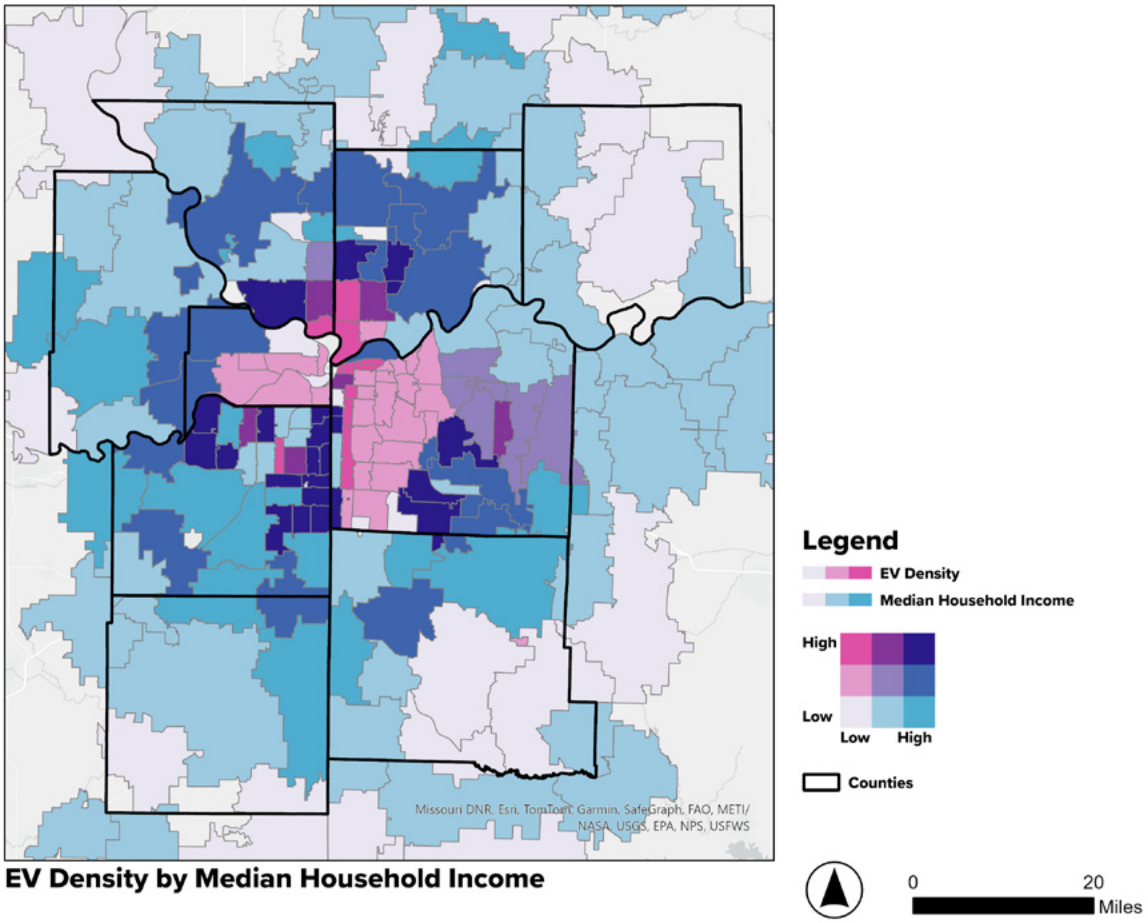
It is not surprising to see the largest number of electric vehicles registered in just a few counties. Until recently the cost of a new electric vehicle was significantly above the average cost of a gasoline vehicle. Furthermore, very few used electric vehicles are currently available, so registrations are heavily skewed toward households that purchase new vehicles. While EVs make up less than 1% of all registered vehicles, sales have been growing. A larger number of electric vehicle models from various manufacturers became available beginning in model year 2021. Before this time, most EV sales were Tesla vehicles. The table below shows registration trends in Kansas counties from 2021 through 2023. Note only 2023 data was available for Missouri counties.

Table 10: EV Registration Growth in Kansas Counties

	2021	2022	2023
Johnson	3,579	4,671	6,393
Leavenworth	109	143	224
Miami	47	57	77
Wyandotte	128	152	213
Total	**3,863**	**5,023**	**6,907**
Year-over-Year Growth		**30%**	**38%**

Figure 36 shows 2023 EV registration density at the census tract level and median household income. Counties that have a higher median income are depicted darker, while counties with a lower median income are depicted lighter. The correlation between EV ownership and household income is expected to gradually lessen as new vehicle prices drop and more used electric vehicles are available in the Kansas City market. This is addressed in detail in section **V.1** of this report.

Figure 36: EV Density by Household Income



2.4 Identification of Barriers

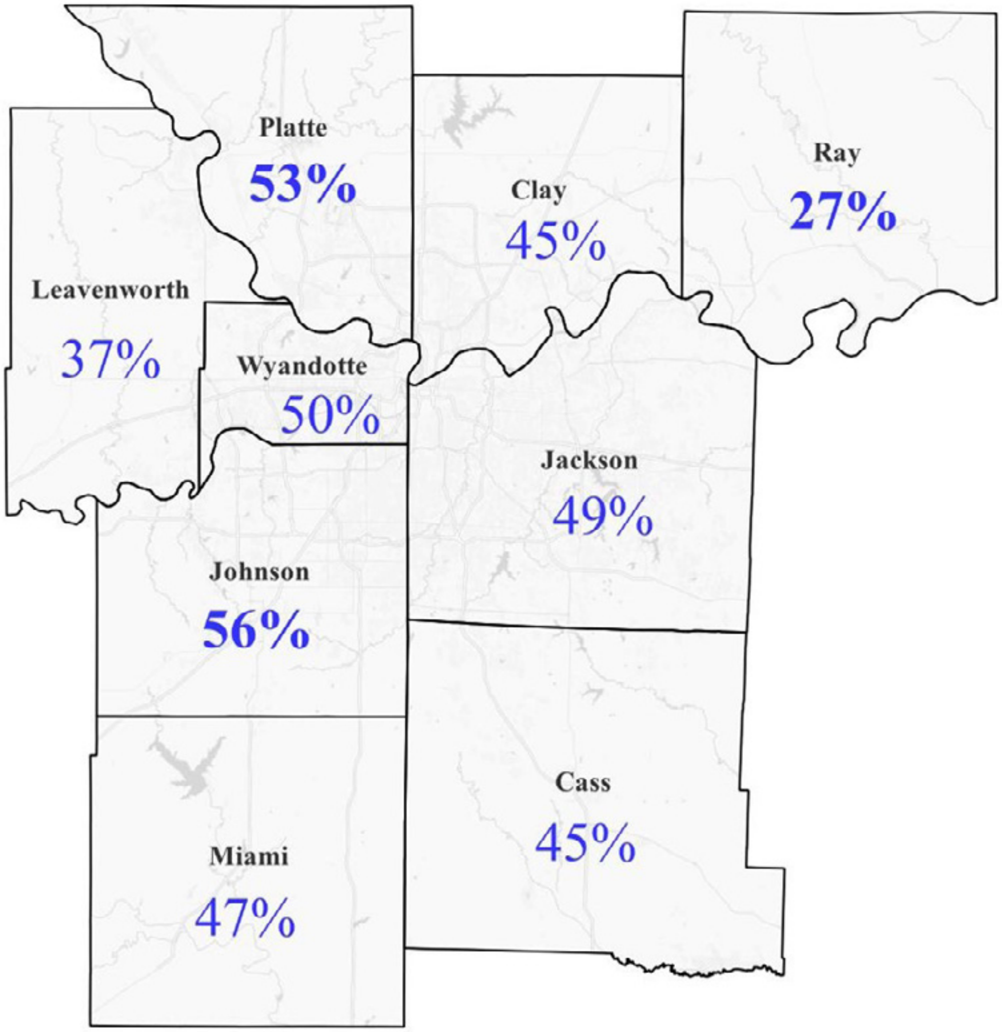
This study identified other barriers and perceived barriers that influence buying behavior using a combination of surveys and direct engagement with stakeholders and members of the community. Two rounds of surveys and multiple public pop-up engagement sessions helped elicit current barriers to EV adoption as well as concerns.

2.4.1 2024 Survey Results

Barriers Identified by MARC Connected KC 2050 Survey:

As part of MARC's Connected KC 2050 plan, a survey was completed with random participants in the Greater Kansas City area. Survey results indicate that almost 50% of respondents do not have an interest in purchasing an EV. 31% indicated some interest in the future, and 15% suggested they are planning to purchase an EV in the next 5 to 10 years. The survey had more than 1700 total responses.

Figure 37: How Likely Are You to Purchase an EV?

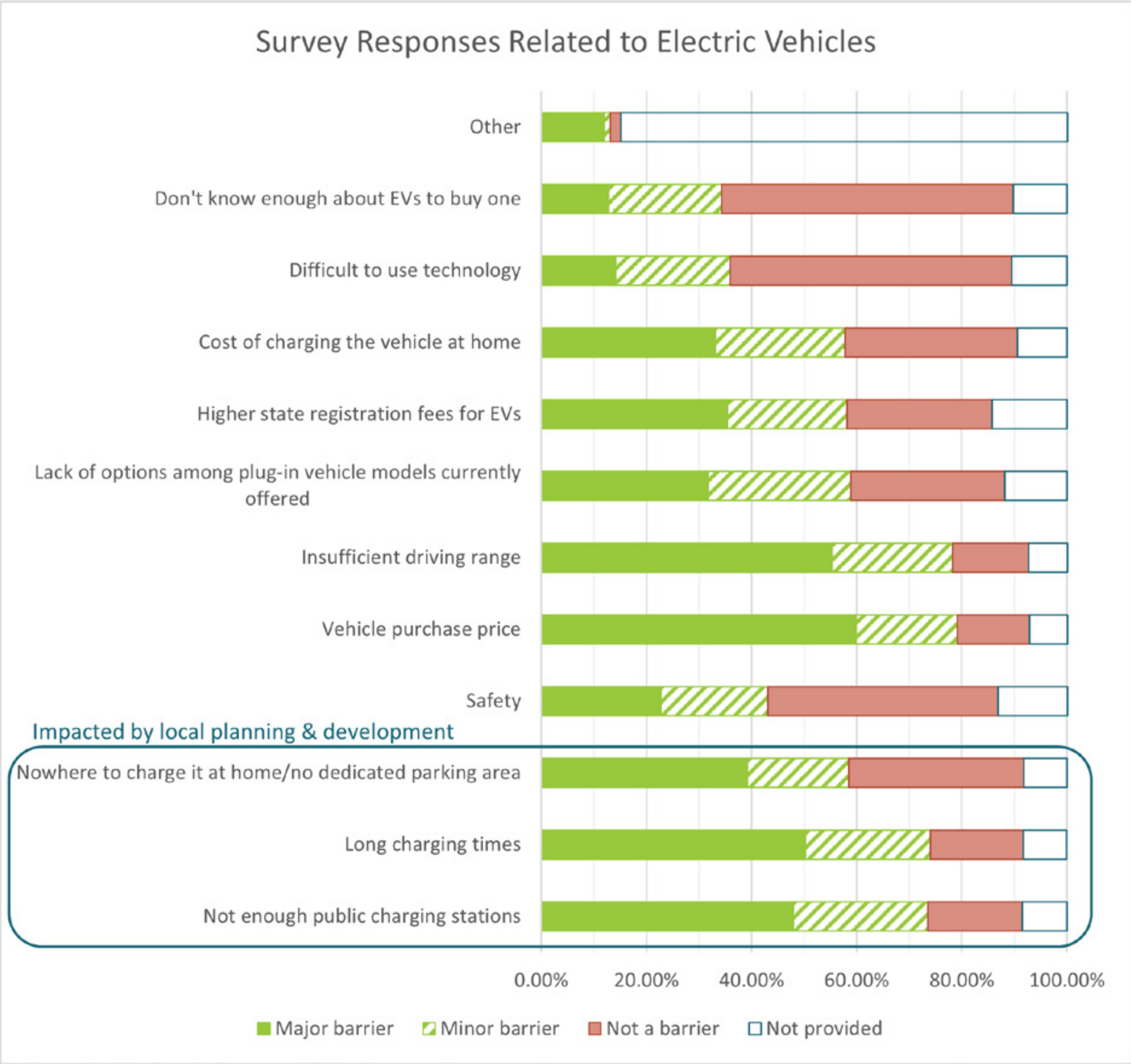


The primary barriers to the participants in the survey were purchase price, insufficient driving range, and charging time. Participants were asked to select the top 3 barriers from a list of potential barriers.

- 51% identified the purchase price of an EV as a barrier.
- 46% were concerned about the driving range being sufficient.
- 35% believe there are not enough public charging stations present at the current time.

The EV industry is a challenging topic for a public survey as the technology is evolving, and battery capacities are evolving. After the top three barriers, the other items were much less prevalent in the number of participants that chose each barrier as a first, second, or third choice as a barrier. Public charging station availability can be impacted on the community level by funding or enabling the development of such stations. The range is the responsibility of the manufacturer, but the purchase price is also able to be impacted by local and national subsidies, which have been in place for almost a decade at this point.

Figure 38: ConnectedKC 2050 Survey Responses



In a comparison of priorities, projects that "encourage the purchase of electric and no-emission vehicles for fleets and personal vehicles" received 38% in the disagree or strongly disagree ends of the preference spectrum. This suggests that these respondents would not prefer to see community scale or funded efforts. It could be suggested that there is an expectation of those individuals that private market forces should or will address such shifts and needs in infrastructure. It could also indicate that many of the other priorities above this item were all that much more important in the strata of priorities currently at hand.

In a similar concern from respondents there were options given about changes in current funding:

- 39% of respondents would reduce funding to public Electric E-bikes for short-term rental like a bike share.
- 32% would reduce funding of electric fleets for the City or County.
- 22% of respondents would reduce funding going towards EV charging systems.

The most enthusiasm for increasing maintenance and rehabilitation of highways at 74% and transportation options for older adults and those with disabilities at 69%. There appears to be considerable support for existing transportation modes and systems, as well as for active transportation, but more hesitancy towards supporting EV development publicly.

2.4.2 Barriers to EV Adoption

Purchase Cost

In the past 10 years while the interest in electric vehicles has increased, the overall costs to purchase an electric vehicle have continued to go down. Kelly Blue Book suggests that a standard sedan that is gas-powered costs $48,397 while a comparable electric vehicle is said to cost $56,351.[62] This is not an exact parity in cost, but it is approaching that quickly. While the cost of electric and comparable gas consumer vehicles is approaching cost parity, the general public commonly has seen dated media references that say otherwise. This leaves many potential markets for consumer electric vehicles at an inherent disadvantage when encouraging further development of consumer EV usage.

Percent of Single-family homeownership

The density of development across the MARC region primarily has focused over the last 30 years on single-family housing. Homeowners can have a Level 2 charger installed in their garage without the permission of a landlord. In contrast, residential areas of greater density like multifamily apartment dwellings are less prevalent to own or have access to a garage, which also means it takes longer to bring home-based charging to a population that might be more apartment-based. While being able to install chargers that multiple families could use at an apartment building, each home is more likely to need to install its own charger. This requires a larger number of charging installation sites and mobilizations for installers than focused, dense apartment dwellings. Further multifamily units in the Midwest are commonly not owner-occupied. This causes slower development of shared charging opportunities adjacent to multifamily residential developments. This can be seen in the participation in the Evergy Charger installation incentive program. The participation is 99% single-family homes as compared to 1% multi-family dwellings.[63] With that 12% of those properties were leased versus 82% being owned by the participant.

Charging Speed and Range Anxiety

The range expectations and charging times of EVs have been a common discussion point for broad EV deployment. While these concerns represent challenges to earlier models of EVs, the broad options of consumer-grade EVs have much more robust driving ranges. For certain contexts like longer trips and cross-country driving the timing and experience may not be equivalent to gas vehicles. Many daily contexts for driving electric vehicles have improved significantly in the last 6-8 years in markets including the MARC region. The time it takes to adequately charge a vehicle is also commonly misunderstood to be significantly longer than current public and private chargers are capable. Fast charging times for cross-country trips are one of the primary metrics about EVs that are over-estimated. These dated assumptions of EV performance abilities make it challenging to overcome barriers to consumer confidence in new technology. This does assume that fast-charging options are available and compatible with a user's vehicle. Range and charging times were both identified by MARC region survey participants.

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62 www.kbb.com/car-advice/how-much-electric-car-cost/

63 Total of 1681 charging projects, provided by Evergy Inc. in relation to their residential EV charging rebate, covering the entirety of the Evergy service territory.

MARC regional sprawl and average density of development cause longer daily distances to commute to work

In a 2014 sprawl comparison[64] of major US Cities, Smart Growth America rated Kansas City 178th of 221 American cities in its Sprawl Index. With Kansas City, KS and Kansas City, MO representing a large portion of the MARC region, this creates an underlying challenge for EVs, given that drive distances to destinations will be longer than more densely developed parts of the country. This creates range anxiety based on community development patterns, rather than based on vehicle expectations or performance.

With lower gas prices, there are fewer car buyers choosing EVs over vehicles that use other fuels. While other initial costs of purchasing an EV are slightly higher, individuals purchasing a vehicle in the MARC region aren't always as inclined to purchase an EV based on affordable gas prices as compared with parts of the country that have more expensive gas prices. Examples of these regions are coasts and mountainous regions that are further from oil refineries and/ or are more remote and take more effort to deliver fuel to. The MARC region also has relatively cheaper electricity costs, so the cost differential between gas and EV fuel-related costs may not differ dramatically from other regions.

Electrification has become politically polarized, and the general politics of the region aren't driven to electrify

Like various technologies associated with climate change, EVs and charging infrastructure have become somewhat politically polarized. With the generally more conservative leanings of Kansas and Missouri, the environmental concern focused on many EV transitions of other regions of the country are less prevalent in the Midwest and MARC regions. More conservative preferences in the MARC region leave many consumers more hesitant to transition to EVs based on their values, concerns, and focuses.

3. UTILITY/ GRID ANALYSIS

The electric utility industry is planned and operated both locally and regionally. Retail electric utilities manage their electric distribution systems that connect the wider electric grid to customers' facilities. Retail planning and operations are primarily regulated at the state and local level, while regional planning and reliability fall under federal jurisdiction. This section summarizes current grid conditions in the MARC region including local utility service territories, electricity costs for EV charging, and planning processes for future load growth.

3.1 Electric Utilities in the MARC Region

Retail customers on the Missouri side of the MARC region are served by two investor-owned utilities, three cooperative associations, and two municipal electric utilities as shown in Table 11. Evergy Missouri West and Evergy Missouri Metro are both part of Evergy, Inc. but may be regulated separately by the Missouri Public Service Commission. Retail customers on the Kansas side of the MARC region are served by one investor-owned utility, one cooperative, and three municipal utilities as shown in Table 12.

64 www.governing.com/news/headlines/gov-study-ranks-metro-areas-by-sprawl.html

Table 11: Electric Utilities in the MARC Region (Missouri)

Missouri				
Cass County	Clay County	Jackson County	Platte County	Ray County
Evergy (Missouri Metro)	Ameren Missouri	Evergy (Missouri Metro)	Evergy (Missouri Metro)	Ameren Missouri
Evergy (Missouri West)	Evergy (Missouri Metro)	Evergy (Missouri West)	Evergy (Missouri West)	Evergy (Missouri West)
City of Harrisonville	Evergy (Missouri West)	Independence Power & Light	Platte-Clay Electric Cooperative, Inc.	Farmers' Electric Cooperative, Inc.
Osage Valley Electric Cooperative Assn.	Platte-Clay Electric Cooperative, Inc.			Platte-Clay Electric Cooperative, Inc.

Table 12: Electric Utilities in the MARC Region (Kansas)

Kansas			
Johnson County	Leavenworth County	Miami County	Wyandotte County
Evergy (Kansas Metro)	Evergy (Kansas Central)	Evergy (Kansas Central)	Kansas City Board of Public Utilities (BPU)
Evergy (Kansas Central)	Freestate Electric Cooperative	City of Osawatomie	
City of Eudora			
City of Gardner			

Retail providers are generally responsible for planning, operating and maintaining the local electric distribution system, connecting new customers to the grid, and administering customer accounts and billing systems. Retail utilities may also own their own generation plants and high-voltage transmission lines, or they may purchase power and transmission capacity from another entity.

3.1.1 Evergy

Evergy provides retail electric service to approximately 1.7 million customers[65] across Kansas and Missouri, many of which are in the Kansas City metro area. Evergy serves the vast majority of customers within the MARC region, operates in both Kansas and Missouri and has the greatest number and most advanced EV-related programs out of every utility included in this report. For this reason, it is discussed in greater detail than other utilities.

3.1.1.1 Company Background

Evergy is a publicly traded investor-owned electric utility company trading under the symbol EVRG on the NASDAQ stock exchange. It was formed in 2018 after the merger between Westar Energy and Kansas City Power & Light, which were themselves part of several mergers and acquisitions over the last four decades. Because of this, Evergy still operates multiple subsidiaries with four distinct service areas:

65 *Evergy 2024 Q2 Financial Results News Release obtained from investors.evergy.com*

- Evergy Kansas Central: former Westar Energy territory that includes the western portions of MARC member counties.
- Evergy Kansas Metro: most of the KC metro area on the Kansas side is not served by a municipal utility or cooperative.
- Evergy Missouri Metro: most of the KC metro area on the Missouri side is not served by a municipal utility.
- Evergy Missouri West: much of the eastern portion of the MARC region that isn't served by a municipal utility or cooperative.

MARC's member counties span all four of these service areas. As a retail electric company that also owns generation and interstate transmission assets, Evergy is regulated at both the state and federal levels. Residential, commercial, and industrial rate plans, known as tariffs, are regulated at the state level by the Kansas Corporation Commission and the Missouri Public Service Commission, respectively. Because of this, customers in Kansas have access to different rate structures and incentives than customers in Missouri, which is important when looking at EV-related programs. Transmission infrastructure and wholesale generation costs are mostly regulated at the federal level by the Federal Energy Regulatory Commission (FERC) but are incorporated into retail rates for cost recovery by the state commissions mentioned above.

3.1.1.2 Capital Investment

Evergy has a market capitalization of approximately $14 billion as of October 18, 2024, and is expected to make over $12 billion in capital investments over the next 5 years, which is about 7% higher than prior year estimates. About $3 billion of this is slated for investment in the KC metro area[66]:

- New Generation / Renewables: $84 million
- Transmission Grid: $409 million
- Distribution Grid: $1.3 billion
- Legacy Generation: $687 million
- Other: $698 million

Evergy has indicated that all of its growth capital will be spent on its regulated utilities through 2025, rather than on the competitive, unregulated side of the energy industry[67]. This supports the estimated rate base[68] growth of approximately 6% over the next several years. Earnings on its rate base are expected to fund the majority of planned capital investments. The remainder is expected to be funded by the issuance of new debt securities, and Evergy continues to have a strong investment-grade credit rating.

Evergy earns a regulated rate of return on its rate base in multiple jurisdictions. The chart below shows the estimated allocation of Evergy's existing rate base (assets in service that haven't yet been depreciated) as of the end of 2023[65]. This is important because it can help quantify Evergy's regulatory risk. For example, investors prefer federally-regulated, or FERC, assets as it has tended to provide longer-term certainty and allow more stable returns. While not directly related to EVs, it does indicate that Evergy has a relatively strong financial position and is likely to be able to fund the investments in infrastructure that it has planned, which will lead to a more capable and reliable electric grid in the Kansas City area.

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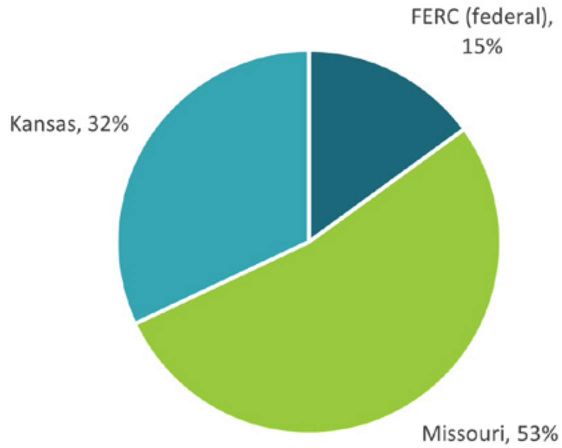
66 Evergy Fourth Quarter 2023 Earnings Call Presentation, 2/29/24, obtained from investors.evergy.com

67 Morningstar Equity Analyst Report, 19 Oct 2024. Information in this report is intended for informational purposes only and does not constitute investment advice.

68 The rate base is the total value of a utility's assets in which it is able to earn a regulated rate-of-return as determined by one or more regulatory agencies.

Figure 39: Rate Base Regulatory Jurisdiction



While only 32% of Evergy's existing rate base is in Kansas, more than half of the planned $12 billion investment mentioned above is estimated to take place on the Kansas side[65].

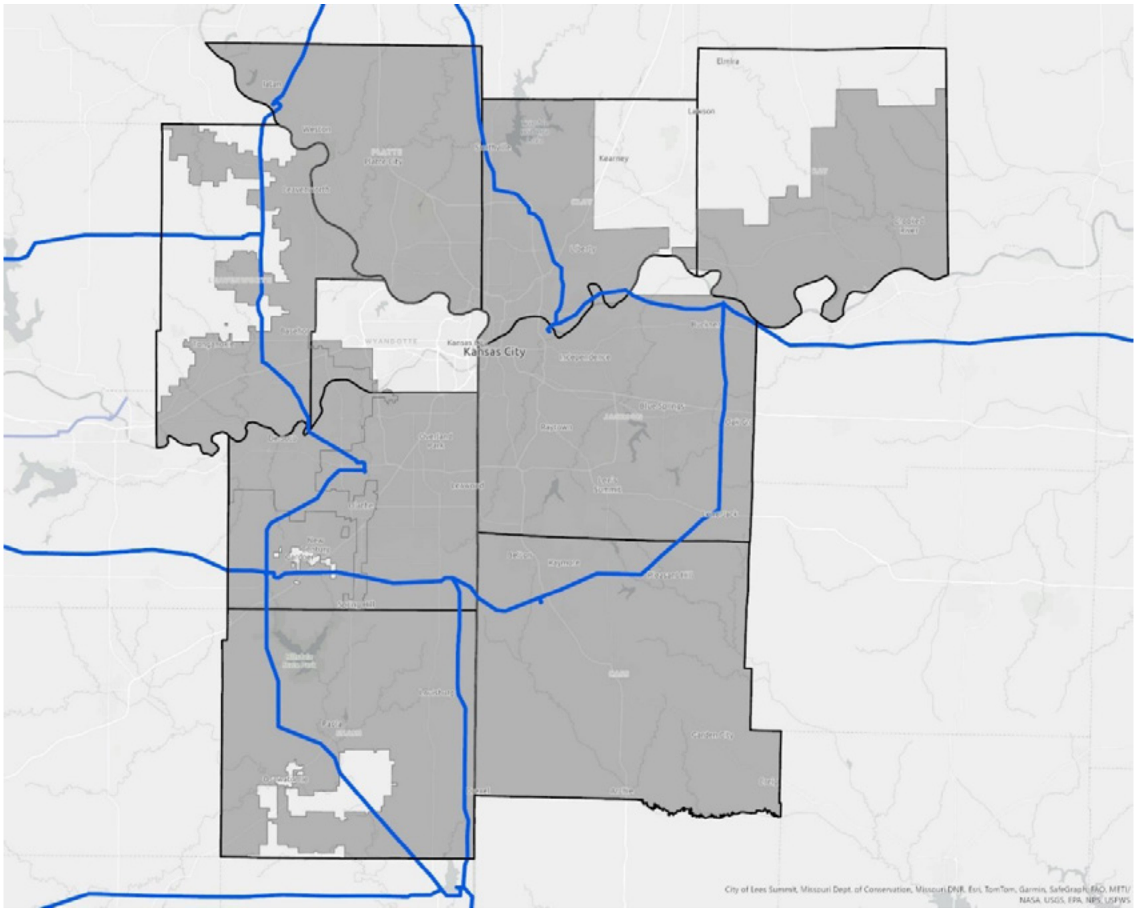
3.1.1.3 Grid Overview

Evergy's system in the Kansas City area is built on a 345 kV transmission line backbone (shown blue in the Figure 40 below), which runs in a loop around Kansas City and is interconnected to the larger Southwest Power Pool (SPP) regional grid to the north, south, and west, and to Ameren's transmission system to the east. This 345 kV backbone provides several benefits to Kansas City:

1. Allows power to be imported or exported hundreds of miles in either direction
2. Provides for the purchase of low-cost wind energy from western Kansas
3. Contributes to wholesale price stability within the Kansas City area by minimizing congestion costs.

Reliability planning for the 345 kV system is typically the responsibility of SPP, of which Evergy is a member and a major contributor to regional planning efforts.

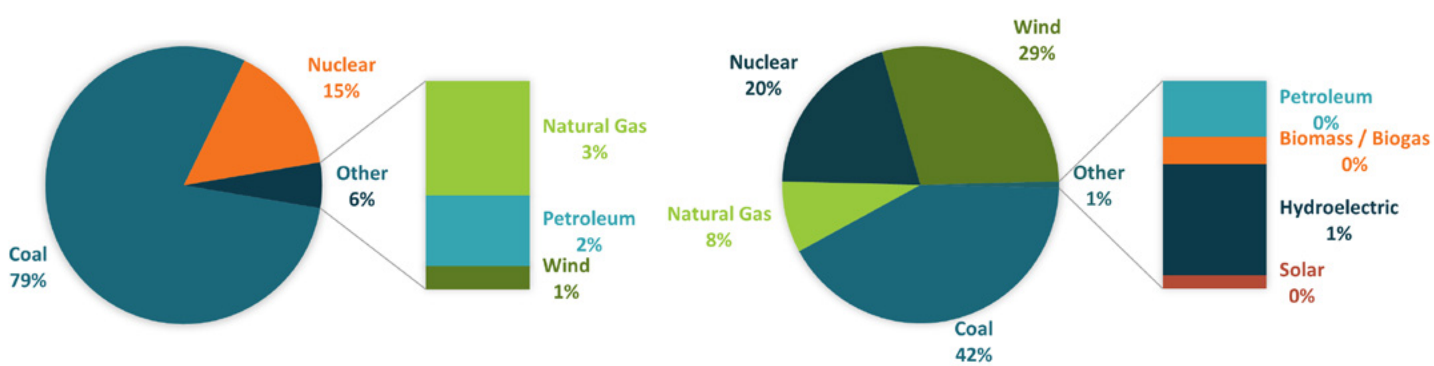
Figure 40: Evergy Retail Service Territory (gray) within MARC Member Counties, 345kV Transmission Lines Shown[69]



Generation Portfolio

Evergy's generation mix has evolved considerably over the last 20 years. Coal-powered generation has decreased significantly even while total energy production has increased by 14%, as shown in Figure 41 below.[70]

Figure 41: Net Generation by Fuel Source, 2005 (left) and 2023 (right)



69 Locations of electrical transmission infrastructure are approximate and based on publicly available data obtained via Homeland Infrastructure Foundation-Level Data. No critical energy infrastructure information (CEII) was obtained or analyzed in the production of this report.

70 Evergy EEI ESG/Sustainability report, obtained from investors.evergy.com/ESGMetrics. Net generation values include Purchased Power Agreements.

Evergy plans to retire an additional 1,900 MW of coal-fired generation between 2028 and 2032 while adding 1,250 MW of wind, 1,950 MW of solar, and 2,600 MW of natural gas across its footprint. Notably, 375 MW of existing coal-fired generation slated for retirement is in the KC metro area, which will positively impact local air .

EV Plans & Programs

Evergy has a team of employees in Kansas City dedicated to EV readiness which is responsible for working with stakeholders in the residential, commercial, and fleet segments. It owns and operates a network of over 1000 electric vehicle charging stations known as the Clean Charge Network, which was primarily constructed between 2015 and 2021 and is discussed in detail in section II.3.2 of this report[71]. Evergy's EV team is involved in the community and regularly hosts EV-related events with other stakeholders, such as local nonprofits and car dealerships to provide education on EV readiness. It encourages early collaboration between developers and its EV team for projects that may include EV charging infrastructure.

In 2022 Evergy conducted an electric vehicle impact and load forecast study with the intent of identifying future areas on their grid that may be constrained if EV-related electricity demand increases. It looked at specific geographic areas to identify portions of the distribution grid that may become overloaded.

> ***"Evergy anticipates localized loading issues at the distribution line transformer level in the future when those transformers are providing service to a cluster of customers who all adopt EVs. Localized distribution line transformer loading can be resolved by upgrading the size of the transformer and/or the line size feeding the transformers. Based on the clustering of individuals who meet the profile for likely adoption, it is also anticipated that upgrades for additional capacity at the substation level will be required as penetration increases[72]."***

The above describes possible issues at the distribution grid level, which consists of the poles, wires, and equipment that directly connect homes and businesses to utility substations and usually operate at 34.5 kV and below. Specifically, transformers outside residential housing units may not supply enough power if those customers purchase multiple electric vehicles. A single transformer usually supplies several single-family homes.

In September of 2024, Evergy filed an Application for Approval of its Phase 2 Transportation Electrification Portfolio with the Kansas Corporation Commission (KCC), which is currently under review with the commission. An equivalent application has not been filed in Missouri. This application requests approval from the KCC to implement a Fleet Advisory Services program and a Residential Managed Charging pilot program. These programs aim to build on previously approved EV initiatives to further shape the electric vehicle charging load on its system. Evergy expects 21,000 customers to participate in the residential managed charging program, and 60 organizations to participate in the fleet advisory program. To justify the need for these programs, Evergy submitted a detailed forecast of electric vehicle growth within its Kansas system. The study consisted of the following:

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71 Kansas City, Missouri Utility Company Installed More Than 1000 Electric Vehicle Charging Stations, Indiana University Environmental Resilience Institute, Case Study

72 Evergy Missouri West, Volume 4.5 Transmission & Distribution Analysis, Integrated Resource Plan 20 CSR 240-22.045, April 2024, filed with the Missouri Public Service Commission

- Market scan of probable fleet locations that identified over 5000 locations where fleet charging may be present in the future
- Evaluation of multiple electrification scenarios for randomly selected fleets
- Estimate of impact on distribution grid infrastructure

Evergy's modeling determined that between 2% and 8% of distribution circuits serving these possible fleet facilities would require upgrades, with proposed charge management plans resulting in a lower number. Further, the study discussed the likely needed capital investment in distribution assets:

> ***"Evergy's impact study result can be considered as the market-weighted average of some fleets electrifying that are almost certain to require large distribution upgrades (e.g., a large transit fleet depot) and others that are unlikely to trigger upgrades (e.g., a small business with light- /medium-duty delivery vehicles). Considering typical distribution upgrade unit costs, these distribution upgrades could amount to $18 million in required investment by 2030, if no mitigating actions are taken[73]."***

3.1.1.4 Participation in Regional Grid Planning

Evergy also owns and operates transmission grid assets – the much larger substations and power lines that may be hundreds of miles long and usually operate at over 69 kV. Its transmission grid is subject to federal reliability and financial regulations, as discussed in section III.2 of this report. It is a member of the Southwest Power Pool (SPP) which serves several important regulatory roles. SPP is responsible for preparing a federally required regional transmission plan, which identifies remedies for possible reliability and economic constraints on the transmission grid. Evergy participates in this process as a member utility and is responsible for providing SPP with load growth projections and other information for its service territory. These load growth projections are the main way that SPP currently factors in the impacts of electric vehicle adoption into its transmission planning process. When asked if EV adoption growth was included in the load models provided to SPP, Evergy provided the following response:

> ***"EV load growth is currently factored into the load model Evergy submits to SPP based on anticipated modest growth. While there is some existing adoption and it's likely to grow, especially in urban areas, the overall adoption for the Evergy footprint is likely to remain fairly limited for the foreseeable future. We continue to monitor trends and will adjust if necessary."***

Evergy also indicated that typically any municipal utilities and cooperatives that are connected to Evergy's system, vv, are responsible for submitting their own load forecasts to SPP. This is one potential risk identified in this study: the regional planning process relies on load forecasts from each utility, and each utility may have a very different view on incorporating EV-related demand growth. This is discussed in more detail in section III.2 of this report.

Evergy's load growth projections for the KC metro area describe average residential growth of 0.6%, small commercial growth of 2.2%, big commercial growth of 0.4%, and industrial growth of 0.0%

73 Evergy Transportation Electrification Portfolio Filing Report, September 2024, Kansas Corporation Commission Docket 25-EKCE-169-TAR between 2023 and 2043.[74] Home Level 2 EV charging would be included as residential, while DC fast chargers would likely be included in the small commercial category. Note that large loads, such as data centers and manufacturing plants, can have a significant impact on the load flows in certain geographic areas. For example, recently announced data centers for Google and Meta, along with a battery manufacturing plant for Panasonic, represent a combined incremental load of approximately 750 megawatts[75]. This is a load equivalent to the output of a small coal-fired power plant and is equivalent to approximately 250-300 electric vehicle DC fast charging stations. This can also be why utilities are hesitant to provide information on spare capacity because capacity projections can change quickly as new commercial projects are developed.

3.1.1.5 Cost of Electricity

On the Kansas side, Evergy has five approved rate structures for residential service – plus several variations for things like residential solar systems. The standard plan is straightforward. It consists of a flat monthly fee ("customer charge") plus an energy charge for each kWh of energy the customer uses. The energy charge is set by the tariff for the summer (June – Sep) and winter seasons[76] but does not change based on the time of day. Five approved riders allow the energy charge to fluctuate for changes in costs incurred by the utility, such as property taxes and transmission charges. These additional rider charges can be a significant percentage of the total cost of energy[77]. In 2024 these additional charges ranged from 2.7 cents / kWh in January to 3.3 cents per kWh in September. The table below compares the three distinct types of plans, with the remaining plan options consisting of slight variations to those shown.

Table 13: Evergy Kansas (Metro) Residential Rate Plans

Rate Schedule Title	Season	Customer Charge	Energy Charge	Time-of-Use	Demand Charge	Other Charges[78]
Residential Service	**Winter**	$14.25	$0.077 / kWh	No	No	$0.027 / kWh
	Summer	$14.25	$0.100 / kWh	No	No	$0.033 / kWh
Residential Time-of-Use (TOU)	**Winter**	$14.25	$0.202 / kWh	Peak	No	$0.027 / kWh
		$14.25	$0.058 / kWh	Off-Peak	No	$0.027 / kWh
		$14.25	$0.029 / kWh	Super Off Peak	No	$0.027 / kWh
	Summer	$14.25	$0.268 / kWh	Peak	No	$0.033 / kWh
		$14.25	$0.077 / kWh	Off Peak	No	$0.033 / kWh
		$14.25	$0.038 / kWh	Super Off Peak	No	$0.033 / kWh
Residential Demand Service	**Winter**	$14.25	$0.043 / kWh	No	$2.20 / kW	$0.027 / kWh
	Summer	$14.25	$0.095 / kWh	No	$7.82 / kW	$0.033 / kWh

On the Missouri side, Evergy has five types of rate structures for residential service – plus several variations for things like residential solar systems. An EV-specific plan is available for customers who choose to install a second meter specifically for EV charging. Four of them are outlined in the table below, with the fifth consisting of a slight variation to the Night & Weekends Max Plan. The default time-based plan was recently approved by the Missouri Public Service Commission and replaced the previous default plan which did not vary based on time-of-use. The EV-only plan represents the least expensive plan for customers who intend to charge overnight but also requires the most up-front cost since an electrician must install a second meter and panel.

74 Evergy Metro Integrated Resource Plan Executive Summary, 20 CSR 4240-22.080 (2)(E), April 2024
75 Evergy Second Quarter Earnings Call Investor Presentation, 8/9/24, obtained from investors.evergy.com
76 Winter rates are applicable from October - May
77 https://www.evergy.com/manage-account/rate-information-link/how-rates-are-set/rate-overviews
78 Other Charges include approved tariff riders for Evergy-KS as of January 2024 (winter) and September 2024 (summer). These charges may vary month to month.

Table 14: Evergy Missouri (Metro) Residential Rate Plans

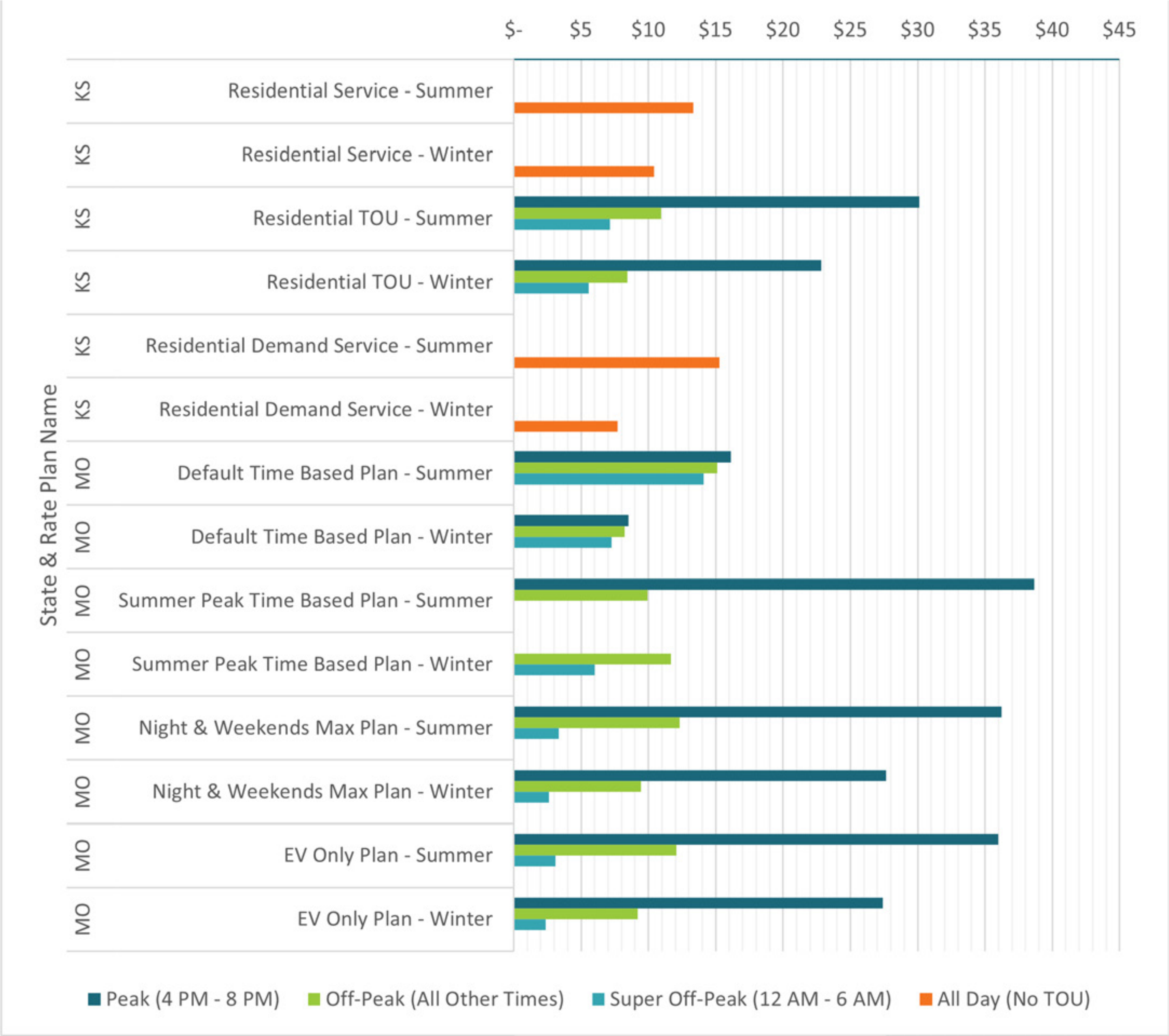
Rate Schedule Title	Season	Customer Charge	Energy Charge	Time-of-Use	Demand Charge	Other Charges[79]
Default Time-Based Plan	**Summer**	$12	0.15 / kWh	Off-Peak	No	0.003 / kWh
		$12	0.16 / kWh	Peak	No	0.003 / kWh
		$12	0.14 / kWh	Super Off Peak	No	0.003 / kWh
	Winter	$12	0.08 / kWh	Off-Peak	No	0.003 / kWh
		$12	0.08 / kWh	Peak	No	0.003 / kWh
		$12	0.07 / kWh	Super Off Peak	No	0.003 / kWh
Summer Peak Time-Based Plan	**Winter**	$12	0.11 / kWh	Off-Peak	No	0.003 / kWh
		$12	0.06 / kWh	Super Off-Peak	No	0.003 / kWh
	Summer	$12	0.38 / kWh	Peak	No	0.003 / kWh
		$12	0.10 / kWh	Off Peak	No	0.003 / kWh
Night & Weekends Max Plan	**Winter**	$12	0.27 / kWh	Peak	No	0.003 / kWh
		$12	0.09 / kWh	Off-Peak	No	0.003 / kWh
		$12	0.02 / kWh	Super Off Peak	No	0.003 / kWh
	Summer	$12	0.36 / kWh	Peak	No	0.003 / kWh
		$12	0.12 / kWh	Off Peak	No	0.003 / kWh
		$12	0.03 / kWh	Super Off Peak	No	0.003 / kWh
EV Only Plan	**Summer**	$3.25	0.35879 / kWh	Peak	No	0.003 / kWh
		$3.25	0.1196 / kWh	Off Peak	No	0.003 / kWh
		$3.25	0.0299 / kWh	Super Off Peak	No	0.003 / kWh
	Winter	$3.25	0.27305 / kWh	Peak	No	0.003 / kWh
		$3.25	0.09102 / kWh	Off Peak	No	0.003 / kWh
			0.02275 / kWh	Super Off Peak	No	0.003 / kWh

Figure 42 below compares the approximate cost for an existing customer to charge a typical EV, with a rated range of approximately 250 miles, for the rate plans shown above.[80]

79 Other Charges for Evergy-MO: FCA (April 2024): 0.00015 / kWh; DSIM (August 2024): 0.00329 / kWh

80 Marginal cost to charge an EV, based on rates obtained between September 11th, 2024 and September 21st, 2024 for Evergy Metro operating company. Summer rates include "other charges" valid as of September 2024. Winter rates are based on "other" charges as of January, 2024. Assumes a vehicle with 100 kWh battery that is fully recharged, with an assumed efficiency of 2.5 mi / kWh and a Level 2 charge rate of 9.6 kW, for a rated range of 250 miles. Fixed customer charges are not included, since it is assumed, a customer would already have electricity service. Demand charges are based on a demand of 9.6 kW and pro-rated over 30 days. This is not intended to be used as a rate plan comparison for a specific customer situation and may not be suitable for comparison to other utility rate structures.

Figure 42: Evergy Residential Rate Plan Comparison



Commercial rates are included in this report to estimate the wholesale energy costs of operating DC fast-charging stations or a commercial vehicle fleet. Evergy offers several commercial rate plans, three of which are detailed on the following page.

https://www.evergy.com/manage-account/rate-information-link/how-rates-are-set/rate-overviews

Table 15: Comparison of Evergy Commercial Rate Plans

Rate Schedule Title	Customer Charge	Energy Charge per kWh	Time-of-Use	Demand Charge	Other Charges (Rate Riders)	Total Effective Cost[81]
Small General Service (DCFC)	$46.25	On-peak $0.28790 (summer) On-peak $0.08566 (winter) Off-peak $0.12139 (summer) Off-peak $0.05666 (winter)	Yes, 2 periods	$2.726 for each kW of demand over 25 kW. $2,385.25 for small DCFC station (900 kW) = $0.1514 / kWh average		**$0.73 / kWh-** (summer, on-peak) **$0.45 / kWh** (summer, off-peak) **$0.39 / kWh** (winter, on-peak) **$0.35 / kWh** (winter, off-peak)
Public Electric Vehicle Charging Station Service (DCFC)	N/A	$0.24113 / kWh	No	No		**0.003 / kWh**
Business EV Charging Service (Fleet, L2)	$102.21	On-Peak $0.17341 (summer) On-Peak $0.11113 (winter) Off-Peak $0.08003 (summer) Off-Peak $0.05264 (winter) Super Off-Peak $0.02657 (summer) Super Off-Peak $0.02330 (winter)	Yes	$2.960 per kW of demand $492.54 = $0.0274 / kWh average	Optional carbon-free energy charge	**$0.09 / kWh**[82] (summer, super off-peak) **$0.08 / kWh** (winter, super off-peak)

Demand charges can be significant for DC fast chargers, especially for chargers that are only used a few times each day.

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81 Cost to charge an EV assumes 10 vehicles per day (small station), 30 days in a month. A small station is assumed to have 4 chargers with a maximum 1-hour demand of 900 kW. Each vehicle has a 100-kWh battery and is charged from 20% - 80%, for a total of 60 kWh of energy added per session per vehicle. This cost reflects the energy cost to the DCFC operator, not the cost to the customer. Retail prices would necessarily need to be higher to account for the cost of infrastructure, equipment, overhead, and profit.

82 Business fleet of 10 vehicles using Level 2 charging (80A, 208V), for a maximum demand of 166.4 kW. 100 kWh battery recharged each day from 20%-80%, for a total monthly energy use of 18,000 kWh. Demand charges are averaged over each vehicle/day of the month.

3.1.1.6 EV Rebate Programs

Evergy offers residential rebates for charging infrastructure. They are slightly different for Kansas and Missouri. The table below how many households in each county have applied for EV charging rebates[83]. Note that this only applies to areas in which Evergy is the retail electric provider. This represents almost 20% of EV drivers in Kansas City.

Kansas

- $500 rebate on home EV charger costs if enrolling in a time-of-use (TOU) rate plan
- $250 rebate on home EV charger costs for those not enrolled in a TOU rate plan

Missouri

- $500 rebate, requires enrollment in TOU rate plan

Table 16: Evergy Residential Rebate Participation (2023)

County	Participating Households
Johnson (KS)	794
Leavenworth (KS)	25
Miami (KS)	7
Wyandotte* [84](KS)	1
Jackson (MO)	571
Cass (MO)	169
Clay (MO)	378

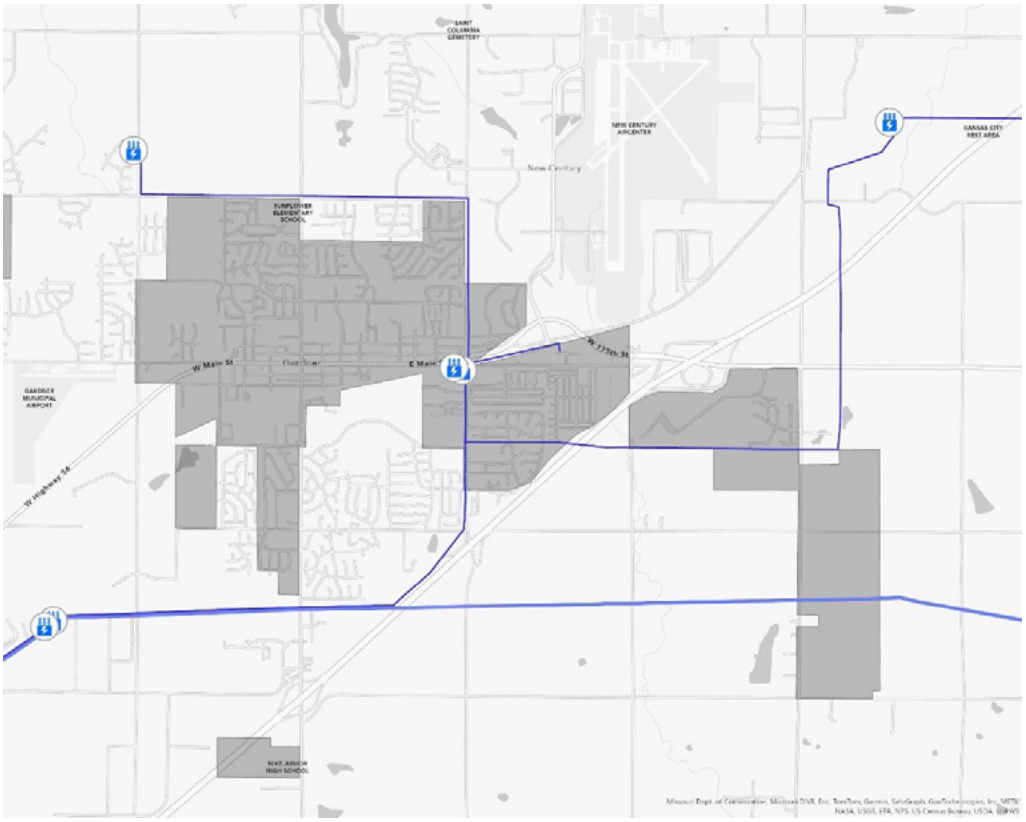
Evergy also offers rebates for workplace or employee Level 2 charging of up to $25,000, or $2,500 per charging port. Fleet customers can qualify for up to $65,000 in rebates if installing a combination of Level 2 and DC fast chargers. All rebate programs have specific qualification requirements, including the use of approved charging vendors and enrollment in specific rate plans.

3.1.2 City of Gardner

The city of Gardner, KS operates a municipal electric system that serves the majority of the customers within Gardner city limits and totals 9.6 square miles. The city maintains 46 miles of overhead distribution lines and 94 miles of underground distribution lines. The distribution network operates at a primary voltage of 7200/12,470Y and is interconnected to the bulk electric grid (Evergy) via three high-voltage substations operating at 161kV. The city is also responsible for procuring electric generation to meet the needs of approximately 8000 customers and a total population of approximately 21,000 people. Most generating capacity is purchased from external generators through power purchase agreements or other means, but the city does operate two natural gas peaking units with an installed capacity of 15 MW and the associated 1.1-mile natural gas pipeline that serves the generator[85].

83 *Evergy rebate participation data provided by Evergy and used with permission*
84 *Wyandotte county is primarily served by BPU, not Evergy.*
85 *gardnerkansas.gov*

Figure 43: City of Gardner Electric Service Territory and high voltage transmission lines[86]



The City of Gardner released an updated Electric Master Plan in April of 2024. Part of the master plan included load growth forecasts through 2040 that included the growth of electric vehicles, as described below.

> ***"Projected impacts from future electric vehicle energy sales less potential future demand-side management (DSM) energy sales reductions (0.17% of total sales), based on similar DSM potential projected by Evergy Metro, were separately forecast and added to total electric sales for Base, Low, and High growth cases."[87]***

The base case resulted in a 1.6%/year peak demand growth from 2024-2040 with a greater than 50% probability of occurrence. It should be noted that the Garder master plan also stated that the city does not have the generation or distribution capacity to serve prospective data center loads in the 23MW range. While typical 4-10 port public DC fast charging stations tend to have a much smaller load (~ 1-3 MW peak), heavy-duty fleets could present a much larger demand in the future.

3.1.2.1 Cost of Electricity

Only one residential rate plan is available. It consists of a fixed $2.72 monthly service charge plus an energy charge of $0.1017 per kWh. This makes the marginal cost of charging an EV at an existing home $10.17, not including the monthly service charge[88].

86 Utility boundary obtained from Kansas Corporation Commission
87 City of Gardner – Electric Master Plan, April 2024
88 City of Gardner New Residential Account Information, obtained from gardnerkansas.gov

3.1.3 City of Osawatomie

The city of Osawatomie, KS operates a municipal electric system that serves approximately 2,000 customers and is connected to Evergy's system by two 34.5 kV overhead subtransmission lines. The distribution grid consists of both 12.47 kV and 4.16 kV distribution lines. 12.47 kV lines can carry much more power than 4.16 kV lines. In 2022 the system had an overall peak demand of 8.5 MW and an average load of 4.1 MW[89].

A DC fast-charging station can exceed 1 MW, which would represent more than 10% of Osawatomie's existing peak load and would likely be the single largest peak demand on the system. It is unlikely that the Osawatomie distribution system would be capable of supporting more than a small DCFC station without significant utility upgrades.

3.1.3.1 Cost of Electricity

Only one residential rate plan is available. It consists of a fixed monthly meter charge, an energy charge based on usage, and an energy cost adjustment rider that varies each month.

Figure 44: City of Osawatomie Electric Service Territory

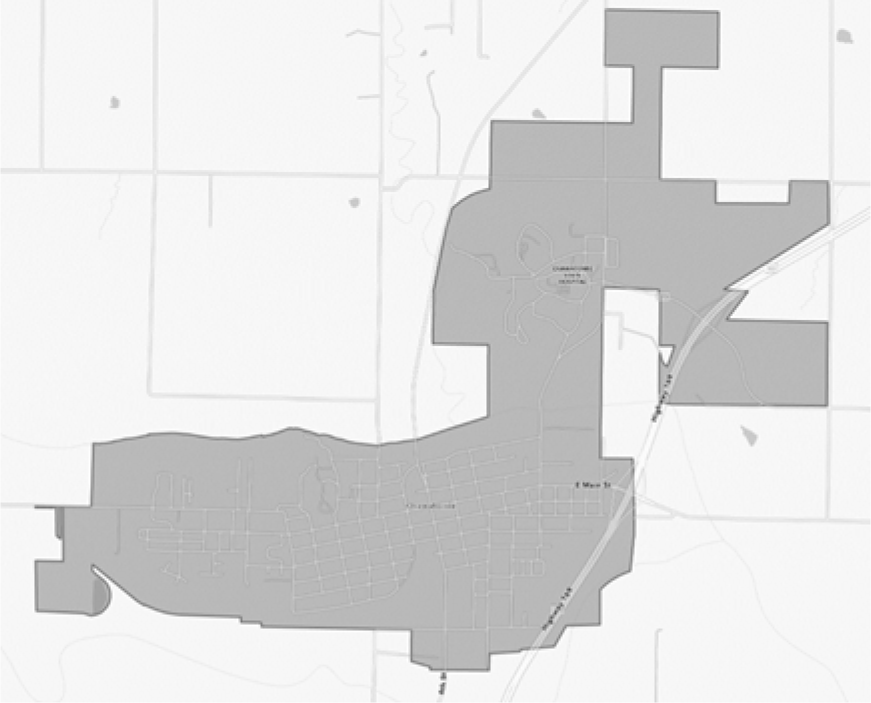


Table 17: City of Osawatomie Residential Rate Plan

Description	Cost
Monthly Meter Charge	$9.00
Energy Charge - First 500 kWh	$0.119 / kWh
Energy Charge - All Additional kWh	$0.093 / kWh
Energy Cost Adjustment Rider[90]	$0.048 per kWh

This results in the marginal cost to charge an EV at an existing home of approximately $14.10.

The city of Osawatomie also operates several Level 2 charging stations at public facilities. Retail rates at these stations range from $0.20 per kWh in the morning to $0.30 per kWh during late

89 City of Osawatomie – 2022 Annual Report of the Electric System
90 Energy Cost Adjustment rider reflects value listed in most recent published rate sheet, but actual rider charges vary month to month.

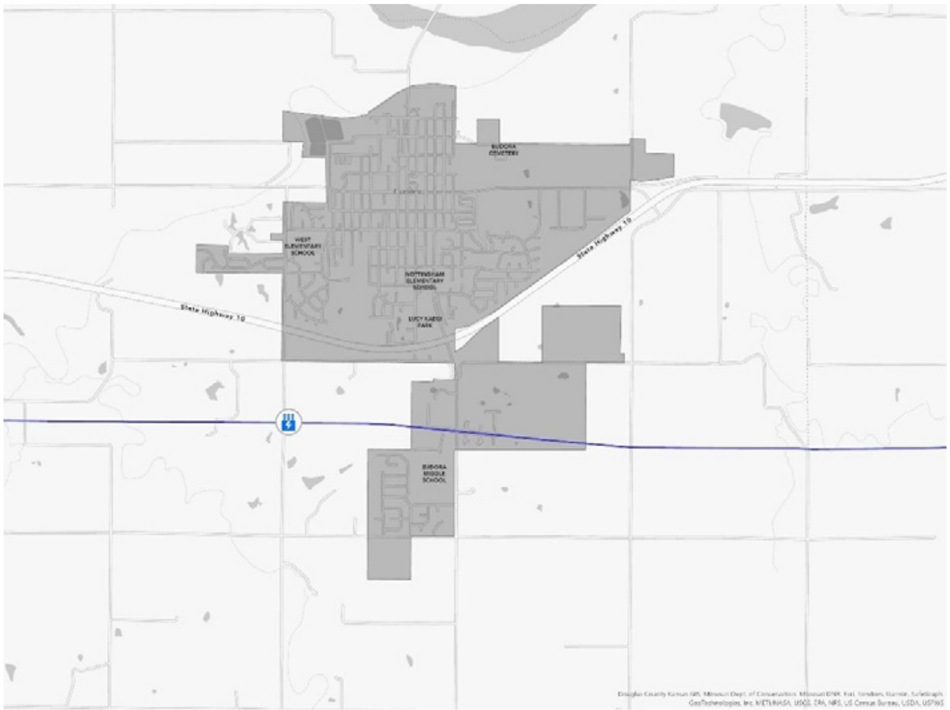
afternoon peak periods, bringing the cost to fully charge an EV to between $20.00 and $30.00.

3.1.4 City of Eudora

The city of Eudora is in Douglas County, which is not part of the MARC region. A summary was included in this report given its proximity to Johnson County and to the heavily traveled K-10 corridor.

The city of Eudora operates a municipal electric system that serves approximately 2,500 customers, most of which are residential customers, and only one of which is considered a large power customer. The system is made up of approximately 100 miles of 12.47 kV distribution lines which are connected to the Westar-Eudora Township Substation (shown in the image below), located south of Kansas Highway 10 at 1264 E 2100 Rd, via four 12.47 kV feeders. Evergy owns both the substation and two 115 kV / 13.09 kV step-down transformers, while Eudora owns the low-side switching station. Combined, these transformers have a rating of 22.5 MVA (or approximately 20 MW). The system peak demand in 2018 was about 12.9 MW or approximately 65% of the full load rating of the substation transformers. The 12.47 kV switching station has positions for eight feeders, while only four are currently in use, leaving four positions available for future feeders. All electricity was purchased from external sources via the Kansas Municipal Energy Agency. Eudora does not own any generation assets.[91]

Figure 45: City of Eudora Service Territory and high voltage transmission lines



A DC fast-charging station can exceed 1 MW, which would represent more than 7.7% of Eudora's existing peak load and would likely be the single largest peak demand on the existing system. It is unlikely that the existing Eudora distribution system would be capable of supporting a DCFC station without significant utility upgrades. However, the feeder substation is located close to Kansas Highway 10 and the transformers may be capable of supplying up to 7 MW of additional peak load. It may be possible to locate one or more DC fast charging stations near the highway by constructing a short new distribution feeder.

It should be noted that the above information is several years old. A large Panasonic battery

91 *City of Eudora, KS – Distribution System Study, Published July 2019*

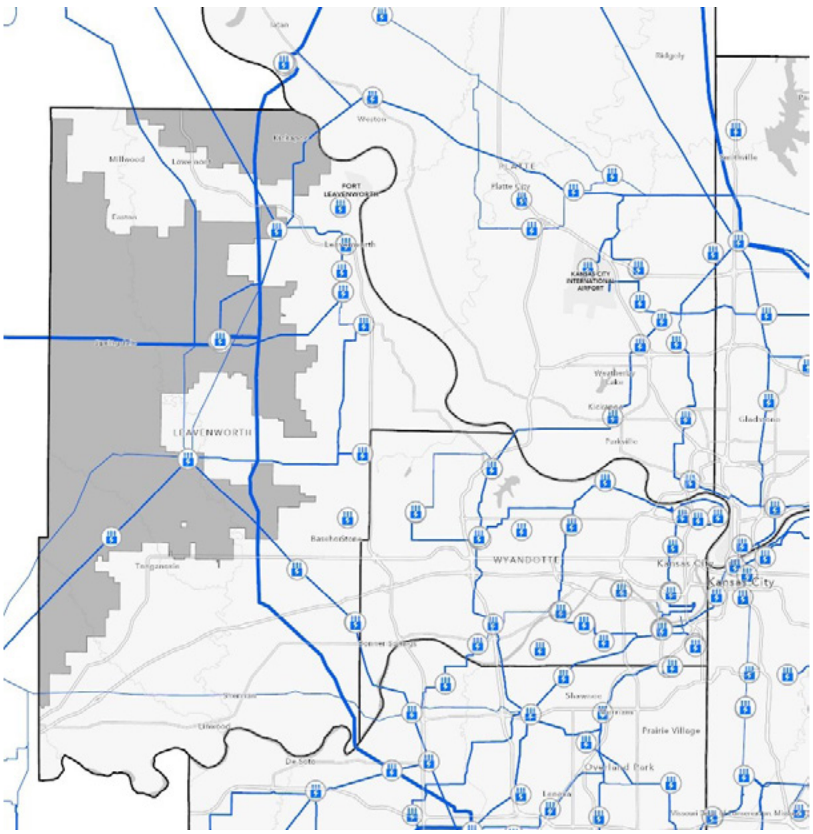
manufacturing facility is currently being constructed near the Eudora area and is projected to be a significant load on the area's transmission system. This could impact spare capacity on the transmission system upstream of Eudora.

3.1.5 Freestate Electric Cooperative

Freestate Electric Cooperative provides retail electric service to a portion of Leavenworth County from a substation in Leavenworth. The Freestate system serves a total of approximately 15,000 mostly rural customers and consists of approximately 3,000 miles of distribution lines.[92] Several Evergy high voltage transmission lines also pass through Freestate's retail service territory.

As of 2024, Freestate Electric Cooperative does not currently have any rates or incentives tied to EV charging or charging installations. A time-of-use rate plan is available for customers in the East District, which includes Leavenworth County. The website also has a section dedicated to educating customers about electric vehicles.

Figure 46: Freestate Electric Cooperative Service Territory (gray) and high voltage transmission lines (blue)



3.1.5.1 Cost of Electricity

Freestate Electric Cooperative currently offers three residential rate plans. They all consist of a fixed monthly service charge, an energy charge, and a rider that fluctuates based on monthly wholesale power costs.

92 *Freestate 2022 Fact Sheet,* *freestate.coop*

Table 18: Freestate Residential Rate Plans

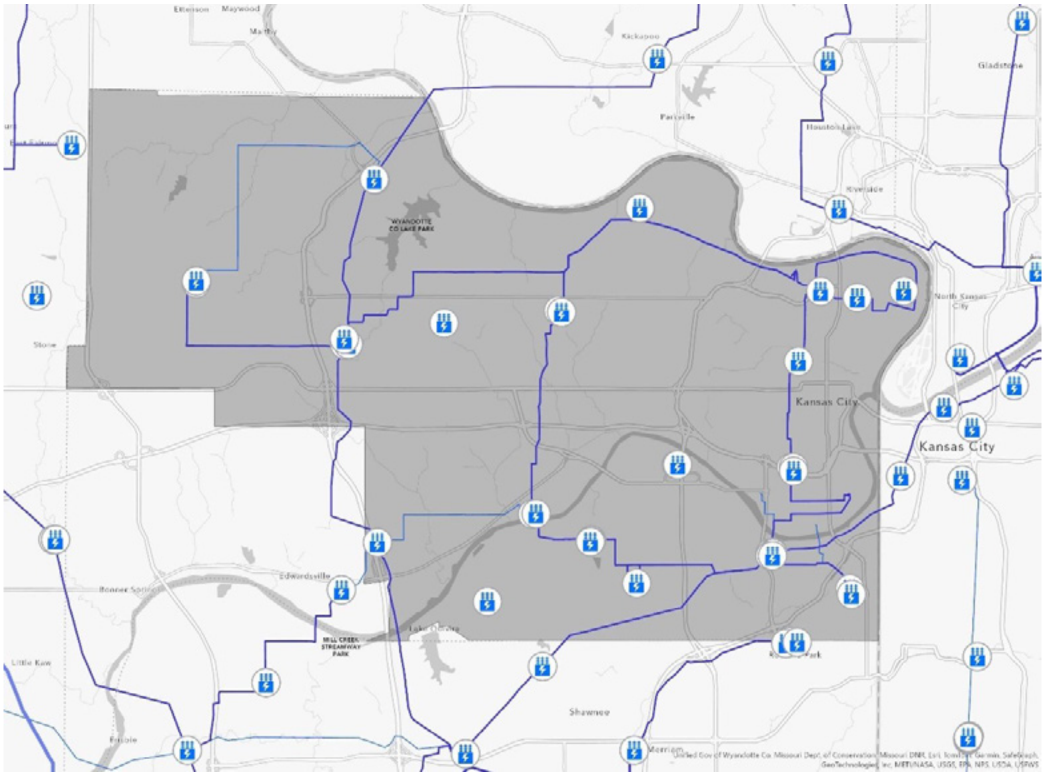
	Service Charge	Energy Charge	Notes
Rate 111 Regular Residential	$40.10	$0.1081 / kWh	Subject to monthly changes based on Purchased Power Adjustment rider
Rate 14 Residential Electric Heat	$40.10	$0.1081 / kWh $0.0971 / kWh (for use over 1000 kWh during winter)	Subject to monthly changes based on Purchased Power Adjustment rider
Rate 13 Residential Time-of-Use	$40.50	$0.1789 / kWh (peak) $0.0845 / kWh (off-peak and holidays)	Subject to monthly changes based on Purchased Power Adjustment rider

The cooperative is currently in the process of a rate design study, which is expected to be completed by early 2025 and will likely result in changes to the rates and rate plans listed above. New rate plans are expected to include a demand charge as well as changes to the design of the time-of-use rate plan.

3.1.6 Kansas City Board of Public Utilities (BPU)

The Kansas City Board of Public Utilities (BPU) supplies electric service to over 65,000 customers across 156 square miles in Wyandotte County, KS, both inside and outside Kansas City, KS city limits. The BPU system is made up of 29 substations and over 3,000 miles of transmission and distribution lines. Transmission lines are set up in a redundant loop around the county and operate at 161 kV and 69 kV, and interconnect to Evergy's system at four separate substation locations. Total system load peaked in 2006 at 529 MW, dropped to 492 MW in 2019 as electricity use by industrial customers decreased, and is estimated to drop further to 474 MW by 2033.

Figure 47: BPU Service Territory, Substations, and High Voltage Transmission Lines



BPU both generates its own power and purchases power externally. BPU has power purchase agreements with several wind producers, and in 2018 wind provided approximately 42% of BPU's total power needs[93]. When added to BPU's hydroelectric, solar, and landfill gas generation, approximately 48% of electrical energy comes from renewable sources[94].

The large drop in overall system demand from 2006 to today was led primarily by a drop in industrial load that was not fully replaced by growth from commercial and residential customers. This drop in demand should provide BPU with a buffer in the near-term to support higher-than-expected EV demand on their system. BPU's system serves more than 15 miles of Interstate 70 in addition to busy commercial and industrial centers, several of which will likely benefit from public EV charging stations.

- United Parcel Service (UPS)
- Amazon Fulfillment Center
- Associated Wholesale Grocers
- BNSF Railway
- Swift Transportation
- Kellogg's
- FedEx Freight
- Dairy Farmers of America
- United States Postal Service Bulk Mail Center
- Ball's Food Stores
- Old Dominion

Many of BPU's current customers operate commercial and industrial vehicle fleets, as shown below[95].

Some of these organizations, such as Amazon and USPS, have already begun to electrify their vehicle fleets nationwide. It is possible that BPU could see significant load growth if more of these customers decide to electrify a large portion of their vehicle fleets. The good news is that private fleets tend to charge their vehicles overnight, while public DC fast chargers have their highest demand during daytime hours. Any needed utility plant upgrades may therefore be able to support both use cases and drive down average infrastructure upgrade costs.

3.1.6.1 Cost of Electricity

BPU offers one general rate plan for residential service. It consists of a fixed monthly service charge of $26.00 plus an energy charge[96].

Table 19: BPU Residential Electricity Rates

Energy Charge	Summer	Winter
First 1000 kWh	$0.06923 / kWh	$0.06850 / kWh
All Additional kWh	$0.06923 / kWh	$0.03800 / kWh
Energy Cost Adjustment Rider	$0.047610 / kWh	$0.038980 / kWh
Environmental Surcharge Rider	$0.01253 / kWh	$0.01253 / kWh
Payment-in-Lieu-of-Tax Rider	11.9%	11.9%

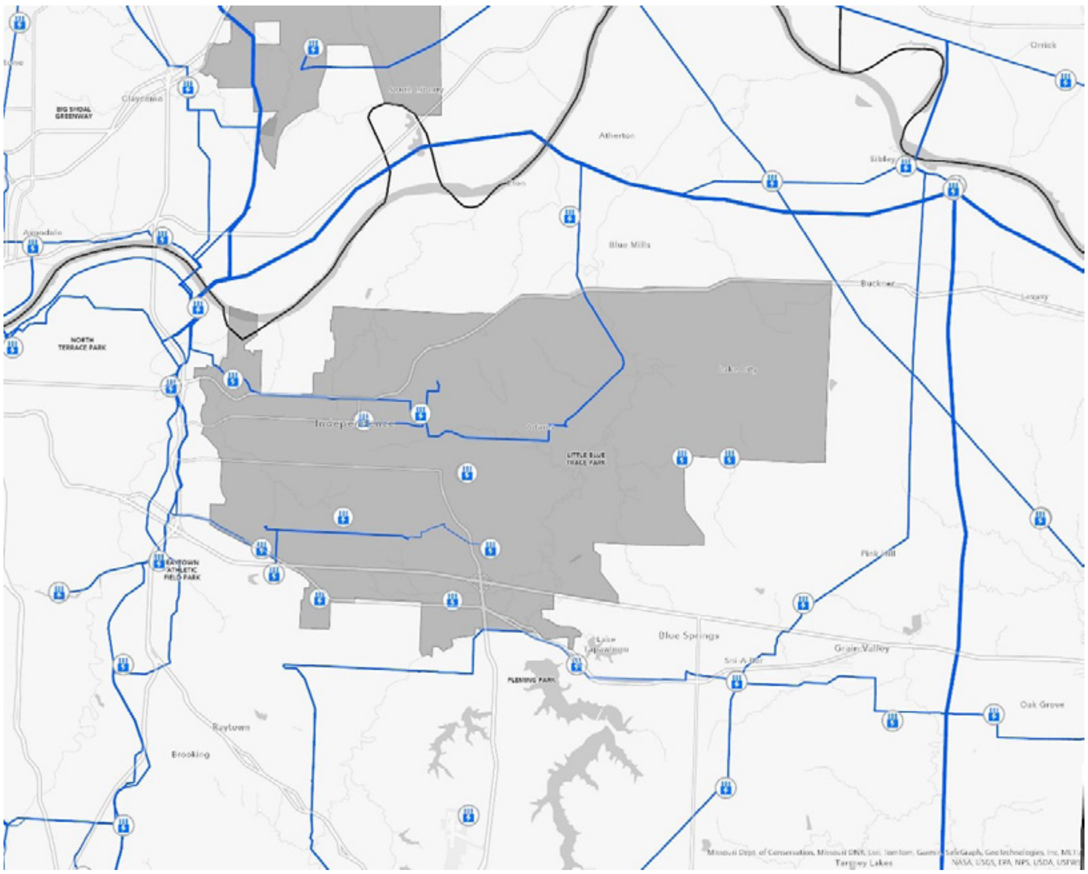
This makes the marginal cost to charge an EV as high as $14.47 in the summer and as low as $10.12 in the winter, depending on other household electricity demand. This does not reflect the electric rate stabilization rider which could be implemented in the future.

93 *Board of Public Utilities Integrated Resource Plan, October 2019*
94 *www.bpu.com, Renewable Energy, The Power of a Cleaner Future*
95 *Wyandotte Economic Development Council, www.wyedc.org/our-talent/major-employers*
96 *Kansas City Board of Public Utilities Rate Application Manual, Effective July 1, 2024*

3.1.7 Independence Power & Light

The City of Independence operates a municipal utility (IPL) that provides power to over 57,000 electric customers within city limits and is the 2nd largest municipal utility within the MARC region. IPL's system is interconnected to three other utilities via 161 kV transmission lines at IPL's one 161kV switching station – Evergy Missouri West, Evergy Missouri Metro, and Associated Electric Cooperative. IPL's 25 miles of 161kV transmission lines feed 51 miles of 69kV transmission lines and three 161/69kV substations. The 69kV network supplies IPL's 795 mile 13.2 kV distribution system at eleven 69/13.2kV substations[97].

Figure 48: IPL Transmission Grid & Service Territory



Only a limited amount of power is generated by IP&L-owned generating stations, with most power being purchased externally via power purchase agreements or part of the Southwest Power Pool integrated marketplace.

IPL does not currently have any incentives or rebate programs in place that apply to residential or business use of electric vehicles or electric vehicle charging equipment. It also does not currently offer a residential time-of-use rate plan that would allow for lower-cost overnight charging.

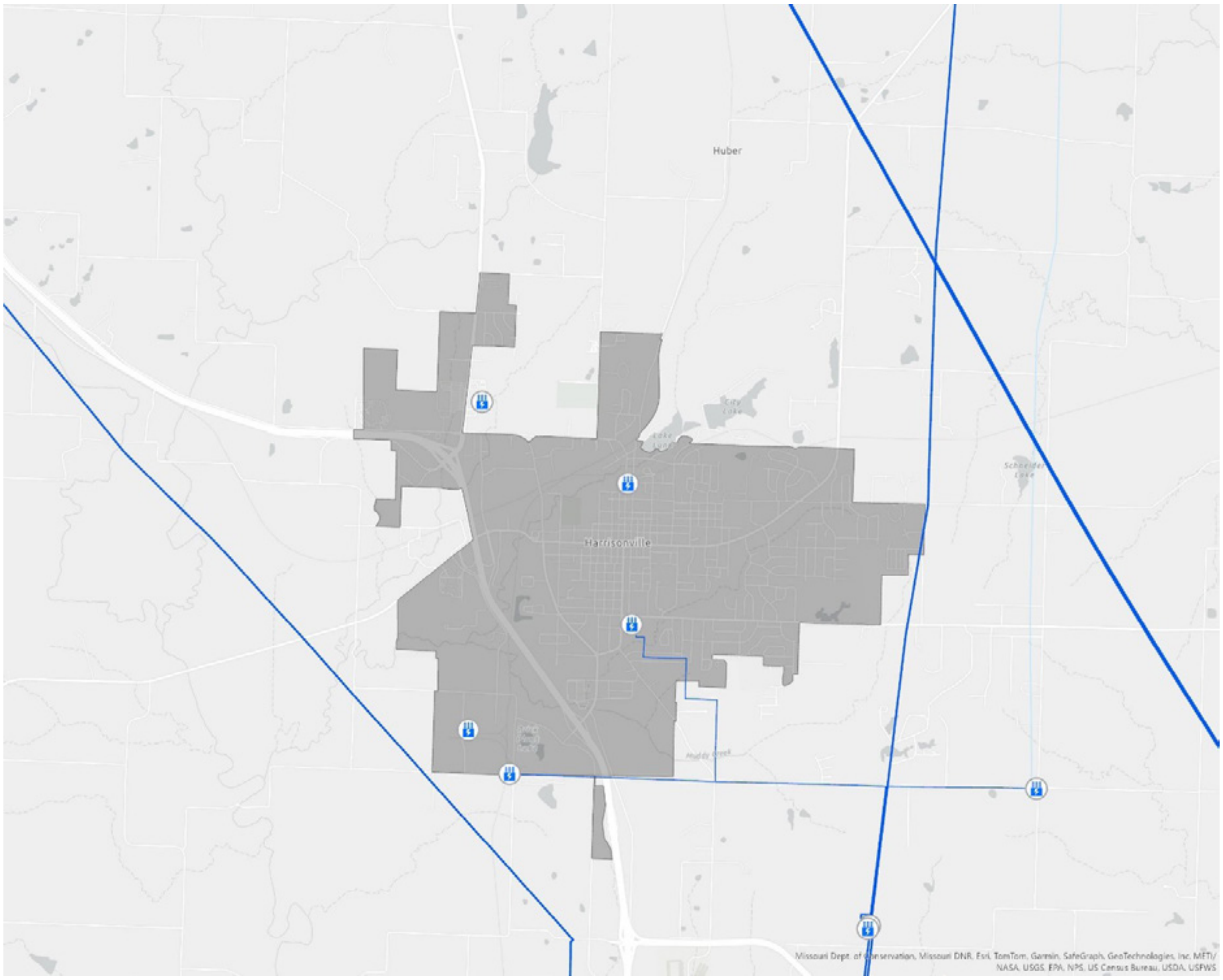
The city of Independence has a total population of about 123,000 living in about 55,000 total housing units, with a median household income of about $61,000[98]. Several heavily traveled highways run through the city, including Interstate 70 to the south, US 24 to the north, and MO-291 through the middle portion of the city. Independence has several areas designated as disadvantaged by the federal Department of Transportation, many of which are located in the western portion of the city.

97 Independence Power & Light Energy Master Plan, 9/20/2018
98 U.S. Census Bureau, obtained from data.census.gov

3.1.8 City of Harrisonville

The city of Harrisonville operates a municipal utility that provides power to approximately 4,700 customers within the city limits of Harrisonville. The city is responsible for constructing and maintaining utility assets, and purchases power from the Missouri Joint Municipal Electric Utility Commission. Physical assets consist of three substations, approximately nine miles of 69 kV transmission lines, approximately 68 miles of 12.47 kV overhead distribution lines, and 10 miles of 12.47 kV underground distribution lines.

Figure 49: Harrisonville Municipal Electric Service Territory[99]



Missouri Highway 71 / I-49 runs from the northwest, and southeast through Harrisonville city limits, before proceeding south. The city of Harrisonville has a population of a little over 10,000, while the county as a whole has a population of around 100,000. Its location along a major state highway will likely make Harrisonville a key location for DC fast chargers in the future, even if not identified as a priority location in this study.

3.1.8.1.1 Cost of Electricity

Only one residential rate plan is available. It consists of a fixed $9.46 monthly service charge plus an energy charge. The summer energy charge is 0.1220 per kWh for the first 1000 kWh and $0.1182 per kWh for usage over 1000 kWh. The winter energy charge is 0.1220 per kWh for the first 1000 kWh and

99 *Service territory source based on Homeland Infrastructure Foundation-Level Data and may not represent exact boundaries.*

$0.1055 per kWh for usage over 1000 kWh[100]. This makes the marginal cost of charging an EV at an existing home $11.82 in summer and $10.55 in winter, not including the monthly service charge. Note that this rate can fluctuate due to a power cost adjustment clause that allows the utility to adjust the energy charge if the wholesale cost of electricity increases or decreases in a given month.

3.1.9 Platte – Clay Electric Cooperative

Platte-Clay Electric Cooperative (PCEC) provides rural electric service to portions of Clay, Ray, and Platte counties in the MARC region, as well as portions of four other counties outside the MARC region. It has approximately 26,000 total customers and 3,100 miles of electrical distribution lines. PCEC does not have any published EV incentives or rate plans.

3.1.9.1.1 Cost of Electricity

PCEC has a residential rate plan, as well as modified plans for customers with dual-fuel heating, home solar panels, and those who wish to purchase 100% renewable energy. The default residential plan consists of a $30 monthly customer charge, a $0.079 / kWh energy charge, and a demand charge of $3.50 per kW. The demand charge is unique since most utilities do not include a demand charge on the default residential rate plan. However, PCEC does not have a time-of-use plan and the energy charge is the same throughout the day.

Bills are also subject to taxes and a “Purchased Power Cost” rider which adjusts the energy charge based on higher or lower wholesale energy prices. This makes the marginal cost of charging an EV at an existing home about $9.02.

3.1.10 Farmer’s Electric Cooperative

Farmer’s Electric Cooperative provides rural electric service to the northeastern portion of Ray County in Missouri, as well as six counties that are not in the MARC region. It serves a total of about 10,000 customers. The northeast portion of Ray County is interconnected to the larger grid by only two 69kV sub-transmission lines. This could constrain future development of DC fast chargers in rural areas since distances to the nearest substation can be many miles, significantly adding to the infrastructure cost.

Farmer’s Electric offers a $250 rebate for customers who install a Level 2 electric vehicle charging station at their home or business. To qualify, customers must agree to participate in a future load management program if it is implemented[101].

3.1.10.1.1 Cost of Electricity

Only one residential rate plan is available. It consists of a fixed $30 monthly service charge plus an energy charge of $0.1535 for the first 120 kWh and $0.0998 for usage greater than 120 kWh. This makes the marginal cost of charging an EV at an existing home range from $9.98 to $15.35, not including the monthly service charge.

3.1.11 Ameren

Ameren is the investor-owned parent company of Union Electric Company, which provides power to many Missouri counties. However, very little of Ameren’s service territory is within the MARC region. Only the very northern portions of Clay County and Ray County are served by Ameren, shown in yellow in the figure 50 below. Some of these areas may also be served by rural electric cooperatives.

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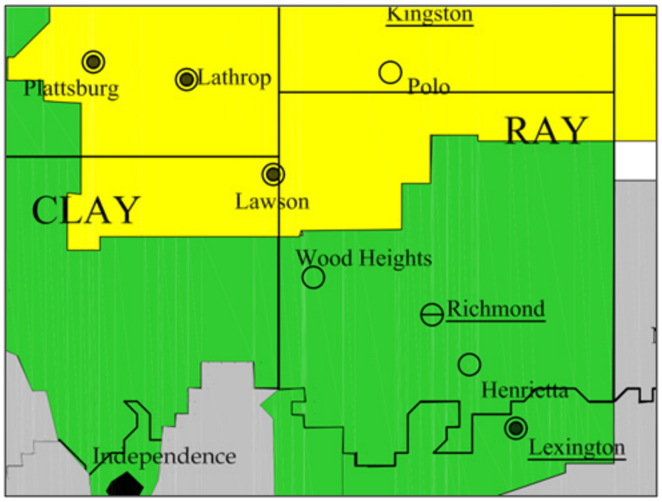
100 www.harrisonville.com/221/Residential-Utility-Rates
101 Farmer’s Electric Cooperative Website: fec-co.com.

Figure 50: Ameren Service Territory within the MARC Region[102], depicted in yellow



Ameren does not currently offer EV-related incentives or rates. However, it does have a section of its website devoted to electric vehicle education for its customers and offers a partnership program to promote EVs and EV-related businesses.

3.2 Regional Grid Planning & Reliability

Reliability is typically front and center when discussing transportation electrification. Many transportation officials worry about the impact of electrical system issues on their transportation assets, and what mechanisms the local utility has in place to ensure reliable power to critical transportation systems. It is important to mention that over the last 20 years the U.S. electric grid, specifically at the regional level, has seen significant reliability-driven investments, and has been subject to extensive federal reliability regulations due to federal legislation starting in the early-2000s. The bulk power system (interstate electric grid) is regulated at the federal level by the Federal Energy Regulatory Commission (FERC) and the North American Electric Reliability Corporation (NERC), whose jurisdiction covers most large electric generation plants and high voltage transmission lines and develops and enforces reliability standards for all major electric utilities.

3.2.1 Southwest Power Pool

FERC has designated Southwest Power Pool, based in Little Rock, AR, as the Regional Transmission Organization (RTO) responsible for ensuring reliable supplies of power, adequate transmission infrastructure, and competitive wholesale electricity prices. In partnership with its members, SPP is responsible for the following functions within most of the MARC region:

102 *Missouri Electric Service Areas Prepared by Missouri Public Service Commission, obtained from psc.mo.gov.*

Table 20: Southwest Power Pool Regional Responsibilities

Reliability Coordination	Manages the entire regional grid in real time to make sure power is available and gets to where it needs to go, especially during natural disasters and other emergency situations.
Tariff Administration	Coordinate access to transmission lines and administer payments between members as part of an Open Access Transmission Tariff.
Regional Scheduling	Schedule day-ahead and real-time energy resources (power plants, etc.) to minimize generation costs and maximize grid reliability
Market Administration	Manage an energy market for members to buy and sell power.
Transmission Planning	Develop and implement short-term and long-term planning processes to figure out where new electric infrastructure is needed to meet load growth forecasts and changes in generation (such as increased renewables).

The SPP Integrated Transmission Planning Process is conducted annually and looks at both near-term (0-7 years) and long-term (10+ years) reliability and economic needs that may impact the electric transmission system. The near-term and 10-year plans are revised annually, while a 20-year study is conducted at least every five years. In 2022, the SPP board approved a 20-year transmission expansion plan, which includes an estimated 94 transmission projects across 9 states with an estimated cost of $894 million[103]. Two new 345 kV transmission lines are in the 20-year plan for the Kansas City area, which aims to create additional interconnections between Kansas City and areas east of Kansas City to improve reliability and lower congestion (and thus delivered energy costs)[104].

- New 345 kV line from Sibley Substation in Sibley, MO west to Nashua Substation located in Clay County, MO near I-435 and US Highway 169. The project has an estimated cost of $44 million with a need date of 2042.
- New 345 kV line from Sibley Substation in Sibley, MO west to Hawthorn substation located at the Hawthorn Generating Station in Kansas City, MO. The project has an estimated cost of $30 million with a need date of 2042.

Specifics of these projects are subject to NDA and not permitted for public release.

These projects address long-term needs and have not yet received a notice-to-construct (NTC). This means they are still in the planning stages and could be modified or replaced as models are revised closer to the needed in-service date. While projects of this magnitude are typically not constructed for a specific purpose like EV charging, they illustrate the robustness of SPP's planning process at the regional level. This translates into improved capacity and reliability for Kansas City as load profiles change due to increased electrification of vehicles and transit systems.

3.2.1.1 Planning for Higher Loads

It is important to note that utilities and regional transmission organizations must have a solid justification for their load projections, especially when these load projections are used as the basis for constructing transmission assets that can cost tens or hundreds of millions of dollars. Costs of these assets are allocated to all customers in a given area, and overly optimistic load growth projections could lead to unnecessary costs to existing customers if projections fall way short of expectations.

103 Southwest Power Pool 2022 Annual Report to Stakeholders, obtained from spp.org
104 Southwest Power Pool 2022 20-Year Assessment Report, Published 7/31/2023, obtained from spp.org

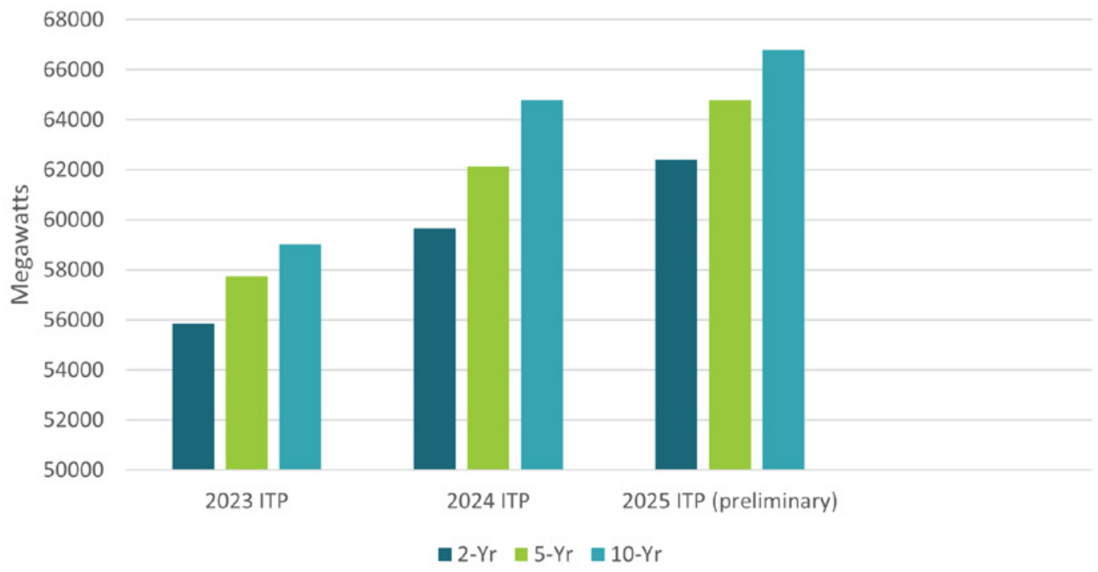
EV sales growth has been volatile due to several factors, so it is not surprising that regional planners are approaching the subject with a healthy amount of caution.

Since SPP conducts an annual planning process, member utilities submit revised load forecasts annually as economic conditions change – which is exactly what happened in the most recent planning process.

> ***"Load growth will drive transmission solutions in the 2024 ITP" - SPP Staff Presentation, June 26th, 2024***

In the most recent SPP planning cycle, near-term load forecasts (2 years out) are estimated to be higher than the 10-year load forecasts included in the previous (2023) planning cycle, as shown in Figure 51 below[105].

Figure 51: SPP Projected Peak Loads from Three Recent Planning Cycles



In other words, the SPP regional load is forecasted to grow a full 8 years sooner than was predicted just a year earlier. The SPP planning team has spent 2024 identifying solutions to ensure continued grid reliability and minimal economic congestion as these higher loads materialize. In this case, the significantly higher load projections are not due to significant electric vehicle adoption but are primarily due to a ramping up of oil and gas industry activity in southern New Mexico, with little impact on the Kansas City area. This does show that the regional grid planning process for the KC area is already able to deal with electrical demand that grows significantly faster than expected, and stakeholders are adopting processes to be able to respond effectively if a similar trend appears due to EV adoption. Unlike public transportation infrastructure, electrical infrastructure funding rarely needs to be allocated legislatively for investor-owned utilities such as Evergy. Regulators have oversight over how capital costs are justified and recovered in utility rates but do not preapprove specific projects.

3.2.1.2 Renewed Interest in a 765 kV Transmission Grid

The Kansas City area is served by an extra high voltage 345 kV transmission system backbone.

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105 Southwest Power Pool 2024 ITP Planning Summit, June 26, 2024. Attended in-person by study team.

This has been the highest voltage used in the Midwest for the last 100 years. However, there has been renewed interest in adding even higher voltage 765 kV lines to the regional grid to support higher load projections as well as much higher deployments of renewable generation sources, which may be far removed from load centers. The capacity of a 765 kV transmission line can be up to three times greater than a 345 kV transmission line. The physical assets are much larger and more expensive but end up being much cheaper on a per-mile basis when normalized for the quantity of energy delivered[106].

No 765 kV projects have been approved, but their inclusion for consideration further demonstrates the robustness of the regional planning process.

4. STAKEHOLDERS AND COMMUNITY ENGAGEMENT

Working with a steering committee of EV stakeholders from across the region, the study team blended technical knowledge with community input to identify barriers, opportunities, and priority recommendations for EV readiness. The effort involved coordinating two rounds of engagement. Both are described below.

4.1 Round 1 – Barriers and Opportunities

The first round of engagement involved establishing a steering committee, which consisted of the invitees listed in **Table 21**. Their first two meetings focused on identifying barriers and opportunities for EV readiness.

Table 21: Steering Committee Invitees

Organization	Name	Title
Johnson County	Brian Alferman	Sustainability Manager
Johnson County	Chris Butler	Director of Fleet Services
City of Overland Park	Laura Isch	LGBTQ+ Liaison/Sustainability Manager
City of Overland Park	Lorraine Basaol	Public Works Director
City of Paola	Randi Shannon	City Manager
Miami County	Jennifer Kane	
Miami County	Kenneth Cook	Planning Director
Unified Government of Wyandotte County-Kansas City, Kansas	Randy Hand	Fleet Technology Lead
Unified Government of Wyandotte County-Kansas City, Kansas	Alyssa Marcy	Long-Range Planner
Kansas Department of Transportation	Allison Smith, Principal Transportation Planner	

106 *Southwest Power Pool 2024 ITP Planning Summit, June 26, 2024. Attended in-person by study team.*

Organization	Name	Title
City of Harrisonville	Brad Ratliff	City Administrator
City of North Kansas City	Anthony Sands	Director of Public Works
City of North Kansas City	Xue Wood	Community Development Director
City of Liberty	Andy Noll	Utilities Director
City of Kansas City	Andy Savastino	Director of Environmental Quality
City of Kansas City	Regan Tokos, Sustainability Analyst	
City of Kansas City	Kacey Eis, Sustainable Buildings Coordinator	
City of Lee's Summit	Michael Park	Director of Public Works
Platte County	Bob Heim	Director of Public Works
City of Parkville	Stephen Lachky	Community Development Director
City of Lawson	Matt Nolker	City Administrator
Missouri Department of Transportation	Elizabeth Prestwood	Policy and Innovation Program Manager
Evergy	Wendy Marine	Manager - Electrification
BPU	Jeremy Ash, General Manager	
Independence Power and Light	Jerry Borland	District Engineer Planning Supervisor
Platte-Clay Coop	Jennifer Grossl	Communications and Marketing Manager
Platte-Clay Coop	Dave Deihl	CEO/General Manager
Metro Energy Center	Kelly Gilbert	Executive Director
Metro Energy Center	Miriam Bouallegue	Program Manager
Plug-In KC	Jaime Green	
Mid-America Regional Council	Ron Achelpohl	Director of Transportation and Environment
Mid-America Regional Council	Karen Clawson	Co-Project Manager
Mid-America Regional Council	Ryan Umberger	Co-Project Manager
Mid-America Regional Council	Doug Norsby, Air Quality Senior Planner	

4.1.1 Steering Committee Meeting No. 1

The first Steering Committee Meeting was held via Zoom on June 20, 2024. A total of 23 government officials, private sector representatives, and others from the MARC region attended. During the meeting, they listened to a short presentation focused on the planning process, project goals, and responses to EV-related questions included in the Connected KC 2050 opinion survey. They also discussed issues and needs and suggested improvement ideas. Actively engaged with the study team, they asked insightful questions about the scope of work, private participation, and adding a metric of profitability to project selection criteria.

4.1.2 Steering Committee Meeting No. 2

The second Steering Committee Meeting happened on August 22, 2024 (also via Zoom). A total of 25 people attended. They represented Harrisonville, Kansas City, Lawson, Leawood, North Kansas City, Overland Park, Parkville, Johnson County, Ray County, Evergy, Platte-Clay Electric Cooperative, Plug-KC, Metropolitan Energy Center, Missouri Department of Transportation, MARC, and the consultant team. During the meeting, participants discussed the propensity to purchase an EV, criteria for charging infrastructure site selection, and upcoming community engagement activities focused on pop-up meetings and an online opinion survey that built on the ***Connected KC 2050*** version.

Steering Committee members noted that they were satisfied with the study team's analyses and some wanted to compare it to other previously completed efforts. They inquired about outreach to commercial entities (as part of a future study) and suggested that the region investigate where charging location investment will not occur and then use public dollars to invest there. They also provided a variety of comments on what should be kept in mind regarding future charging sites. Considerations included wayfinding signs, security (visibility, lighting), proximity to amenities, walkability, ADA access, and the need for covering similar to what exists at many gas stations.

4.1.3 Opinion Survey

Engagement for the broader community involved the opinion survey and two pop-ups. The survey yielded 101 respondents. Steering Committee members helped spread the word about it. Most respondents indicated they lived in single-family homes in Jackson County or Johnson County. Three out of four commented that they owned or leased a gas or diesel-powered vehicle. The balance had hybrid (not plug-in), plug-in hybrid, or fully electric vehicles. About a third commented they drive 10 to 20 miles each day.

The survey results indicated that 82.18% would expect to find EV charging locations at home and 40.00% are willing to wait 10 to 30 minutes for a charge. Nearly 70.00% commented that when away from home, they would be willing to pay more for charging times faster than 30 minutes. Fully electric and/or plug-in hybrid (gas and electric) vehicles appealed to 87.23% of respondents. Purchasing options that involved buying a new or used vehicle appealed to 77.66% of respondents. Incentives and rebates were appealing to many.

More than half of respondents' incomes were between $100,000 and $150,000 (or more). A similar proportion anticipated spending $20,000 to $39,999 on their next vehicle. Charging infrastructure; battery lifetime, replacement and/or disposal, and EV performance were the top three most important EV features for respondents.

4.1.4 Pop-ups

Figure 52: Public Pop-up Meeting

Figure 53: Public Pop-up Meeting

During the survey period, the study team also conducted two pop-up meetings. The first was held at the Wyandotte County Farmers Market on June 22, 2024. The second was at the Overland Park Farmers Market on June 29. Overall, the study team engaged 52 people. Conversation themes related to EV charging infrastructure and availability, costs and affordability of vehicles, and environmental concerns. Community members commented that a low percentage of people seem knowledgeable about EVs. They also said that charging stations are needed and fast charging is preferred. Some said the current number of available charging stations affects their perceptions of how useful EVs may be to them.

4.2 Priority Recommendations

4.2.1 Steering Committee Meeting No. 3

The third Steering Committee Meeting was an in-person meeting held at MARC on September 25, 2025. Eight representatives from North Kansas City, Overland Park, Johnson County, Metropolitan Energy Center, MARC, and the consultant team participated. Their discussion focused on findings from the online opinion survey, draft recommendations and priorities, and upcoming engagement activities. Important items included making 30-minute fast charging the standard rather than a goal while keeping in mind some vehicles require more time. Other comments concerned being consistent with NEVI; CFI grant considerations related to the type of charging pursued; the impacts of light and medium duty vehicles on the EV market; and site considerations for future EV charging locations, such as distance between charging spots, available amenities, security, and more.

4.2.2 Additional Opinion Survey and Pop-Ups

Building on the first round of engagement, the study team scheduled a virtual public meeting for September 5. No one attended, so the team utilized a targeted, go-to-the-people approach that involved:

- Sharing project postcards at popular coffee shops and community gathering spots. The cards included a QR code for the study's latest EV online opinion survey.
- Gathering feedback about potential future charging locations and other comments at community events and online.

As part of the effort, they reached out to 14 coffee shops across the region and three popular community gathering spots: The Blue Room, Negro Leagues Baseball / American Jazz Museum, and

Northland Regional Chamber's Morning Brew. They also popped up at Drive Electric KCK, First Fridays in the Crossroads, the Chicano Art Festival, and the Low Rider / Custom Car Show. Arguably, First Fridays and the Chicano Art Festival are significant regional events, drawing a combination of locals and visitors.

Using dry-erase boards and cameras, the study team asked a demographically diverse range of First Friday and Chicano Art Festival and Low Rider / Custom Car Show participants where they would like to see future EV charging locations. Organized by event, their responses are noted in Table 22.

Table 22: Suggested Future EV Charging Station Locations from First Friday and the Chicano Art Festival

First Friday	• Red Line on Troost. • By Town Topic Burgers • Linwood and Indiana • 39th and Indiana • 31st and Prospect • 55th and Prospect • Along Parallel Parkway (Kansas City, Kansas) • Near The Legends • River Market area • Quieter streets • Bank parking lot, off street • 39th/Westport Road and Broadway • Movie Theatres • Gas stations along the interstate	• Highways • Downtown • The Crossroads • Westport • Grocery Stores • Libraries • Bars • Cosentino's • Coffee shops (Mother Earth) • Broadway Café • Sun Fresh • The Filling Station (coffee shop) • Costco • Sam's Club • Walmart • Near the hospitals	• Near rapid transit routes • Near museums (WW1, Nelson Atkins) • Restaurants (First Watch) • Unused parking lots • Along street parking • In parking garages • Angled parking spots • Repurposing and reusing unused parking lots • Target • Parks (Loose Park)

Chicano Art Festival	• City Market area • North Kansas City's Iron District • Riverfront (KC Current Stadium) • Prospect Avene • Paseo Boulevard • Troost • Gas stations • Public infrastructure (schools, parks, community centers) • Homes (mentioned a few times) • Restaurants • Churches • Small businesses • Dog parks • Everywhere there are gas stations (like the locations now, mentioned several times)	• Restaurants (mentioned a few times) • Coffee shops • Libraries • Grocery stores (mentioned several times) • Good locations now • Parks (mentioned a few times) • Workplaces (mentioned a few times) • Target • Walmart • Starbucks • West Bottoms Parking (new development) • Strip malls - Larger centers (walkability hub, multipurpose) • West Bottoms - Back side	• Downtown Overland Park, Lenexa, and Parkville • Sar-Ko-Par Trails Park • Zona Rosa shopping center • Larry's Nursery • Near trails • Rest areas / rest stops (along major highways) • Salons • Rural options (need adjacent activity) • Movie theaters • Portable options • The pool • Bar + Grill

With the Steering Committee continuing to share information about the availability of additional online commenting option, ultimately 88 respondents participated via the project's opinion survey. Most described themselves as residents, government officials or staff, property owners, and/or workers. The balance were business owners, utility providers, and others. Using the survey's mapping options, participants suggested where future EV charging locations could be located across the region. Near interstates; schools; public facilities (city halls, libraries, hospitals, community centers, airports, commuter/ride-share parking lots); recreational areas (parks, aquatics, sports complexes); family-friendly destinations; apartment complexes; shopping districts, commercial hubs or central business districts (restaurants, cafes, hotels, gas stations, grocery stores, entertainment venues); employment centers; and suburban and under-served communities were among the options suggested.

4.2.3 Steering Committee Meeting No. 4

The Mid-American Regional Council (MARC), with assistance from WSP and Vireo, held the fourth of four steering committee meetings for the Kansas City Regional Electric Vehicle (EV) Readiness Plan. Nineteen people attended the meeting from 3 to 4:30 p.m. at MARC and online September 25, 2024. They represented Evergy, Johnson County, Kansas City, Lee's Summit, MARC, Metropolitan Energy Center, Overland Park, Unified Government of Wyandotte County-Kansas City, and the consultant team. During the meeting, participants:

- Participant were made aware of the latest steps in the planning process.
- Reviewed findings from the latest round of community engagement.
- Discussed final recommendations and priorities.

4.3 Moving Forward – Engagement and Communications Next Steps

If there are opportunities to implement the ***Kansas City Regional EV Readiness Plan***, such that engagement and communications are included, the study team recommends:

- The Steering Committee be reconvened via purposeful, in-person meetings that allow participants to view one another face to face and engage in focused conversations. Virtual meeting options could be provided as a back-up.
- Community engagement continues to utilize go-to-the-people tactics and information sharing, focusing on popular gathering spots and events that draw diverse crowds from across the region.
- Online commenting tools are developed and leveraged as necessary to provide an alternative engagement option for those unable to attend in-person activities.
- Targeted, paid advertising should be pursued as priority projects are implemented.
- The project web page should be maintained and updated as needed.
- EV project ambassadors or champions are identified and requested to assist with implementation activities, such as funding pursuits, deployment of communication materials, and more.

5. IDENTIFICATION OF NEEDS

5.1 Predicting Future EV Ownership

To identify where EV charging infrastructure should be built, it is important to predict how many electric vehicles will be in service, who is driving them, and where those drivers live and work. A propensity-to-purchase model for the Kansas City area was developed at the census tract level for years 2030 and 2035 to capture 5 and 10-year growth.

5.1.1 Sources of Data

- Energy Information Administration Annual Energy Outlook 2023 Dataset
- Kansas Department of Revenue vehicle registration data obtained via open records request
- Missouri Department of Revenue vehicle registration data obtained via open records request
- US Census / ACS] Demographic data for MARC region
- Oak Ridge National Laboratory Transportation Energy Data Book

Note that for the purposes of this model, 2024 model year vehicles were excluded. This was done because the vehicle registration data obtained from Kansas and Missouri only specified registration year, not date of sale. To calculate the number of new-vehicle sales for 2023, we treated all 2023 model year vehicles as having been first sold in 2023, and excluded 2024 model year vehicles. In reality some 2023 model-year vehicles were sold at the end of 2022, while some 2024 model-year vehicles were sold in 2023. This led to a conservative model, since EV sales trended upward nationwide toward the end of 2023. This is why the propensity model shows a total of 10,819 in 2023 compared to 13,736 actual vehicles in service.

5.1.2 Methodology

The Energy Information Administration (EIA) has developed a data model to forecast vehicle sales for a variety of scenarios as part of the 2023 Annual Energy Outlook. The propensity model incorporated data from the EIA tool to calculate a reasonable growth curve for electric vehicles in the Kansas City area[107]. This growth rate represents the projected sales of new light-duty electric vehicles in the given year for the west-north-central census division. The study team met with individuals from the EIA model development team to discuss the EIA vehicle sales model and its limitations before using it as a basis for developing a propensity to purchase model specific to the Kansas City area. Two economic scenarios were evaluated, the reference case and a high economic growth case, as shown below.

Table 23: Projected Annual Sales Growth for New EVs in the MARC Region

	Reference Case (Selected for Propensity Model)		High Economic Growth Case	
Year	**YoY Sales Growth**	**New EV Sales**	**YoY Sales Growth**	**New EV Sales**
2023 (base)		2917		2917
2024	11.4%	3250	15%	3366
2025	54.9%	5036	51%	5068
2026	15.5%	5814	16%	5856
2027	13.5%	6599	13%	6621
2028	12.2%	7403	12%	7414
2029	12.5%	8332	13%	8356

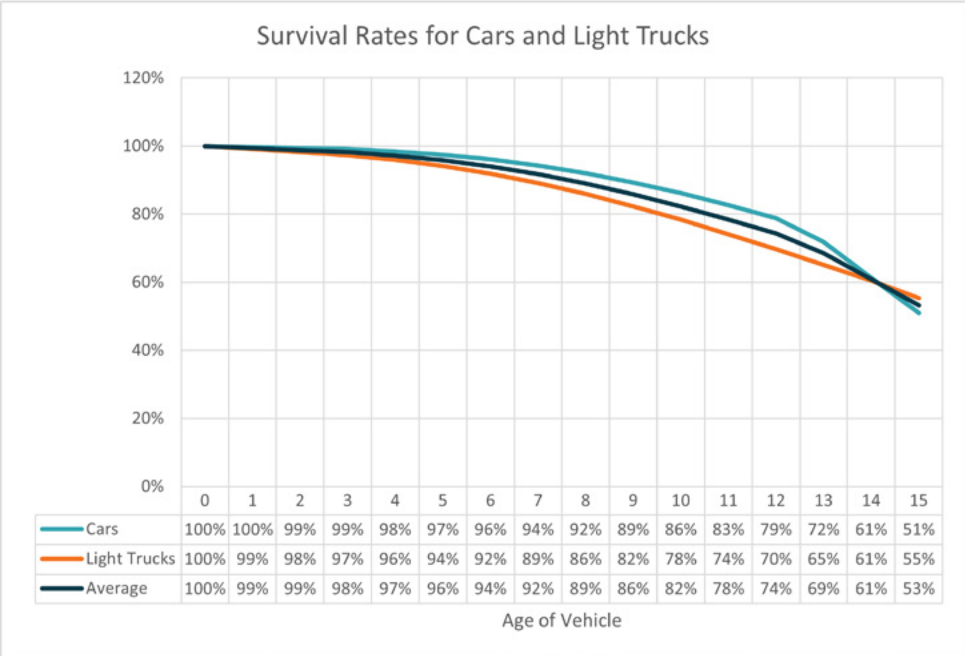
107 *Energy Information Administration Annual Energy Outlook 2023, Light-Duty Vehicle Sales by Technology Type, www.EIA.gov.*

	Reference Case (Selected for Propensity Model)		High Economic Growth Case	
Year	YoY Sales Growth	New EV Sales	YoY Sales Growth	New EV Sales
2030	8.3%	**9020**	8%	**9037**
2031	3.7%	9357	4%	9358
2032	4.7%	9796	4%	9768
2033	2.7%	10060	2%	9982
2034	2.9%	10352	3%	10324
2035	3.2%	**10682**	4%	**10699**

Both displayed similar growth rates for electric vehicles, although gas vehicle sales differed more significantly. It was determined that the reference case below was sufficient for this analysis and was used to develop the propensity to purchase model. This results in new electric vehicle sales growing a total of 209% by 2030 and 266% by 2035 compared to baseline 2023 sales.

5.1.3 Results – Total Vehicles in Service

It is important to account for used vehicles to determine the total number of electric vehicles in service in a given year, since the chart above plots anticipated growth rates for new vehicles only. The survival rate factors below were used in the model to account for vehicle retirements due to age, mechanical issues, accidents, etc. These factors are based on EPA numbers as shown in Table 3.15 of Oak Ridge National Laboratory's Transportation Energy Data Book . The survival rates used are derived from decades of historical data on gasoline-powered vehicles and reflect vehicles that are removed from service for a variety of reasons, including accidents and cost-prohibitive repairs.

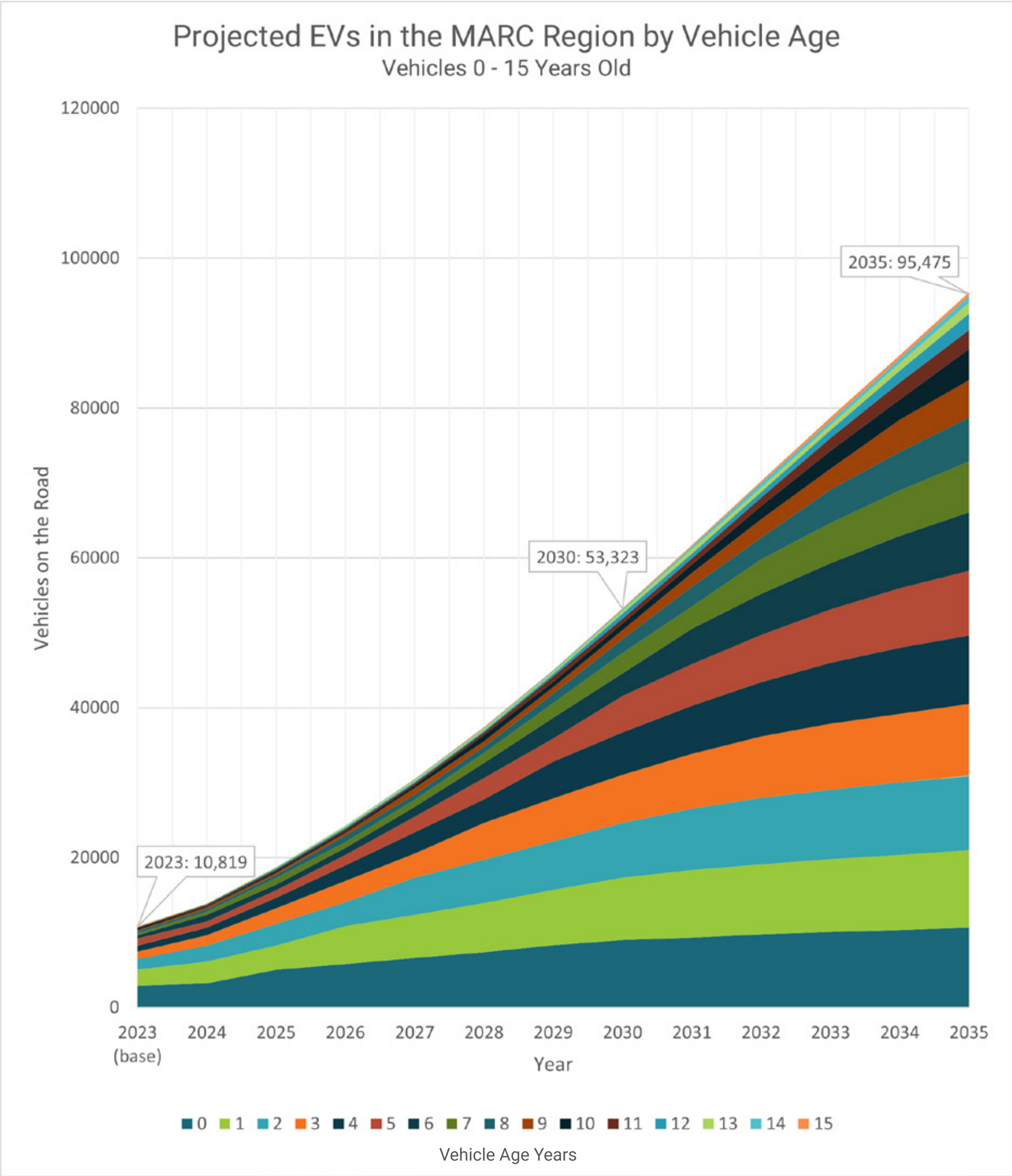


	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Cars	100%	100%	99%	99%	98%	97%	96%	94%	92%	89%	86%	83%	79%	72%	61%	51%
Light Trucks	100%	99%	98%	97%	96%	94%	92%	89%	86%	82%	78%	74%	70%	65%	61%	55%
Average	100%	99%	99%	98%	97%	96%	94%	92%	89%	86%	82%	78%	74%	69%	61%	53%

Figure 54: Survival Rates for Cars and Light Trucks

Modern electric vehicles have not been in operation long enough or in large enough quantities to have reliable data on whether there are any differences in service life compared to gasoline vehicles, but it is reasonable to assume that the largest factor driving useful life, when compared to gasoline vehicles, is the traction battery. Battery technology has been improving over the last few years. Various battery chemistries, such as lithium-iron-phosphate, and the use of sophisticated active cooling systems are expected to lead to longer useful lives for EV batteries. Furthermore, there is not a consensus on what the definition of end of life should be for EV batteries. Many consider a battery to have reached the end of its useful life when the capacity drops below 70-80% of its original capacity, but this alone doesn't necessarily mean that an electric vehicle is unusable. Nevertheless, it seems reasonable that modern EVs should have an average lifespan of at least 15 years[108], which is consistent with the survival rate of gasoline-powered vehicles shown in the table below. That is, 53.2% of vehicles are expected to still be in operation after 15 years.

Figure 55: Projected EVs in the MARC Region



108 Etxandi-Santolaya et al, Extending the electric vehicle battery first life: Performance beyond the current end of life threshold, Heliyon 2024

Estimated EV ownership was first estimated at the zip code level since that matches the geospatial categorization of the Kansas and Missouri vehicle databases provided by each state's department of revenue. The total number of projected EVs was allocated proportionally among the zip codes in the MARC area according to vehicle age (for vehicles between 0 and 15 years old) consistent with vehicle age in the base year 2023. That is, for each zip code in the MARC planning region, the percentage of all light-duty vehicles in the year 2023 was calculated by fuel type (gas, electric, and hybrid), from zero to 15 years old, that were registered in that zip code. 2023 vehicle data for each zip code was obtained from the Kansas and Missouri Departments of Revenue and processed to remove vehicles that are not categorized as light-duty. The projected EVs for the entire region, as shown in Figure 55 above, were then allocated for study years 2030 and 2035 using the 2023 new and used proportions determined for each zip code.

Results are summarized in Table 24 and Table 25 below for each county in the MARC region[109]. The number of used EVs is included since they tend to be much less expensive than new vehicles. They serve as a proxy for the number of households that may be less likely to spend money installing Level 2 home chargers and may be more reliant on public charging infrastructure.

Table 24: Projected EVs by County (Kansas)

	Kansas Counties			
	Johnson	Leavenworth	Miami	Wyandotte
2023 Total EVs (actual)	6,393	224	77	213
2030 New EVs (0-2 Years Old)	8,028	761	361	942
2030 Used EVs (3-7 Years Old)	9,242	1,008	436	1,475
2030 Used EVs (8-15 Years Old)	2,360	278	132	581
2030 Total EVs	19,629	2,049	932	3,000
2035 New EVs (0-2 Years Old)	10,179	973	461	1,206
2035 Used EVs (3-7 Years Old)	17,092	1,882	815	2,793
2035 Used EVs (8-15 Years Old)	8,854	1,058	496	2,192
2035 Total EVs	36,139	3,910	1,772	6,191
Total County Population	610,742	82,050	34,312	167,989
Renter Occupied Housing Units	75,104	9,389	2,731	24,185
Total Occupied Housing Units	241,191	29,226	13,239	61,282

109 Population, total housing units, and rental housing units based on US Census Bureau American Community Survey data 2018-2022 and aggregated for each county. Numbers are approximate due to boundary differences between federal census tracts and state counties.

Table 25 - Projected EVs by County (Missouri)

	Missouri Counties				
	Cass	Clay	Jackson	Platte	Ray
2023 Total EVs (actual)	424	1,310	3,613	1,426	56
2030 New EVs (0-2 Years Old)	1,240	3,085	7,141	2,663	347
2030 Used EVs (3-7 Years Old)	933	2,096	5,304	1,266	275
2030 Used EVs (8-15 Years Old)	217	474	1,291	215	67
2030 Total EVs	2,388	5,650	13,733	4,154	689
2035 New EVs (0-2 Years Old)	1,543	3,838	8,908	3,298	432
2035 Used EVs (3-7 Years Old)	1,713	3,848	9,749	2,315	504
2035 Used EVs (8-15 Years Old)	808	1,751	4,822	804	250
2035 Total EVs	4,068	9,438	23,465	6,417	1186
Total County Population	108,205	253,085	715,526	107,033	23,120
Renter Occupied Housing Units	9,902	31,651	123,945	14,305	1,884
Total Occupied Housing Units	41,524	99,501	298,908	42,606	8,772

5.1.3.1 Assumptions

- On average, people in zip codes that own used vehicles in 2023 will also own used vehicles in 2030 and 2035. For example, households that own a 5-year-old car today will also own a comparable 5-year-old car in 2030.
- On average, people in zip codes that purchase new vehicles in 2023 will also purchase new vehicles in 2030 and 2035. This may change slightly for certain areas experiencing gentrification, but overall relative household incomes for most zip codes are unlikely to change significantly in 12 years.
- The average price of used electric vehicles will be roughly the same as the average price of gas vehicles – that is, a 5-year-old used EV will cost roughly the same as a 5-year-old comparable gas vehicle. This is a reasonable assumption for study years 2030 and 2035 given that used EV prices have trended downward toward prices for used gas vehicles through the first half of 2024 and have in many cases already reached parity with gas vehicles[110].

110 *Wall Street Journal, Used EVs Sell for Bargain Prices Now, Putting Owners and Dealers in a Bind, 10/14/24, obtained from* www.wsj.com

- The survival rates for electric vehicles are the same as that of gas-powered vehicles (from 0 – 15 years in service). There is not enough reliable data to determine whether, or at what point in their lifespan, EV survival rates will differ from gas vehicles given the small sample size of EVs that are greater than 10 years old (both in number of vehicles and number of makes/models).
- This model assumes that all new vehicles purchased within the MARC geographic region remain in the MARC region for the entire study period 2023 - 2035. That is, a new vehicle in the MARC region becomes a used vehicle within the MARC region. Overall population growth or population loss was not included in the model but may become more important over longer (20+ year) time horizons.

5.1.3.2 Limitations

- The propensity model does not directly account for consumer preferences or survey results. However, the model does indirectly incorporate this information. New vehicle sales growth rates are built on the results from the EIA vehicle sales growth model, which is based on a large-scale consumer preference model at the census division level.
- Political beliefs and attitudes toward low/no emission vehicles were not included at the zip code level, although this may be indirectly accounted for in the aggregate consumer preference model as mentioned above.
- This model assumes a comparable electric vehicle is available for each vehicle class in the years 2030 and 2035. This will likely be true for new vehicle purchases, but several vehicle OEMs have recently pushed back plans for some EV models past year 2027, which will limit the number of used vehicles available in certain vehicle classes (especially larger three-row SUVs, minivans, and certain classes of light-duty trucks).
- This model does not directly quantify fleet purchases or look at the likelihood of specific industries adopting electrification strategies. However, the propensity model was based on all light-duty vehicle registrations, which includes fleet vehicles. This model therefore indirectly includes fleets to the extent they embrace electrification at the same rate as the overall population. However, this model would not capture fleets that electrify faster than average.

5.1.4 Results – Future EV Ownership by Census Tract

Results of the propensity model developed above were processed to translate them from zip code to census tract to better align with other datasets.

Figure 56: Current (2024) Electric Vehicle Density by Zip Code

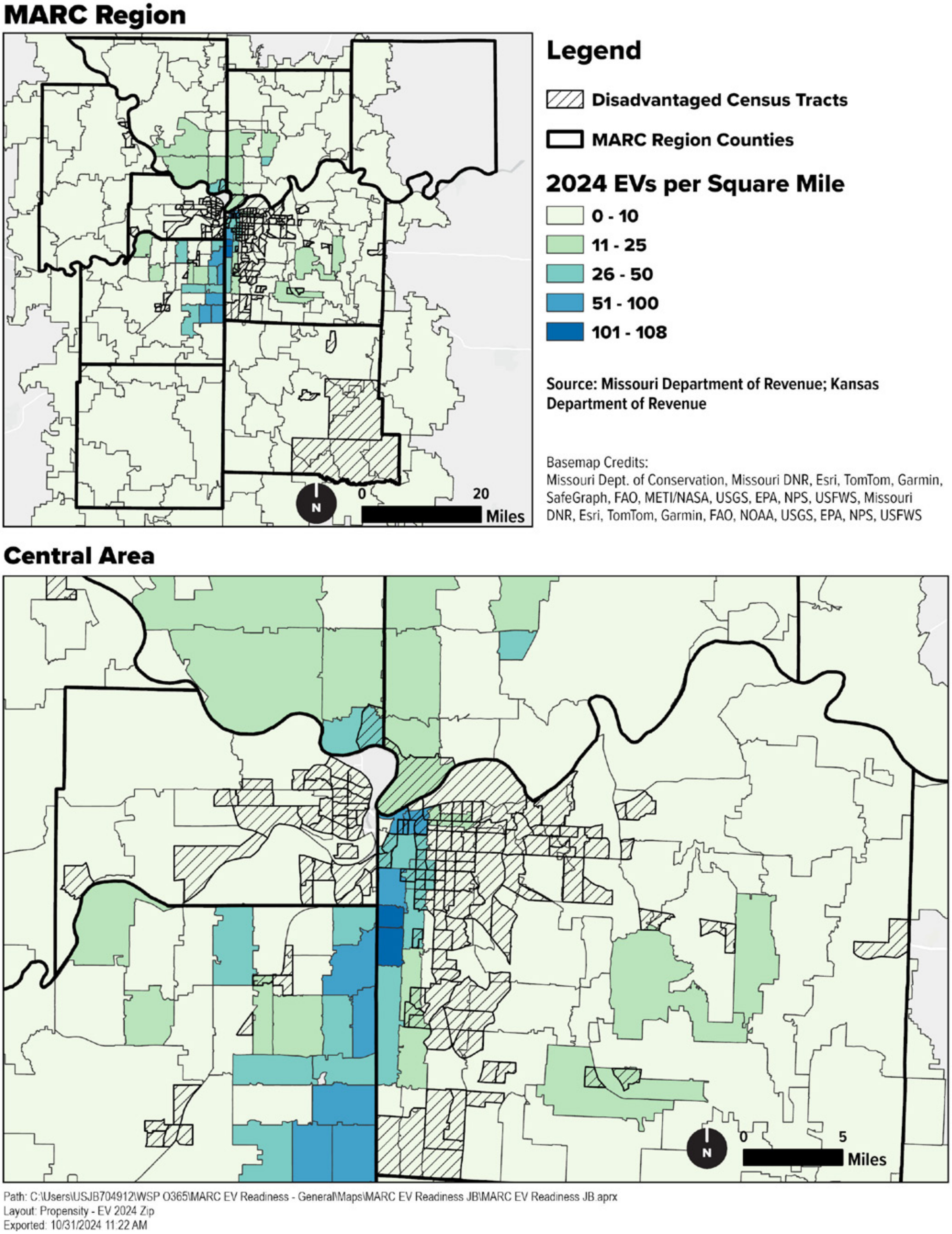


Figure 57: 2030 Projected EV Ownership Density by Zip Code

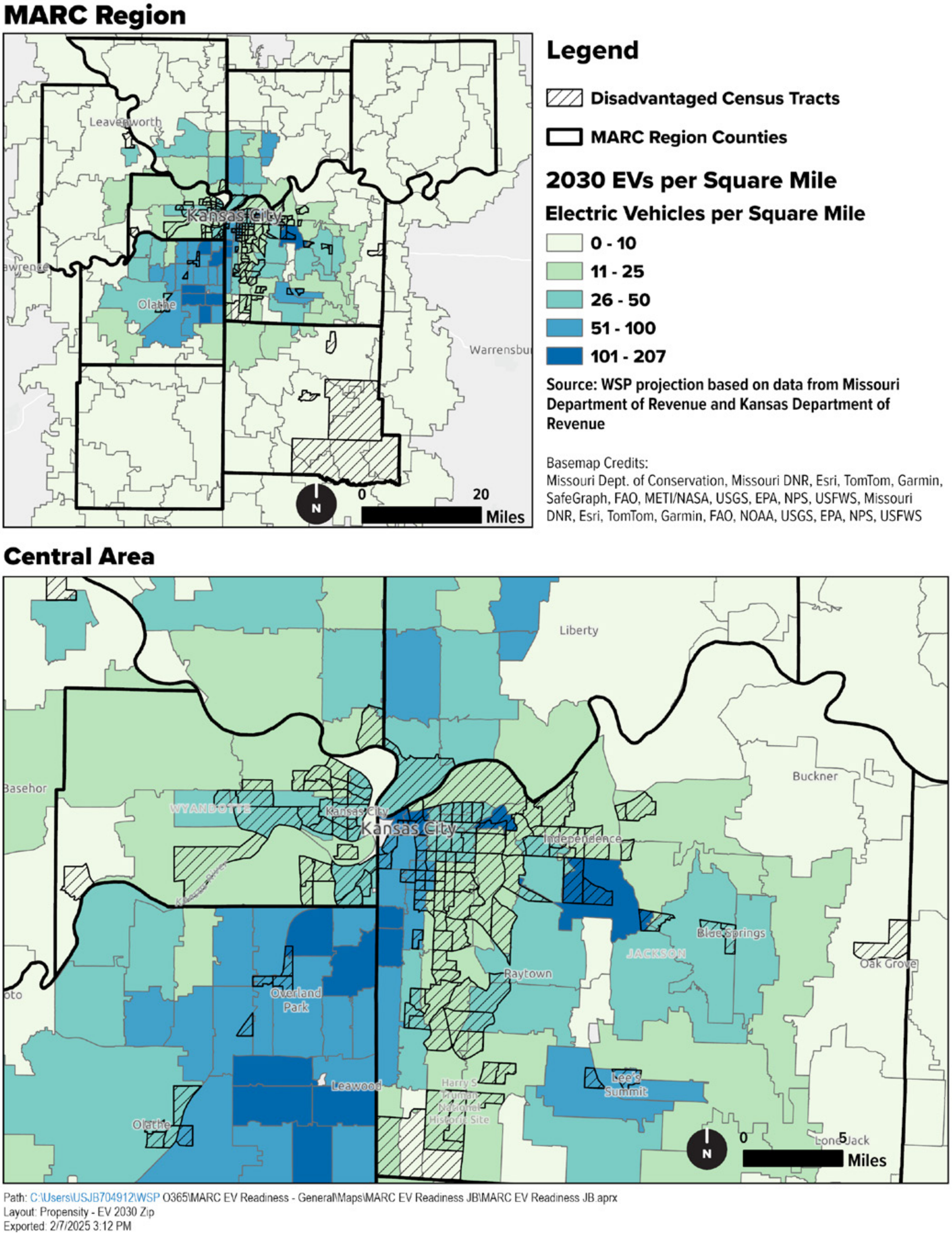
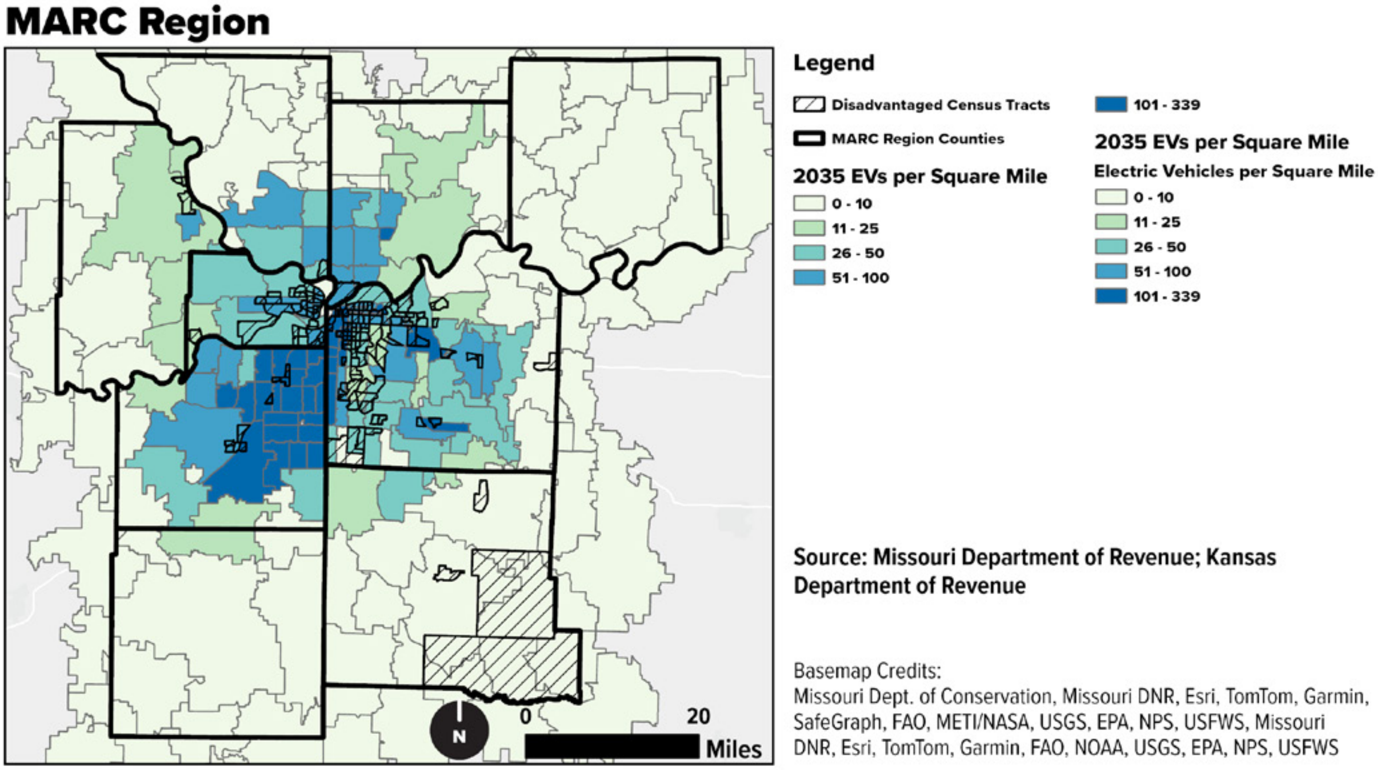
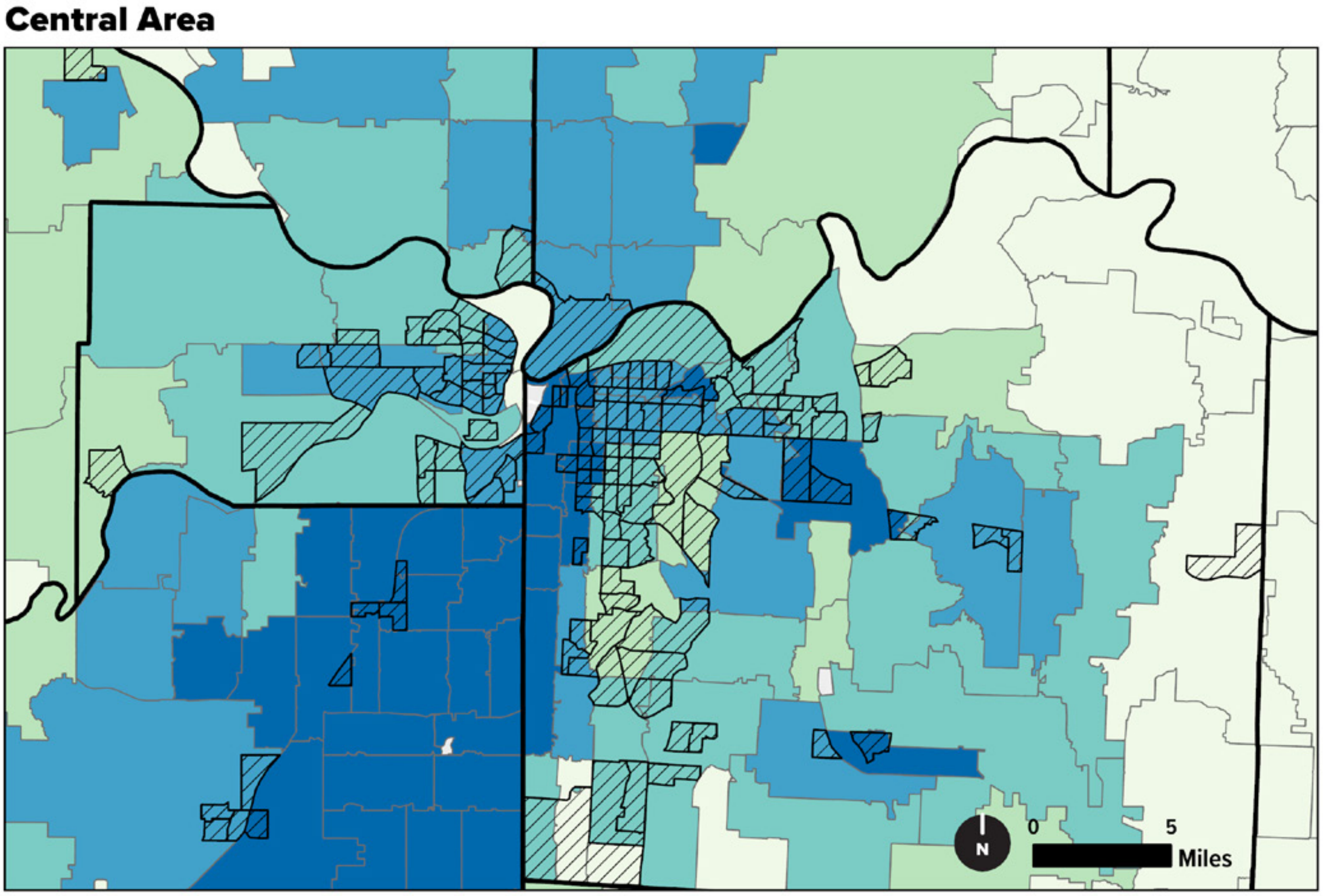


Figure 58: 2035 Electric Vehicle Density by Zip Code





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Layout: Propensity - EV 2035 Zip
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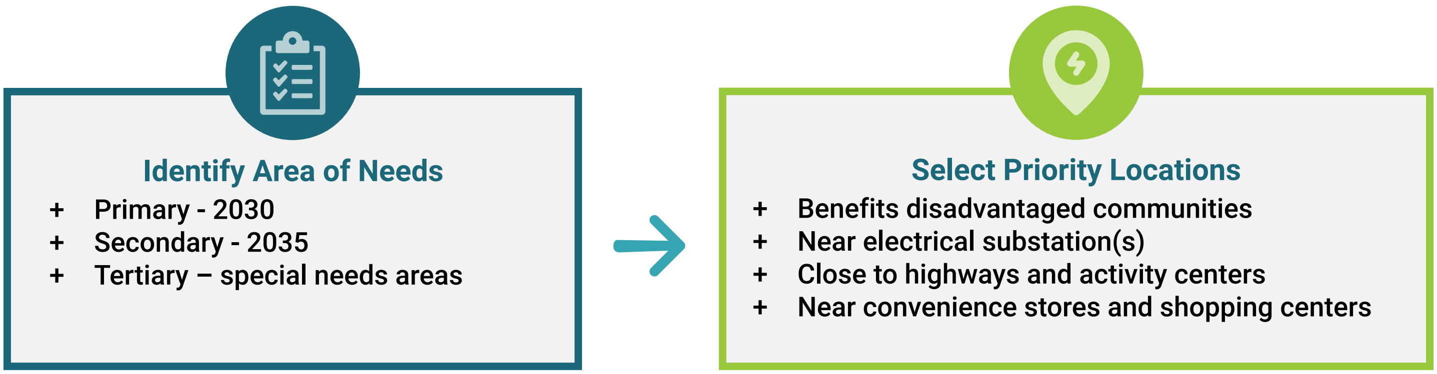
5.2 Needs Analysis

A needs analysis was conducted to identify and prioritize locations that would benefit from public electric vehicle charging infrastructure. First, a top-down study was conducted using geospatial data to identify areas, at the census tract level, that had the highest need for EV charging. These areas were prioritized as primary (5-year needs), secondary (10-year needs), and tertiary (special needs).

Figure 59: Needs Analysis Process



Next, for the areas of need, priority locations were selected based on several criteria. Finally, detailed maps of potential locations were created to aid developers and planners.

5.2.1 Methodology

Areas of need were determined by looking for census tracts that scored highly in three categories: trip-based scenario models, propensity to purchase model, and home charging density model.

The objective is to identify areas that would experience high utilization of public charging infrastructure: these are areas of Kansas City that are popular destinations, have a high number of future EV drivers living in them, and are less likely to have access to home-based charging than other census tracts.

Figure 60: Methodology

5.2.1.1 Model Input 1: Trip-based Metrics

The study team employed 2023 Replica[111] datasets to model three common types of vehicle trips that would most benefit from EV charging. Replica uses a proprietary model that uses dozens of input data sources to generate a calibrated and validated output data set for the Kansas City metro area. While they do not cover every type of trip a vehicle owner may take, the idea is to capture a diverse set of vehicle trips, that with the right charging infrastructure, would enable the owner of a gas vehicle in the Kansas City metro and surrounding areas to make the transition to an electric vehicle.

- Out-of-town visitors: vehicle trips that originated outside the counties in the MARC geographic area as well as any adjacent counties. These types of trips may also be important to capture the economic benefits of EV charging as it would enable EV owners in other cities to visit Kansas City.
- Commuters: vehicle trips that take place within the MARC geographic area, on a typical weekday, and are less than 20 miles one-way. These are trips that may have a relatively long dwell time and could benefit from both Level 2 and Level 3 charging infrastructure.
- Pass-through visitors: vehicle trips that both originate and end outside of the MARC geographic area, but pass through at least one MARC county.

This model did not include long-distance trips that originate in the Kansas City area and end outside of the MARC region (i.e. road trips). This use case is outside the scope of this study because it is being addressed by the National Electric Vehicle Infrastructure Program (NEVI), which involves separate ongoing planning processes in Kansas and Missouri. In Kansas this is called the Charge Up Kansas program and is being administered by the Kansas Department of Transportation (KDOT)[112]. In Missouri, it is called the National Electric Vehicle Infrastructure Formula Program and is being administered by the Missouri Department of Transportation (MoDOT)[113]. While this study is not specifically addressing the same use cases as the NEVI planning process, the NEVI criteria were incorporated into location selection and prioritization such that some recommended priority locations could qualify for funding consideration under the KS and MO NEVI programs, respectively.

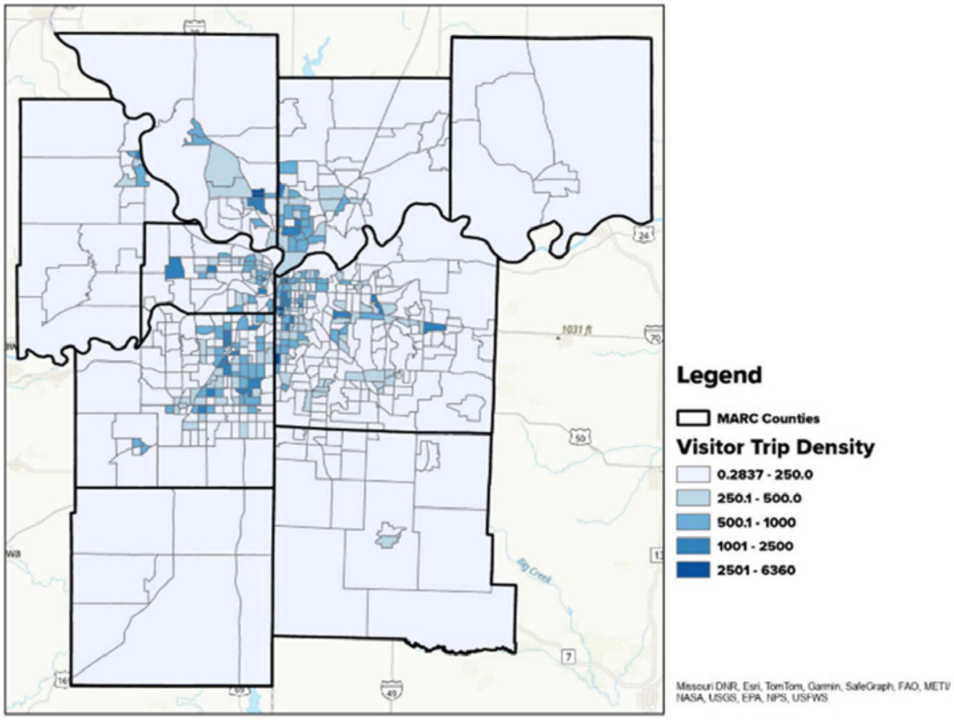
5.2.1.1.1 Out of Town Visitors

Out of town visitors are likely to be more reliant on DC fast charging stations than Level 2 charging stations, especially if visiting suburban or rural parts of the MARC region.

Replica trip data is based on a model created to represent a typical day, in this case, a normal Thursday in the fall of 2023, the most recent timeframe in which data was available. Origins and destinations are at the census tract level and were selected to represent trips that began at least two counties away from the MARC region and ended within the MARC region. This was done to filter out longer-distance commuters who may commute from adjacent counties.

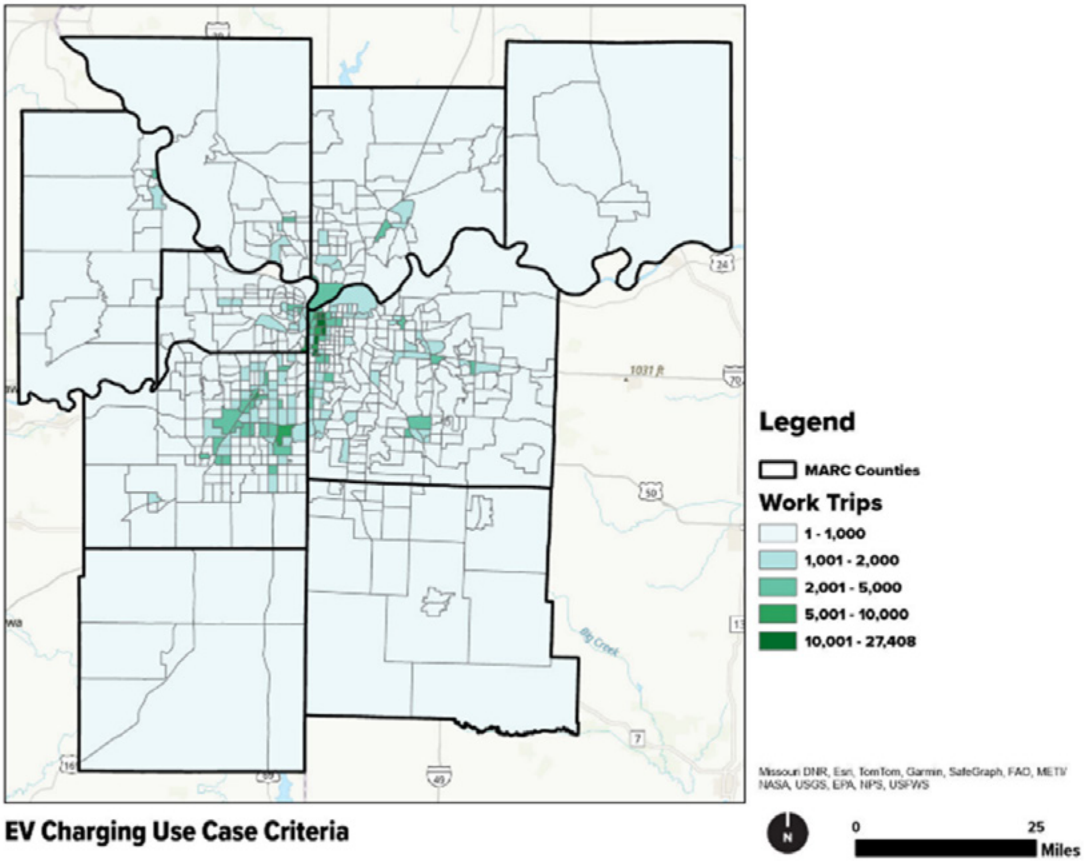
111 www.replicahq.com
112 KDOT Charge Up Kansas Program, ike.ksdot.gov/charge-up-kansas
113 MODOT National Electric Vehicle Infrastructure Formula Program, www.modot.org/nevi

Figure 61: Visitor Trip Density by Tract



5.2.1.1.2 Commuters

Figure 62: Density of Commute Destinations in the MARC Region (Replica)



This scenario was included to capture medium-distance trips within the MARC region. Drivers without reliable access to home-based charging could drive electric vehicles if sufficient charging infrastructure exists near their workplace. This is especially important when identifying locations to place DC fast chargers, since commuters may be more likely to behaviorally treat them like traditional fueling stations by charging once or twice a week.

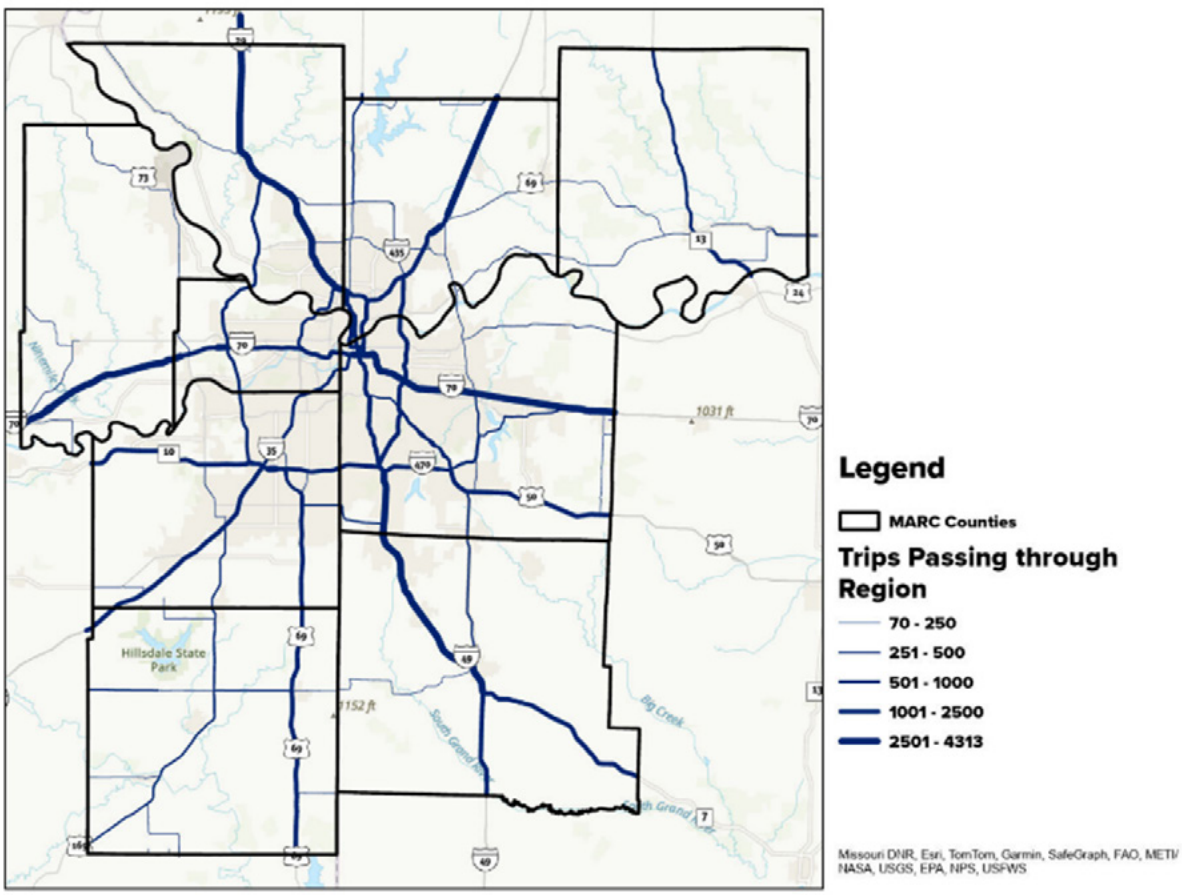
Note that the maps shown are normalized to show trip destinations per square mile to account for census tracts that vary in geographic area.

5.2.1.1.3 Pass-Through Visitors

Pass-through traffic will be focused along highway and interstate corridors. Census tracts that are bisected by a corridor with a high amount of pass-through traffic are weighted higher in the needs analysis model. This prioritizes locations for DC fast chargers that will be more likely to have higher utilization in the short-term, and will also be more likely to qualify for NEVI program consideration described earlier.

Conveniently, high-voltage electric transmission lines tend to be routed along major highways. While not specifically a criterion in this model, it may mean that DC fast chargers located along these routes may be more likely to have access to sufficient utility infrastructure in the future.

Figure 63: Pass-Through Visitor Trips (Replica)

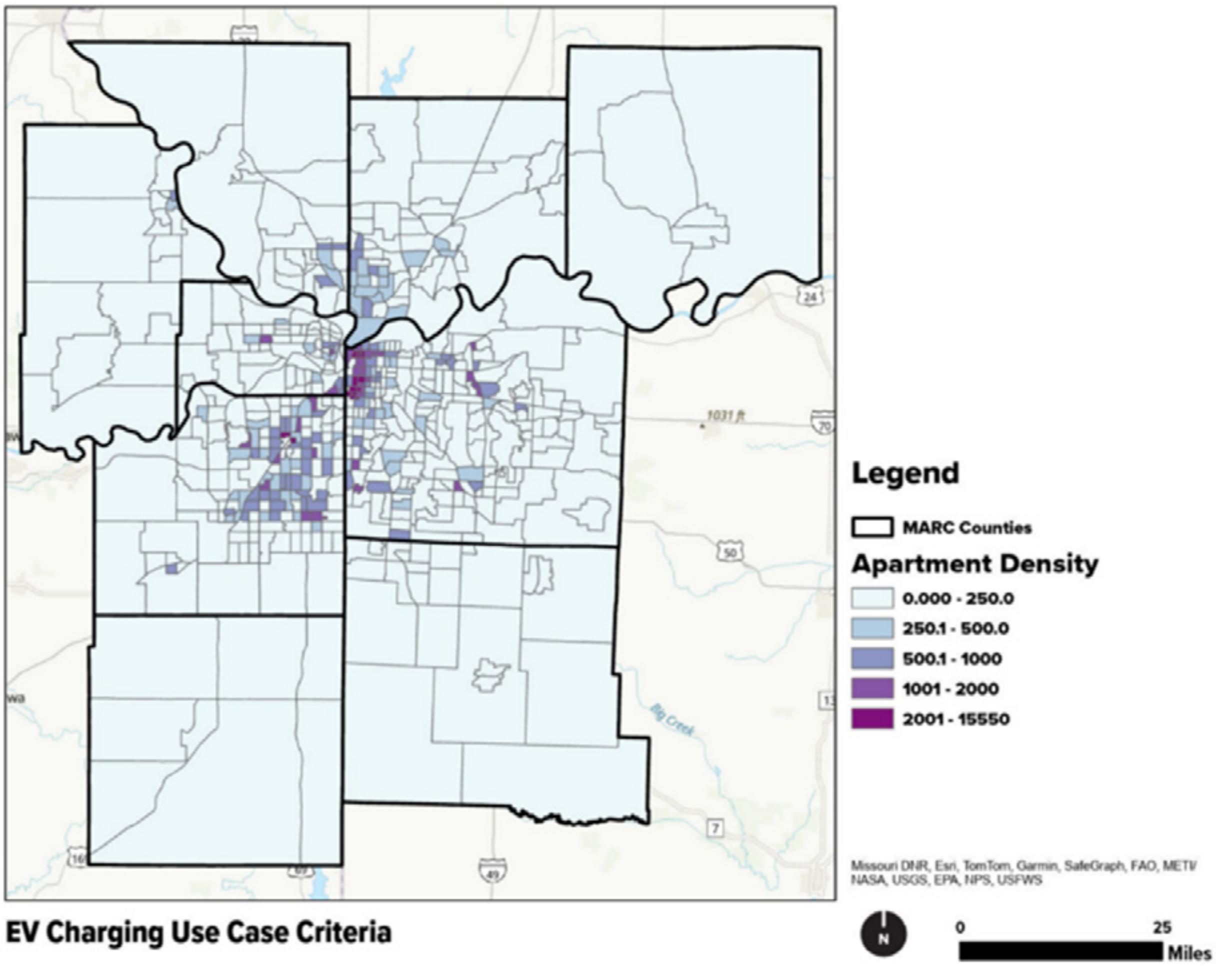


5.2.1.2 Model Input 2: Drivers Unlikely to Have Access to Home Charging

The second input to the needs analysis model is intended to capture areas with a higher density of housing units that would be less likely to have access to electric vehicle chargers at home. To capture this, the model takes an average of three different datasets at the census tract level:

- Multifamily Housing Density
- Homes Without Garages
- Pre-1940 Housing Density

Figure 64: Regional Multifamily/Apartment Density



5.2.1.3 Composite Score

A composite score was assigned to each census tract as follows, based on the values in below.

Table 26: Composite Score Rating Criteria

		Assigned Score by Metric Range					
			1	2	3	4	5
Metrics	Work Trips per Square Mile	Low	0	1,000	2,000	5,000	10,000
		High	1,000	2,000	5,000	10,000	>=10,000
	Long-Term Visitor Trips	Low	0	250	500	1,000	2,500
		High	>250	>500	>1,000	>2,500	>=2,500
	Pass-Through Trips	Low	0	250	500	1,000	2,500
		High	250	500	1,000	2,500	>=2,500
	Apartment Structures per Square Mile	Low	0	250	500	1,000	2,000
		High	250	500	1,000	2,000	>=2,000
	No Garage Residential Properties per Square Mile	Low	0	250	500	1,000	2,000
		High	250	500	1,000	2,000	>=2,000
	Pre-1940 Housing Units	Low	0	250	500	1,000	2,000
		High	250	500	1,000	2,000	>=2,000

(Work Trips Rating)+(Visitor Trips Rating)+(Passthrough Trips Rating)

+ average [Apartment Structures Rating, No Garage Residential Properties Rating, Pre-1940 Housing Units Rating]

An average was used for housing data in order to weight the score more toward where people go rather than where they live. This was done because the propensity to purchase model results are incorporated in Section 5.2.2, which is also based on where drivers live. The end result prioritizes areas that strike a balance of being popular destinations, are likely to be occupied by EV owners, and have an above-average number of homes without garages.

5.2.2 Needs Analysis Results – Areas of Need

The composite score above was then overlaid with the propensity to purchase model in GIS software to identify census tracts as either primary, secondary, or tertiary areas of need based on the criteria below.

Primary Area of Need

Composite score rating greater than 9

AND

2030 EV density greater than 50 vehicles per square mile

Secondary Area of Need

Composite score rating greater than 8

AND

2035 EV density greater than 50 vehicles per square mile

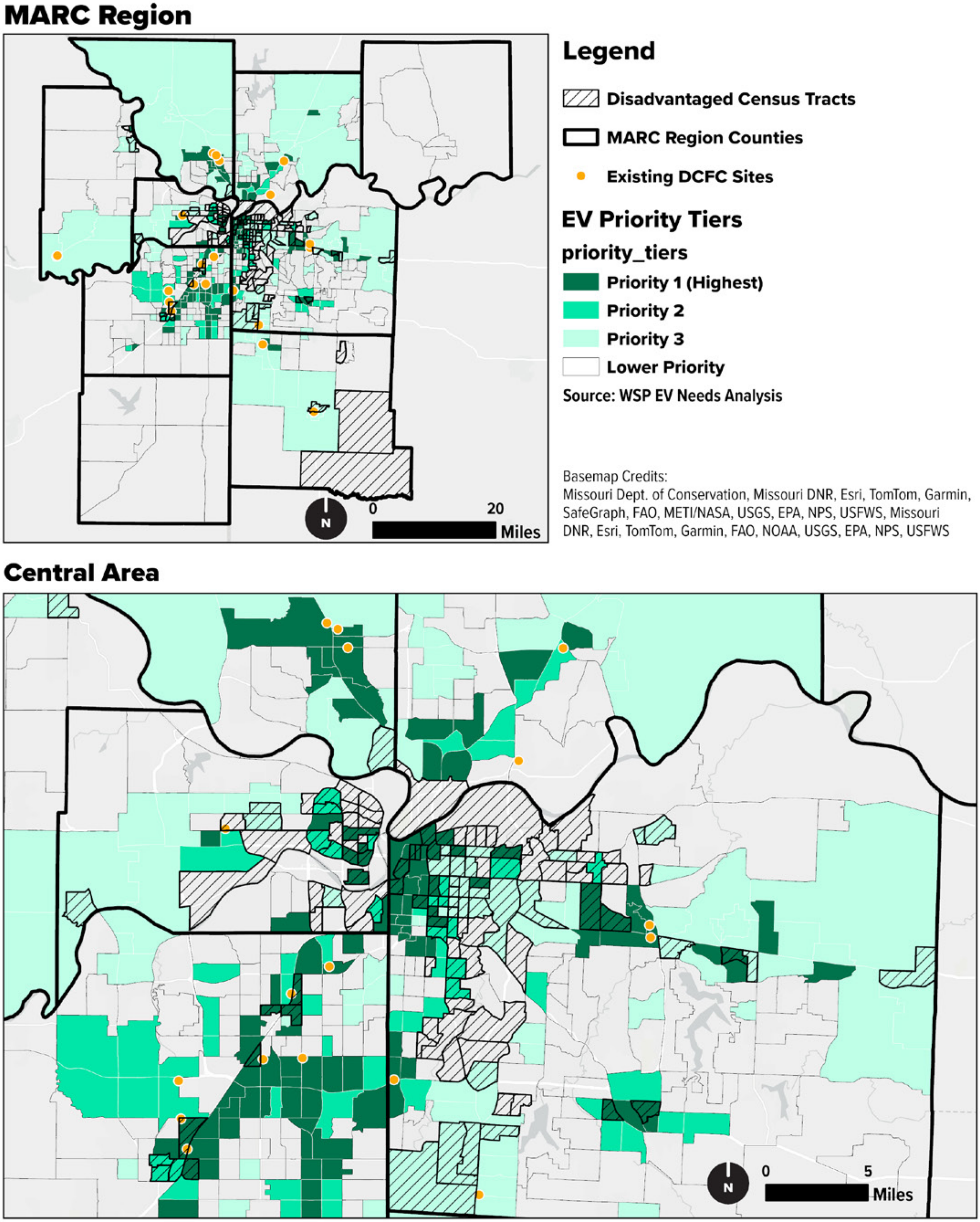
Tertiary Area of Need

Very high rating in an individual trip scenario

OR

Extremely high projected EV density

Figure 65: Charging Infrastructure Priority Tiers



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Layout: Priority Tiers
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5.2.3 Quantity of Chargers Needed

Access to home charging is an important part of scaling EV adoption. For the purposes of this study, it is assumed that drivers living in rental housing units would have access to Level 2 charging for at least 80% of regional miles driven while drivers living in owned homes have access to Level 2 charging for 95% of regional miles driven. The remaining local miles would be recharged at a public DC fast charging station. Particular emphasis was given to drivers in rental housing units, because they may not have the ability to install Level 2 charging stations at home. A report from UCLA in 2021 found people living in rental housing units were more likely to drive an electric vehicle if they lived near DC fast charging stations. Like a gas station, they provide a reliable means to charge quickly if a driver is unable to utilize a Level 2 charger at home or work, which is a big reason why this plan's model adds weight toward locating them near areas with a higher concentration of multifamily and rental housing units.

However, the cost to charge an electric vehicle at a DC fast charging station tends to be much higher than charging overnight with a Level 2 charger as described in section 2.3.2. The reasons for this are multifaceted:

- Significantly higher capital costs of the chargers themselves, which must be depreciated and recovered in usage fees
- Capital costs of associated utility upgrades, parking facilities, and other amenities
- Operating costs related to payment processing, telecommunications, and regular maintenance
- High utility demand charges are imposed because utilization rates at many DCFCs have been low. That is, there are many times each day that chargers are not being used. As EV ownership increases, so will utilization rates, which will lessen the impact of demand charges over time.

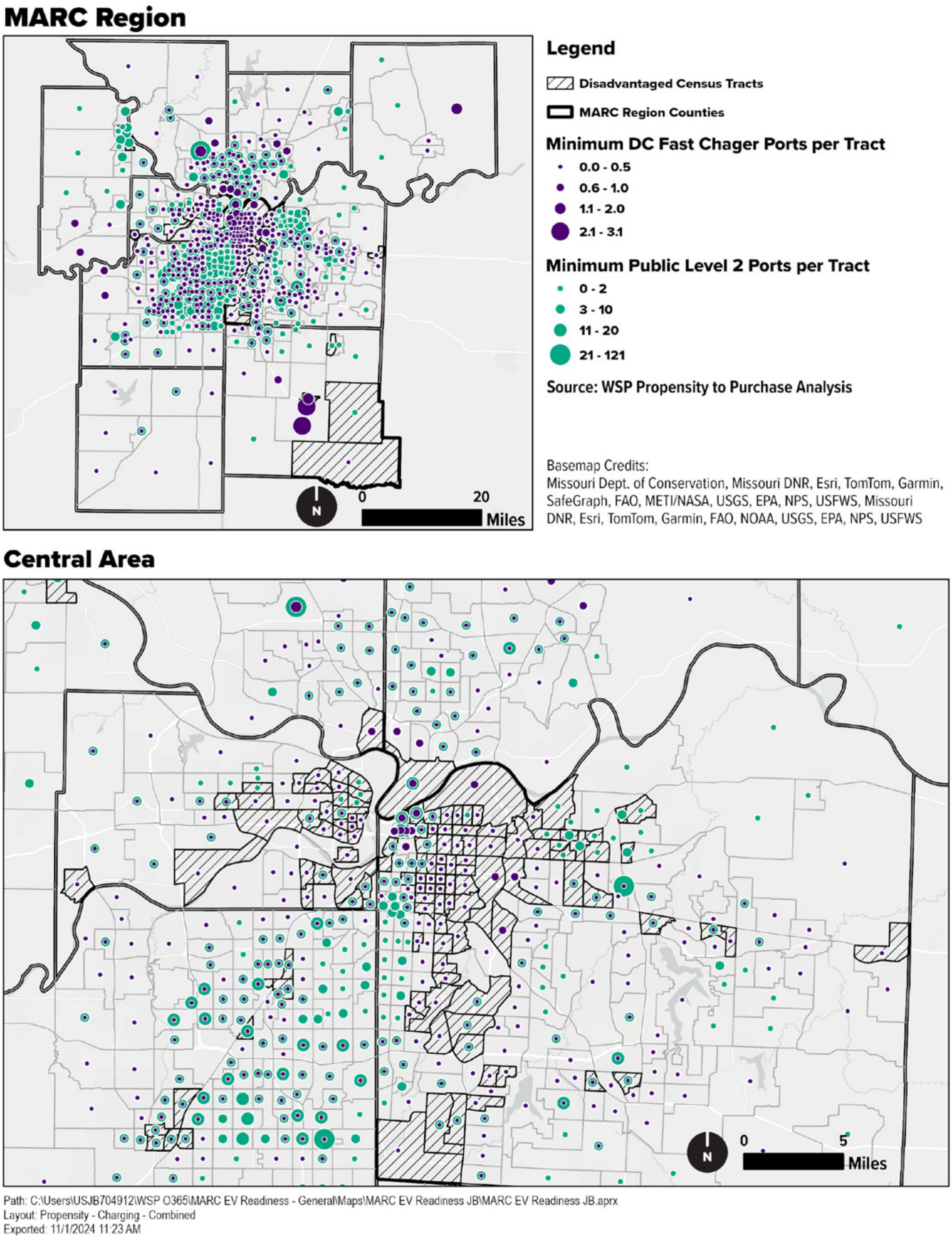
Transportation plans and public policy that rely exclusively on public DC fast chargers to enable renters to drive EVs would lead to regressive policy that disproportionately burdens renters with high charging costs and adds unnecessary strain to the utility grid during peak times. This was a topic of discussion during the steering committee meeting on Wednesday, September 25th at Mid-America Regional Council offices in Kansas City. The question proposed was "What percentage of time should renters be expected to use higher-cost DC fast charging stations for in-town driving." 20% is a reasonable expectation for planning purposes. That is, to calculate how many DC fast chargers are needed, it is assumed that renters will use them for 20% of in-town (regional) driving, with the other 80% provided by Level 2 chargers located at home, work, or public activity centers. Suggestions for how to achieve this are discussed in Section 6.1.2. This assumption is consistent with those used by the Electric Power Research Institute as described below.

> ***"At the levels of EV adoption forecasted by EPRI, 85% of vehicles are expected to have residential charging access based on the data in the No Place Like Home Study. In the full electrification scenario, 75% of vehicles are expected to have residential charging access."***
> ***– EPRI eRoadMAP***

The study team developed a model to calculate the minimum number of DCFC and Level 2 ports needed in 2035 at the census tract level based on residential and visitor demand in each tract. DCFC demand is comprised of residential demand from single-family and multifamily homes. Our methodology assumes that 5% of charging for EV owners in single-family homes will take place at a DCFC location, and 20% of charging for multifamily owners in EV homes will take place at DCFC locations. The 2035 share of single-family and multifamily housing was assumed to remain consistent with current land use. Visitor trips were calculated using data from Replica, filtering for trips greater than 100 miles on motorway links. These trips were scaled and normalized to reflect an approximate 5.5% share of electric vehicles in 2035 and distributed among census tracts within 1 mile of these links. Level 2 public charging demand is comprised solely of multifamily EV charging demand.

For DC Fast Chargers, the total number of charging hours was calculated based on the number of electric vehicles in the tract, the residential VMT of that tract (Replica), the efficiency of the electric vehicles, and a standard charge rate for DC Fast Chargers. We assume 12 hours per day of charging per plug to arrive at the minimum number of required DC fast chargers for that tract. For Level 2 chargers, we assume that each multifamily owner will likely charge two times per week and leave that vehicle plugged into a public charger overnight or during the day. The demand for Level 2 chargers is calculated by taking the estimated number of multifamily EV owners in that tract in the year 2035 and multiplying it by a ratio of 0.286 (2 of 7 days). Based on this analysis, it is estimated that the region will need a minimum of 80 DCFC plugs and 1,739 Level 2 plugs by the year 2035.

Figure 66: DC Fast Charger Plugs Needed by Census Tract



6. STRATEGIC RECOMMENDATIONS

6.1 Prioritization of New Charging Station Locations

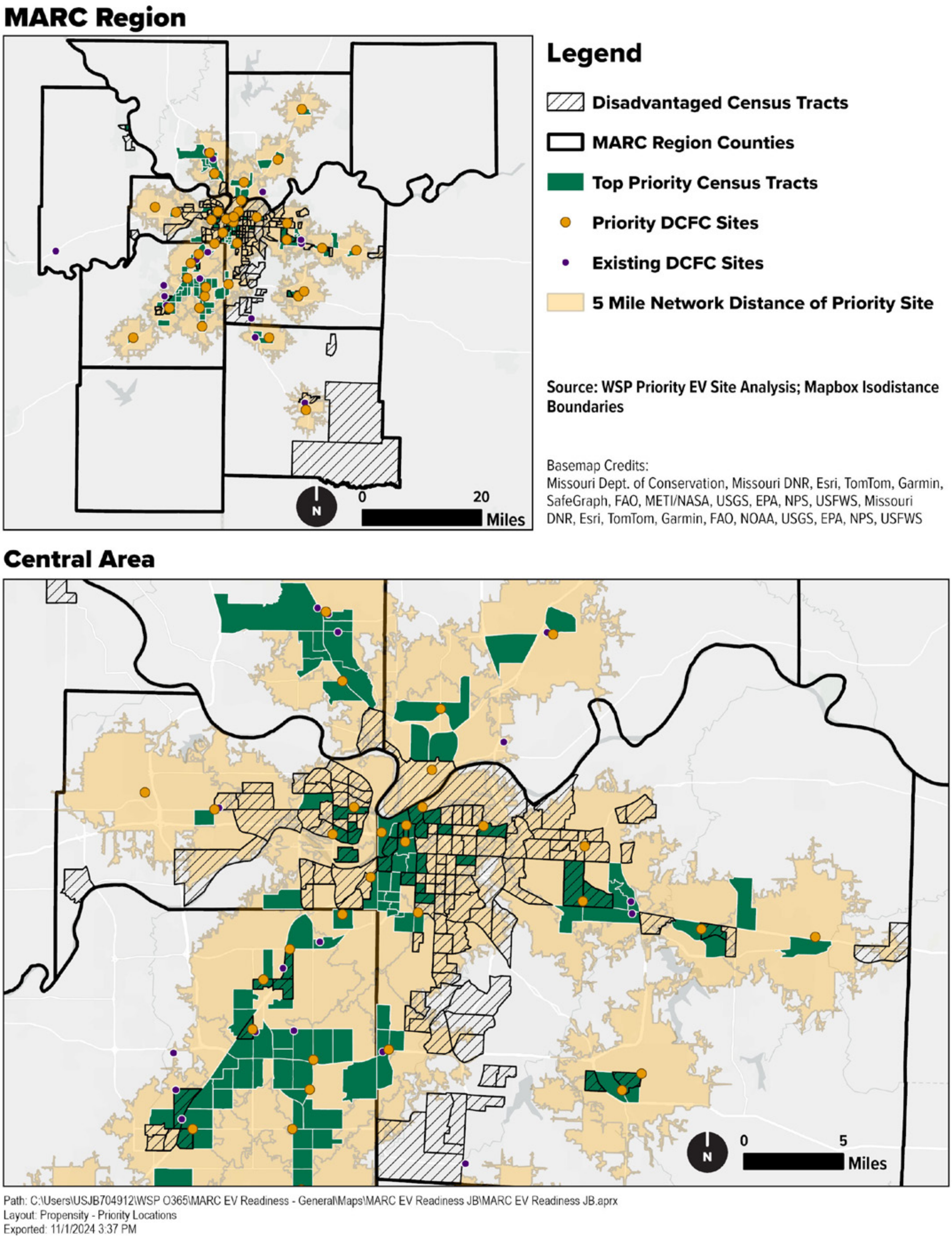
6.1.1 DC fast charger Priority Locations

36 DC fast charger priority locations in six different counties were selected as shown in the figure below. Locations were selected to balance the following criteria as best as possible for a given area.

- Within or near a tract identified as a priority area in the needs analysis model
- Near a heavily traveled highway
- Proximity to restaurants, shopping, and convenience stores
- Near a utility substation
- Near activity centers as described in the MARC ConnectedKC 2050 plan
- Located in municipalities throughout the MARC region
- Identified as a preferred location in the public survey administered by Vireo as described in section 3 of this report.

Specific site selection will depend on the willingness of private business partners to act as site hosts, the availability of private capital, as well as other considerations.

Figure 67: Tier 1 Priority Census Tracts, Priority DCFC Sites, and 5-mile Driving Travel Sheds of Priority Sites



Some priority locations are near existing DC fast chargers. In these cases, it was determined that the area has a high enough need to justify additional charging stations within the next 5-10 years. Many existing DC fast charging stations have only a small number of charging ports (sometimes as few as 4) and may be in locations that have poor visibility to the surrounding community or from highways. Development details are outside the scope of this plan. Ideal locations are recommended in this report, but it could be more cost-effective in some areas to expand an existing DC fast charging station rather than construct a new one. This should be determined during a detailed site selection study.

6.1.1.1 Utility Power Availability

15 of the 36 preferred site locations were submitted to utilities for system planners to review. Seven are located in Evergy's territory, four are in BPU's territory, two are in IPL's territory and one is in the City of Gardner.

Utility planners were asked to classify each location based on the ability of the distribution system to handle the additional load of either a small or a large DC fast charging station. The assumptions below are intended to capture summer or winter peak demand during a busy travel season, such as the afternoon of a holiday weekend when many vehicles would be charging at the same time.

Small DC Fast Charging Station

- Six plugs able to be used simultaneously
- 4-hour average peak demand of 150 kW per port, for a total of approximately 1 MW peak load.
- Each unit assumed to be capable of 350 kW peak charge power
- Study year 2030

Large DC Fast Charging Station

- 20 plugs able to be used simultaneously
- 4-hour average peak demand of 150 kW per port, for a total of approximately 3 MW peak load
- Each unit assumed to be capable of 350 kW peak charge power
- Study year 2030

Utilities were asked to rank each location from 1-4 based on the relative cost and complexity of the project scope for the utility (in front of the meter), based on the below criteria:

1. Low Effort $, unlikely to require feeder or substation equipment upgrades to support the additional load.
2. Moderate Effort $$, may require upgrades to substation or line equipment, but not a major piece of equipment. That is, the limiting element is not something like a circuit breaker, switchgear, or entire feeder conductor. If a new feeder is required, it is only a short distance from the substation.
3. High Effort $$$, likely requires a costly new feeder, the area is in an expensive location for construction, or the limiting element is a major piece of substation equipment (such as a transformer, breaker, or switchgear).
4. Very High Effort $$$$, the limiting element is on the bulk electric system or the transformer / high side of a substation.

Table 27 : Estimated Utility Effort at Selected DCFC Locations

Site Description	Utility	Utility Effort Small DCFC (1-4)	Utility Effort Large DCFC (1-4)
Blue Springs #1	Evergy	3	3
Grain Valley #1 I-70 / Buckner Tarsney Rd	Evergy	3	3
KCMO #4 103rd / Wornall Rd	Evergy	3	3
Gardner #1	City of Gardner	1	3
KCMO 19th / Main St	Evergy	1	1
KCMO 7th / Grand	Evergy	3	3
KCMO Berkley Pkwy / I-29	Evergy	1	1
KCMO Emanuel Cleaver / Virgina	Evergy	1	1
KCMO Independence Ave	Evergy	1	1
KCMO N #1 NE Antioch / 53rd	Evergy	1	1
KCMO N #2 I-29 / 64th St	Evergy	3	3
KCMO N #3 I-29 / Old Tiffany Springs	Evergy	1	3
KCMO West Bottoms	Evergy	3	3
KCK #1 18th / Pacific Ave	BPU	1	1
KCMO N #2 I-29 / 64th St	Evergy	3	3
KCMO N #3 I-29 / Old Tiffany Springs	Evergy	1	3
KCMO West Bottoms	Evergy	3	3
KCK #1 18th / Pacific Ave	BPU	1	1
KCK #2 Washington Blvd / 8th	BPU	3	3
KCK #3 State Ave / 78th St	BPU	1	3
KCK #4 Legends Area	BPU	1	1
KCK Rainbow Blvd / Southwest Trfwy	BPU		
Independence #1 Noland Rd / 39th St	IPL	1	2
Independence #2 Noland Rd / Walnut St	IPL	1	1
Kearney #1 I-35 / 6th St	Platte-Clay Electric Cooperative	TBD	TBD
Lees Summit #2 - Hwy 291 / Chipman Rd	Evergy	3	3
Lee's Summit 01	Evergy	3	3
Lenexa #1 I-35 / 95th St	Evergy	1	1
Liberty #1 291 Hwy / Kansas St	Evergy	3	3
Merriam #1 / I-35 / 63rd	Evergy	3	3
North KC #1 - I-29 / Armour Rd	Evergy	1	1
Olathe #1	Evergy	2	2
OP #1 135th / Antioch Rd	Evergy	3	3
OP #2 159th / 69 Hwy	Evergy	3	3

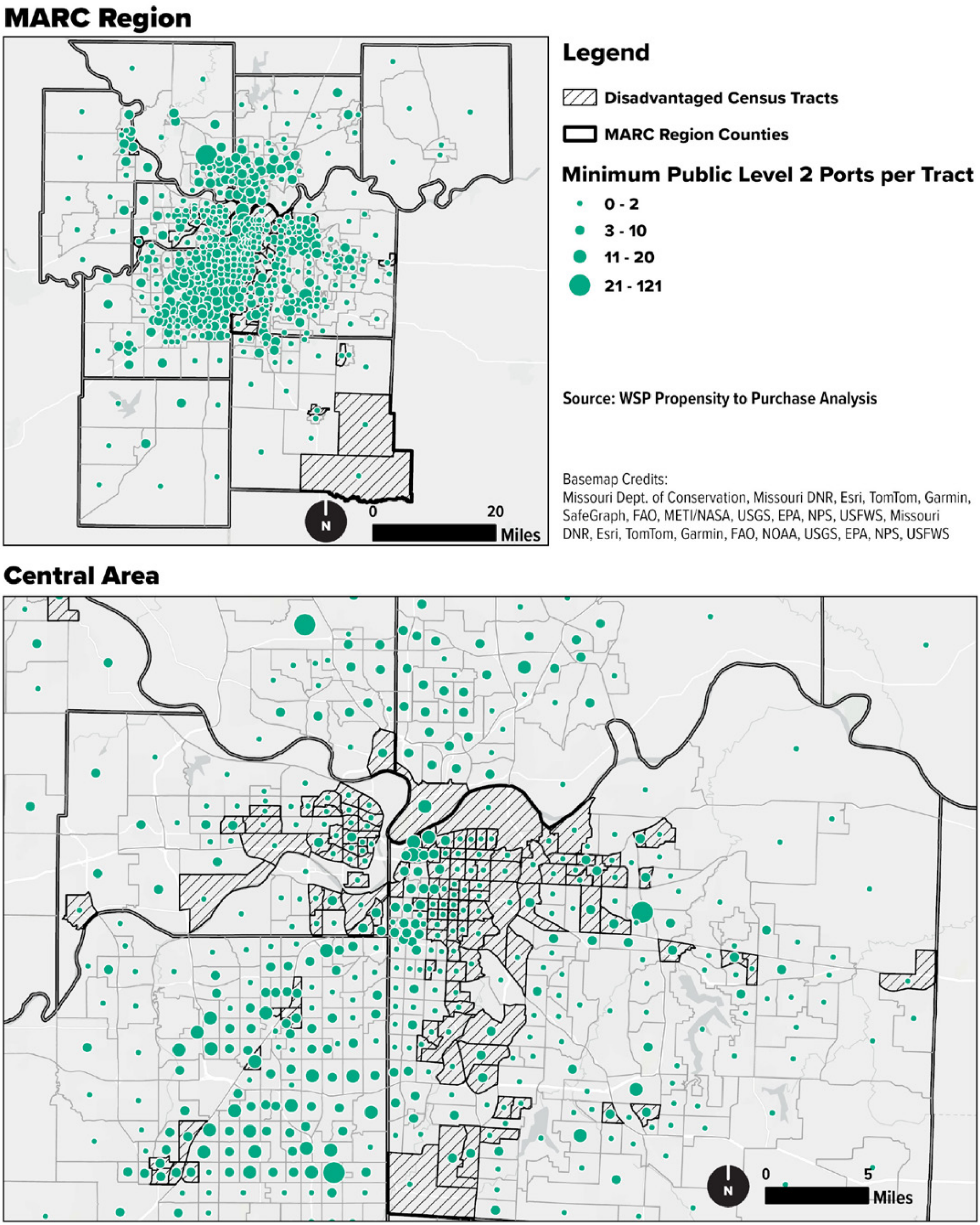
Site Description	Utility	Utility Effort Small DCFC (1-4)	Utility Effort Large DCFC (1-4)
OP #3 119th / Metcalf	Evergy	3	3
OP #4 107th / Metcalf	Evergy	3	3
Raymore #1	Evergy	3	3
Harrisonville #1 - I-49 / Commercial St	City of Harrisonville	TBD	TBD
Roeland Park #1 Roe Blvd / 48th St	Evergy	3	3
Shawnee #1 75th / Nieman Rd	Evergy	3	3

Locations were selected for analysis purposes only. They represent existing businesses that meet the criteria listed above. Actual site selection for future funding applications may or may not result in these exact addresses being selected as preferred site hosts and will depend on negotiations with private businesses.

6.1.2 Level 2 Chargers

As Kansas City transitions to electric vehicles, the majority of vehicle charging should take place overnight via Level 2 charging stations. Most charging stations should be located where people live or work. This plan did not identify specific site locations for Level 2 chargers because the number of necessary locations is too large to identify specific sites at the regional level. However, specific focus areas are provided for use when planning Level 2 charger deployments, as shown below.

Figure 68: Minimum Number of Level 2 Ports Needed per Census Tract in 2035



Path: C:\Users\USJB704912\WSP O365\MARC EV Readiness - General\Maps\MARC EV Readiness JB\MARC EV Readiness JB.aprx
Layout: Propensity - Charging - L2 Public
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MARC and its members should also incorporate the following tactics when developing a plan to expand the Level 2 charging network in KC.

1. **Prioritize Multifamily Housing**
Unlike DC fast chargers, Level 2 chargers can require 6 or more hours to fully recharge a vehicle. Owners of multifamily housing units should be encouraged to install Level 2 chargers for residents, with particular emphasis given to multifamily developments in disadvantaged census tracts that are also identified in the propensity model, as shown in Appendix 7.1. Local governments should incentivize multifamily housing developers to include EV chargers when building or renovating properties by amending zoning and building codes.

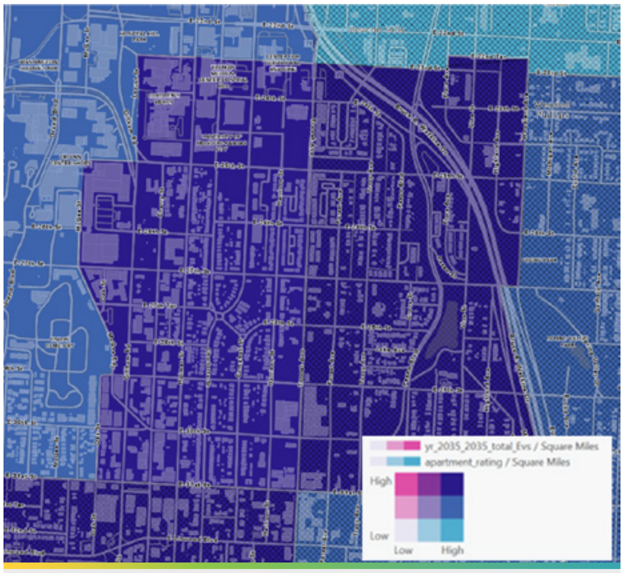


Figure 69: Example Neighborhood

2. **Take Advantage of Existing Incentives**
Both private businesses and tax-exempt entities can take advantage of federal tax credits for EV charging infrastructure, which can be significant if the project is in a disadvantaged census tract and meets certain requirements.[114]

"Tax-exempt entities can qualify to receive full payment for the federal alternative fuel infrastructure tax credit. Starting on Jan. 1, 2023, the value of this credit is 6% of the cost of property subject to depreciation, with a maximum credit of $100,000 for each single item of property……Projects that meet prevailing wage and apprenticeship requirements may be eligible to receive a 30% tax credit." – US DOE Alternative Fuels Data Center

Level two charging stations may also be included in applications for charging and fueling infrastructure (CFI) grant funding and can be strategically placed to complement DC fast chargers. If the site is served by Evergy, it may also be eligible for utility rebates.

3. **Focus on Neighborhoods**
It is tempting to look at the extensive map of Level 2 chargers in Kansas City and draw the conclusion that a particular area has a sufficient number of chargers, but this should be avoided. While DC fast chargers should be planned at the regional level, Level 2 chargers should be considered at the neighborhood level. Because Level 2 chargers require so long to charge a vehicle, they are only useful if located within walking distance of the drivers' destination. For example, a Level 2 charger located at a suburban movie theater will be hardly utilized during the workday, even if there is a large employment center ½ mile away.

Medium-density, mixed-use areas, such as midtown Kansas City are a great example of locations that could benefit from public Level 2 charging stations.

114 Tax Credits for Electric Vehicles and Charging Infrastructure, U.S. Department of Energy Alternative Fuels Data Center, obtained from afdc.energy.gov/laws/ev-tax-credits

Note that some federal funding is tied to a particular census tract being designated as disadvantaged. This is an understandable way to ensure projects benefit disadvantaged communities. However, many census tracts may not be considered disadvantaged as a whole, but still have quite a few neighborhoods that would still be considered disadvantaged and may be overlooked if only filtering at the census tract level, such as the midtown example shown above. Neighborhoods, homes, and multifamily housing developments should be evaluated on a case-by-case basis for Level 2 charging.

4. **Multiply the Impact of DC fast chargers**
   Level 2 chargers should be located near rental housing units and employment centers that have DC fast chargers nearby, based on the locations depicted in Figure 69. Locating both DC fast chargers and level 2 chargers nearby will provide reliable access to charging and give drivers the confidence they need to purchase an EV. This is especially important for Level 2 chargers at multifamily housing developments, where residents may not have access to a dedicated EV charging space and may rely on nearby DCFCs when level 2 spots are occupied by other drivers.

6.2 Policy and Best Practice Recommendations

This section of the Electric Vehicle Readiness Plan provides recommendations on policies and best practices that municipalities in the MARC region can put into place to make it easier to encourage the deployment of publicly accessible EV chargers. The recommendations made here include policies that can remove barriers to the deployment of EV chargers at the MARC level, the municipal level, as well as community program level.

Greater Kansas City is a bi-state region extending across nine counties and 119 municipalities in Kansas and Missouri. Sustainability managers in these different jurisdictions have multiple demands on their time and many counties and municipalities have limited bandwidth. The recommendations presented here are known to be impactful and have been used in other metropolitan regions to encourage the installation of EV chargers.

6.2.1 Streamline and Accelerate Permitting Recommendations

- MARC should coordinate with local governments to ensure that the EV supply equipment permitting process is standardized, simplified, and expedited and that permitting staff are educated on the permitting process. The MARC region should coordinate the adoption of standardized EV charging code requirements to mitigate the confusion in permitting variation among local governments and between permitting practices in Kansas and Missouri.
- MARC should also work with both states to develop a standardized permitting ordinance or include streamlined permitting as a requirement for future state funding opportunities.
- MARC should coordinate with other stakeholders in Kansas and Missouri to support virtual and in-person education workshops for local governments on streamlining the permitting process.
- MARC should also work with local planning boards to include EV charging in their comprehensive plans and zoning laws.

Many municipalities and counties have limited capacity and experience in reviewing and approving permits for the installation of EV charging infrastructure and will require training resources to familiarize themselves with the permit approval process for DC fast chargers. In addition, permitting requirements for DC fast chargers are different from Level 2 chargers, which can cause additional confusion. Other challenges include lengthy zoning reviews that may at times be unnecessary.

Some local governments have taken steps to streamline and simplify the permitting process for residential and commercial EV charging infrastructure. For example, in Greater Kansas City, a standard electrical permit is all that is required to install home charging equipment. The process is straightforward and consistent with other electrical projects. Note that residential and commercial charging projects vary in regulatory approval and design, so efforts to streamline should consider both types.

Some jurisdictions have eliminated lengthy zoning reviews by amending their zoning ordinances to clarify that DCFC chargers are an accessory use that does not require further zoning board approval. Electrical and other permit review processes can also be made concurrently or reduced significantly to decrease wait times.

6.2.2 Encourage the Implementation of EV Chargers at Multi-Unit Dwelling Recommendations

- MARC should seek funding opportunities to support the deployment of EV chargers at multi-unit dwellings.
- MARC should coordinate with local governments and planning boards to develop EV-ready building codes that require parking facilities for newly constructed multi-unit dwellings to be wired to support the deployment of EV chargers. Regulations should also stipulate a suitable ratio of chargers to dwelling units.
- MARC should coordinate with utilities to encourage them to adopt make-ready programs
- MARC should coordinate with local real estate organizations and building manager associations to provide input on incentives that would encourage the deployment of EV chargers at existing multi-unit buildings.

Any chargers financed with federal funds must be fully open to the public, although this requirement does not apply to the tax credits described earlier. This makes it difficult to use federal funding for multi-unit dwellings with private parking facilities. Therefore, MARC and its stakeholders will need to find other sources of funding to encourage the deployment of chargers in these settings.

The Make Ready Program offers a rebate for the purchase of Level 2 chargers for public and private entities between $2,000 - $4,000 per charging port. It also provides an additional $500 per port for chargers installed in disadvantaged communities.

Several utilities also sponsor Make Ready Programs that provide incentives to offset costs related to preparing a site for Level 2 or DCFC installations. While Evergy offers incentives for electric vehicle chargers, most of the other local utilities discussed in section 2.4 do not have any incentives or rate plans that encourage EV adoption.

6.2.3 Develop Educational Materials Recommendations

- MARC should work with its stakeholders to develop educational materials on the deployment of Level 2 and DCFC chargers to provide information on costs, the approvals process, and siting. seek funding opportunities to support the deployment of EV chargers at multi-unit dwellings.
- MARC should develop highly targeted education campaigns focusing on specific issues associated with the implementation of EV chargers. Successful educational campaigns should provide participants with sufficient support and reassurance that implementing the EV-related action is feasible, affordable, and reliable.

6.3 Solutions for EV/EVSE in Underserved Communities

6.3.1 Expanded Access in Low-Income Communities

Determining locations for the proposed charging hubs in the MARC region started with serving disadvantaged communities as a baseline. These definitions are defined by the Federal Highway Administration. There are barriers to purchasing an electric vehicle for low-income populations at this point. Initial purchase costs for the user can still be prohibitive if the vehicle is purchased new. An ever-growing used electric vehicle selection continues to drive down the initial cost of purchasing an electric vehicle. The next barrier could be the potential challenges to charging in the daily routine of electric vehicle ownership. Low-income populations may not reside in or own a single-family dwelling where they can install a home charger. Their dwelling may be rented or a multi-family unit in which the ownership either doesn't provide or is not interested in providing electric vehicle chargers at the dwelling.

Solutions and approaches to addressing this challenge come in the form of trying to connect to other access points in this user's daily routine. Either connecting to other places or transportation options can attempt to connect the lower-income electric vehicle owner or driver with optimal charging opportunities. Charging could be found at nearby retail centers that they could walk to and charge overnight or during their workday. This adds a layer of walking to and from the vehicle to access it and assumes their mobility is such that this is a potential. Another option to address mobility needs could be a park-and-ride concept. Charging stations could be placed adjacent to transit facilities, existing or new to augment the trip, regularly or intermittently. The user could drive to a public location, charge, and ride transit for an errand or the rest of their day, meanwhile, the vehicle charges until they return.

Another common approach to making charging infrastructure accessible and convenient for the public is to locate the charging infrastructure at public buildings and facilities that are naturally placed in neighborhoods or near a density of dwelling units. Locations like parks, recreation centers, libraries, schools, and other municipal facilities offer a location that's potentially more conducive to public use and also is more conveniently located for electric vehicle users who want to charge near home, rather than at home due to constraints outside their control. The public facility location option is nice in that there are also various public grant opportunities that local and state governments are eligible for, so the facilitation of these sites might be quicker than awaiting a commercial developer to pursue a similar location.

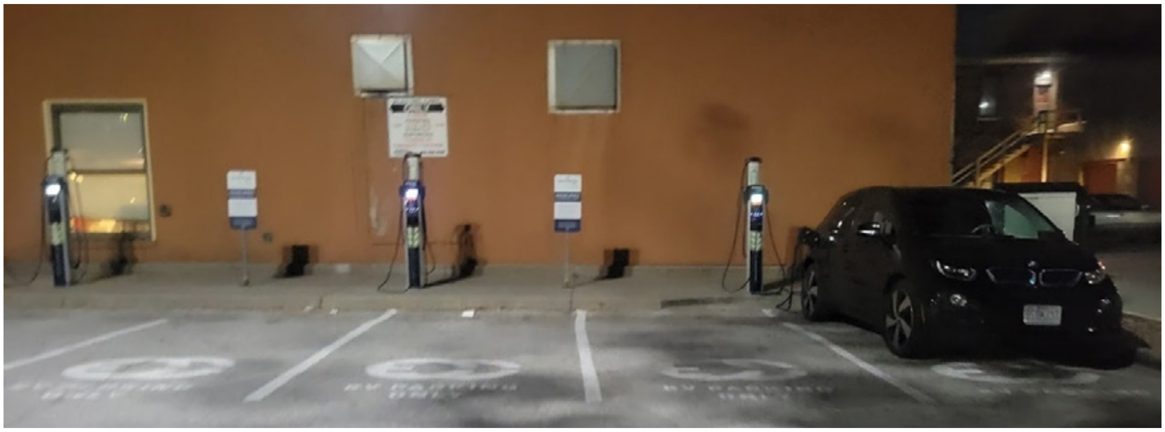
Educational institutions provide a particularly appealing opportunity as there could be multiple layers of overlap in users, depending on the speed of charging infrastructure that's installed. Staff, teachers, and students could use the charging during the day. Also, fleet vehicles or assigned buses that might be tasked with serving the facility could charge between uses. Then when the evening comes, these same charging spots could serve the surrounding neighborhood residents in a more continuous loop of charging throughout the day, perhaps leveling the volume of electricity needed and being predictable and more consistent for the utility provider.

6.3.2 Expanded Access for Higher Density Housing

Multi-family housing options bring about an opportunity for more consistent use of charging infrastructure than single-family housing with the larger potential population of electric vehicles that need to be charged. Despite this, many housing developers are more accustomed to being in the business of providing home-based amenities, rather than vehicle-based amenities. This can be illustrated by the common lack of garage or vehicle shelters or workspaces provided in higher density housing options common of the past few decades. With newer Federal incentives available to incent electric vehicle charging, there may be a potential program that could be developed at the

Metropolitan Planning Office level to incent developers to consider installing chargers themselves or to coordinate with existing charging networks to install charging infrastructure in surface level parking as well as publicly accessible parking structures. One way of encouraging worthwhile investments in used and useful charging infrastructure could include reporting or performance measures, similar to the NEVI availability requirements. Incentive mechanisms could include financing assistance with lenders, loan programs, or grant processes. Being a host site to a charging network could introduce another diversified revenue stream for housing management or development companies. Figure 70 shows an existing charging location in the River Market area of Kansas City, MO adjacent to both residential and commercial developments.

Figure 70: Public L2 Chargers



6.4 Emerging Technologies

6.4.1 Wireless Charging

Among the various charging technologies, inductive wireless charging stands out as a revolutionary approach that promises to enhance the user experience while promoting the widespread adoption of electric vehicles. Inductive wireless charging is a method of transferring electrical energy from a power source to an electrical device without the need for physical connectors or cables. This technology relies on electromagnetic fields to transfer energy between a transmitter embedded in the charging station and a receiver integrated into the EV system. When the transmitter/receiver are aligned in the same frequency, or in resonance, an alternating current in the transmitter generates a magnetic field, which induces a current in the receiver, thus charging the vehicle's battery.

Figure 71: Wireless Charging Technology

Inductive wireless charging offers several benefits over traditional plug-in charging methods:

- **Convenience:** Drivers can charge their EVs simply by parking over a charging pad, eliminating the need to handle heavy cables and connectors.
- **Safety:** The absence of exposed conductive parts reduces the risk of electric shocks and trip hazards associated with cables.
- **Weather Resistance:** Wireless charging systems are less susceptible to weather-related issues, such as rain or snow, which can affect plug-in chargers.
- **Enhanced User Experience:** The seamless and automatic nature of wireless charging can encourage more frequent charging, thus prolonging the battery life and improving the overall EV ownership experience.

Despite its numerous advantages, inductive wireless charging also faces several challenges:

- **Efficiency:** Wireless charging is generally less efficient than wired charging, resulting in higher energy losses. Advances in technology are necessary to improve efficiency and reduce energy waste.
- **Cost:** The installation and maintenance of wireless charging infrastructure can be more expensive compared to traditional plug-in systems. However, as the technology matures and economies of scale are realized, costs are expected to decrease.
- **Standardization:** The lack of universal standards for wireless charging can lead to compatibility issues between different EV models and charging stations. Industry-wide collaboration is essential to establish common standards.

There are various ongoing research pilots in the US including Michigan, Utah, Florida, Indiana and Pennsylvania. Michigan has the first deployment in the US in a real-world environment that is currently operational on a ¼ stretch of road with plans to scale up to a transit corridor on Michigan Avenue in Detroit.

6.4.2 Battery Technology Advancements

The development of advanced battery technologies is central to the evolution of EVs for enhancing performance, range, safety, and affordability. Lithium-ion batteries remain the predominant energy storage solution for EVs today. They offer a good balance of energy density, cost, and performance. Additionally, advancements in battery management systems have improved safety and efficiency, ensuring optimal performance under various operating conditions.

One of the most promising advancements in EV battery technology is the development of solid-state batteries. Unlike conventional lithium-ion batteries, which use liquid electrolytes, solid-state batteries employ solid electrolytes, which offer several advantages including enhanced safety and longer lifespan. Despite these benefits, solid-state batteries face many challenges related to manufacturing scalability and high cost. Ongoing research efforts are focused on overcoming these challenges and bringing solid-state batteries to the market.

6.4.3 Hydrogen & Other Alternative Energy Solutions

Hydrogen fueling in transportation represents a promising avenue for achieving a sustainable and low-carbon future. With continued advancements in technology, supportive policies, and growing infrastructure, hydrogen has the potential to revolutionize the transportation sector. Hydrogen is the most abundant element in the universe, making it an attractive candidate for fuel. It can be produced from various sources, including natural gas, water (via electrolysis), and biomass. The process of using hydrogen as a fuel typically involves its conversion into electricity through fuel cells, which power electric motors in vehicles.

Hydrogen is particularly well-suited for heavy-duty transport applications, including trucks, buses, and trains. These sectors benefit from hydrogen's high energy density and fast refueling times, which are essential for maintaining operational efficiency.

- **Trucks:** Long-haul trucking demands high energy capacity and rapid refueling. Hydrogen-powered trucks, such as those developed by Nikola and Hyundai, offer a promising solution, reducing emissions and reliance on diesel fuel.
- **Buses:** Public transit systems are increasingly adopting hydrogen fuel cell buses, which provide quieter, cleaner, and more efficient operations. Cities like London, Tokyo, and Los Angeles are leading the way with growing hydrogen bus fleets.

6.4.4 High-Speed Charging Advancements

Fast Charging technology for electric vehicles has made substantial advancements, addressing one of the critical barriers to EV adoption. With innovations such as DC fast charging, ultra-fast charging, wireless charging, and solid-state batteries, the future of EV charging looks promising.

Various EV charging technologies are currently being employed to enhance the speed and efficiency of EV charging:

DC Fast Charging: Direct Current (DC) fast charging is one of the most common methods for quickly recharging EVs. These chargers can deliver power up to 350 kW, significantly reducing the time required to charge an EV battery. For instance, a typical 50 kW DC fast charger can replenish an EV battery to 80% capacity in about 30 minutes.

Ultra-Fast Charging: Ultra-fast chargers, often exceeding 350 kW, are designed to charge EVs even more rapidly. Companies like Tesla with their Supercharger V3 stations and networks such as Electrify America are pioneering this technology, enabling EVs to gain up to 200 miles of range in just 15 minutes.

High-Power Charging Stations: The deployment of high-power charging stations is increasing globally. These stations, capable of delivering up to 500 kW of power, are designed to cater to the next generation of EVs with larger battery capacities and longer ranges.

6.4.5 Energy Storage & Resiliency Solutions

As the adoption of EVs continues to surge, there is a pressing need to develop robust energy storage and resiliency solutions to support the growing demand for EV charging and ensure that the EV infrastructure remains reliable, efficient, and environmentally sustainable. The utility industry plays a key role in the future sustainability of EV charging. Some of the current technologies being employed are grid-scale battery storage, vehicle-to-grid (V2G), microgrids, renewable energy integration as well as backup generation.

In terms of the EV Charging infrastructure one of the most effective back power solutions is the integration of the battery storage systems. In the event of a grid failure, the stored energy can be utilized to power EV chargers. The most commonly used are Lithium-ion batteries due to their efficiency. In addition, advanced biofuel generators can provide a reliable power source during emergencies, while also aligning with environmental sustainability goals.

Hydrogen fuel cells represent a cutting-edge solution for backup power at EV charging stations.

Combining multiple backup power solutions into a hybrid system can further enhance the resiliency of EV charging infrastructure. For example, a hybrid system might integrate battery storage with hydrogen fuel cells and biofuel generators, creating a multi-layered defense against power interruptions. These types of systems can dynamically switch between power sources based on availability and demand, optimizing efficiency and reliability.

6.5 Land-Use Considerations

In the context of charging facilities needed for community-level charging, rather than NEVI charging facilities or longer distance corridors, much of the land-use needs are based on contextual location for the user. There will still be the desire for lighting and access to amenities. To move local charging in the MARC region forward there will be a need to have charging in areas that are convenient to potential users. There is a need to provide charging at the origin and/or destination locations of the users. Commonly, the first location would be the user's home or residence or that neighborhood. In this MARC plan, it's been a focus to try and provide this residential charging for individuals who may not have a single-family dwelling where they have control over their ability to install or provide charging infrastructure. Instead, this plan tries to provide solutions at the neighborhood and community level for the great remainder of users to charge at community hub locations like retail areas, government, or school areas that naturally have communities around them. Many of the locations focused on have existing, extensive parking areas and aren't separated from surrounding residential areas.

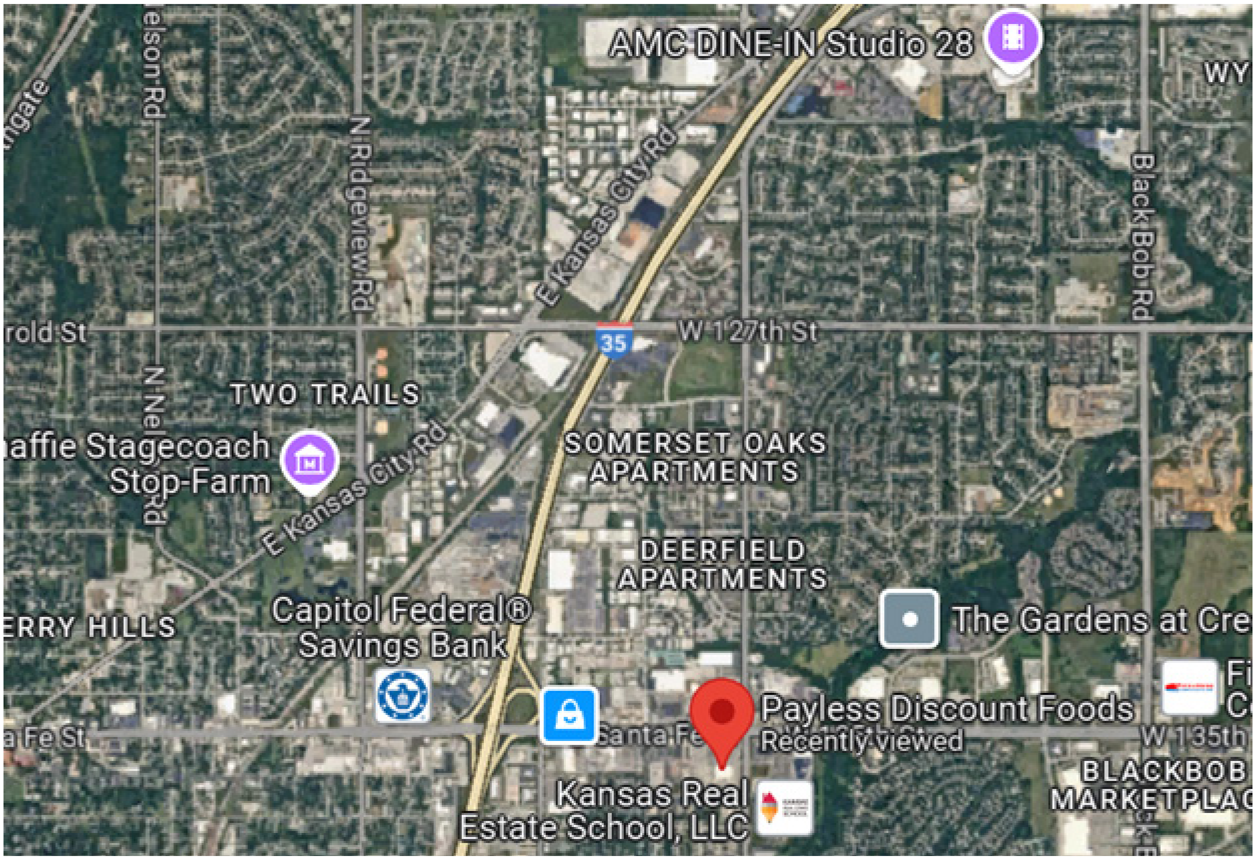
An example of one of the sample locations identified as a potential charging hub was in Blue Springs. Figure 72 illustrates the embeddedness and intention that each potential charging location is focused on convenience and serving a community, rather than just being by a highway or corridor. Using various elements of census data like identifying FHWA's disadvantaged population's definitions as well as higher propensity to purchase newer vehicles, locations were identified. The exacting location wasn't initially as important as finding an area with these conditions to try and address the higher potential to purchase an EV and need support in charging it. In this example, the charger could be placed down by the retail area in the lower left by the highway interchange. The user might then walk home to some of the various apartments or homes adjacent. Further, the High School could also offer a charging location both for students or staff that are assigned to the school, but to the adjoining neighborhoods in the off-hours of the school in which it would be advantageous to charge at an overnight, off-peak time.

Figure 72: Example DCFC Location

The goal of the MARC EV Readiness Plan was not to find a "greenfield" site in a new construction area and break new ground, but rather to try and entrench in existing, developed spaces that might not have already provided public charging that could serve as a secondary line of charging next to personal charging. Like gasoline stations as a predecessor, charging infrastructure aims to be located adjacent to a need. In contrast, charging infrastructure can weave further into a community's fabric because of the more universal availability of electricity and the lack of safety regulations not found because there aren't tanks and flammability, etc. Each charging location would provide 6-8 chargers. These could be a combination of Level 2 AC J1772 chargers as well as faster charging in the DC range with CCS or other appropriate charging protocols. The land-use adjacent to many of these locations isn't travel-based for super-fast turnover of charging facilities, but rather a location that the user is going to be at for at least 10-12 hours as a home base in their daily life. There will be time to charge, and with current battery densities, the charging rate would not have to be faster. Higher and higher densities of users might change the need for higher speeds of charging.

The other end of the journey from the residential needs would be the destination of most individuals' daily routines. That would tend to be at a workplace or destination. Similarly, there are hubs of these sorts of locations placed across the MARC region. There might be users that for whatever reason are not able to charge at home, but are parked at their workplace, or in the neighborhood of the workplace for 6-8 hours or more of their day. This could offer what is termed an "opportunity charge" that the user might regularly take advantage of to keep adequately fueled to complete their weekly commuting patterns. Figure 73 from Olathe, KS shows a commercial and retail hub of development that depending on where the charging was located would provide a charging access point that could potentially serve a large base of employee users as an alternative to home residential charging. This sort of charging opportunity can be an impactful draw for regional employees who might live in adjoining communities, but otherwise not commute or pursue employment here without such charging opportunities.

Figure 73: Example DCFC Location



6.6 Funding Strategy and EVSE Management

Federal funding strategies for EVSE deployments include various programs and initiatives aimed at supporting the development, expansion, and modernization of EV charging infrastructure. Costs to plan, construct, deploy, and operate EV charging infrastructure remain a barrier to widespread deployment. With goals to expand EV charging infrastructure construction and installation throughout the region, steady and innovative streams of funding are necessary to move towards a goal of zero-emission mobility. This section identifies two key federal funding sources that can be used to build a charging network including the NEVI program and CFI.

6.7 Federal Funding

At the time of this report's conclusion, many Federal funding programs related to Electric Vehicles and associated charging infrastructure were under review for possible revision. MARC and regional stakeholders will continue to monitor these programs as potential adjustments are made and funding programs related to EVs are made available in the future.

6.7.1 Federal Funding - NEVI

The NEVI grant program is a reimbursement grant program, and applicants must provide a minimum of 20% match of the eligible costs from non-federal sources. Applicants must commit to operating and maintaining the EV charging stations for a specified period, typically five years or longer. They must also describe their plan to meet uptime requirements of 97% or greater. The State of Kansas submitted the updated 2024 NEVI plan recently and will benefit from an estimated $40 million over the 5 years of the NEVI program. The Charge Up Kansas NEVI Plan was developed on a foundation of public outreach and engagement to ensure that the plan incorporated a wide range of perspectives and addressed charging infrastructure needs faced by communities. While MARC is not eligible for NEVI funding, continuous coordination with the NEVI program should be conducted. Collaboration with the NEVI program would ensure an accurate depiction of existing and future planned Level 3 DCFC stations around the region as well as learn and apply best practices for deploying EV infrastructure such as procurement and delivery methods as well as past performance on EVSE manufacturers and owners/operators.

6.7.2 Federal Funding - CFI

The CFI grant focuses on projects that reduce greenhouse gas emissions and expand or fill gaps in access to charging or alternative fueling infrastructure. These projects must be located on public roads or in other publicly accessible locations, address environmental justice, and be accessible to and usable by individuals with disabilities. The grant covers various costs, including the acquisition and installation of eligible infrastructure, related construction or reconstruction, acquisition of real property directly related to the project, development phase activities, and contracting with private entities for the acquisition, construction, installation, maintenance, or operation of eligible infrastructure.

MARC is eligible to apply for the CFI grant and will focus on preposition tasks to ensure a successful application in the upcoming three years. Round 1B of CFI winners was recently announced and round 2 of applications was submitted on September 11th, 2024. It is anticipated the next round of the

Electricians working to install or maintain EVSE shall be EVITP certified or shall have graduated from or have a certificate from a DOT-registered apprenticeship program.
EV charging infrastructure includes at least four (4) charging ports.
Each of the four (4) charging ports supports a continuous power delivery rating of at least 150 kW and will supply power according to an EV's power delivery request up to at least 150 kW, continuously and simultaneously with the other three (3) ports.
At least one (1) charging port is ADA accessible, and all EVSE are ADA compliant.
Charging is available at all four (4) ports 24 hours a day, 365 days a year.
A non-federal match of at least twenty percent (20%) of eligible project costs is provided by other sources.
Charging customers will have multiple payment options that do not require paying a membership fee, and which include the option for contactless payment with major credit and debit cards, and either a toll-free number or SMS option to initiate charging and submit payment.
EVSE owner will ensure that all four (4) charging ports remain in operation for a minimum of five (5) years after station is operational.
During five (5) year operating period EVSE owner will maintain all ports to achieve at least ninety-seven percent (97%) annual average uptime for each port.
During the five (5) year operating period EVSE owner will provide to NDOT quarterly and annual reports as specified in the contract. (Refer to NEVI Standards and Requirements (23 CFR 680.112) for data collection and reporting requirements.)
EVSE shall be certified by an Occupational Safety and Health Administration Nationally Recognized Testing Laboratory to the appropriate UL standards.
EVSE shall conform to the latest Open Charge Point Protocol (OCPP2.0.1) to communicate with a network.

NOFO will be posted in May of 2025. A key recent change to the NOFO is the additional funding made available to states and local agencies where the Secretary shall set aside 10% of the NEVI Formula Program each fiscal year to strategically assist with the deployment of the EV charging infrastructure (in addition to the CFI funding). By combining the NEVI 10 funds with the CFI funds, FHWA is reducing the burden on State and local applicants who would otherwise have to submit multiple applications to different programs.

6.7.2.1 Prepare for CFI

To prepare for the upcoming CFI grant MARC should focus on understanding the grant requirements and identifying deployment location priorities.

- One of the first key steps MARC is taking at this stage to get ready for the CFI application is identifying public-private partnerships to support the build-out of the public charging infrastructure. These partnerships will leverage the strengths of both sectors, combining public funding and policy support with private sector efficiency and innovation. Private companies can bring in capital, technology, and operational expertise to the projects. To identify these key partners, MARC is working on developing and posting a formal Request for Information (RFI). The primary objectives of the RFI are to acquire a comprehensive understanding of the market, assess potential solutions, and identify qualified vendors or partners.

- Another key step of prepositioning for the CFI is developing high-level cost estimates to include all the different stages of the project implementation from the planning, design, deployment, operation, and maintenance. Costs associated with the design, purchase, installation, and operation of an EV charging station are largely dependent on the location of the site, specifically site conditions, utility improvements, type of charger, vendor warranty and maintenance terms, and operational characteristics including consideration of charge management solutions, payment and reservation systems, utility and usage rates, ongoing maintenance of the chargers, and the cost of decommissioning and replacement when the charger reaches the end of the useful life or is significantly damaged or non-operational. Vendor costs including additional margins on provided services and market risks including cost escalation of parts and materials and labor should also be considered within the timing of deployment and anticipated operational life of the charger. Funding availability is the key constraint on the number of public chargers that can be deployed and establishing the private capital ahead of time will play a key role in the award and selection.
- Having all the required data compiled including the number of EV chargers and locations is another important step MARC is taking to prepare for the CFI funding. This EV Readiness plan should serve as a roadmap to inform decision-making for the short-term deployments and long-term planning of EV Infrastructure projects. Showing a solid scalability plan in the CFI grant application would be a key differentiator for selection.

7. IMPLEMENTATION RESOURCES

7.1 EV Readiness Atlas

GIS datasets and layers created as part of the Kansas City Regional EV Readiness Plan were provided to MARC for use in future planning efforts.

7.2 RFP Scope for Single-source Administration Procurement Process

Crafting a successful RFP for a CFI grant requires meticulous planning and strategic thinking. By following some of the following strategies, MARC will create an RFP that attracts high-quality proposals and aligns with the sustainable transportation goal of the regions and stakeholders. A well-executed RFP not only secures funding but also paves the way for innovative and efficient charging and fueling infrastructure solutions. The sections below highlight some of the key chapters to be included in the RFP:

7.2.1 Identify Stakeholders Roles and Responsibilities

The CFI RFP for MARC is intended to serve multiple communities and agencies in the region, therefore, clearly identifying key partners and defining their roles and responsibilities in the RFP is imperative. This will help with collaboration across the different parties during the delivery phase of the project and help the bidder get a good understanding of the contract administration.

MARC will serve as the lead contract administration agency for the CFI grant in charge of overseeing the planning, design, build, and data reporting to the FHWA during the 5-year operation and maintenance period. MARC will also be in charge of administering the funds from CFI and issuing payments to the contractor's invoices.

7.2.2 Clearly Describe the Project Goals and Objectives

The RFP will typically become part of the contract after award making the contractor responsible for fulfilling the goals and objectives laid out in the RFP. Some key goals to include in the RFP are:

- Establish a network of fast chargers across the MARC region to accelerate the adoption of EVs and reduce range anxiety
- Reduce transportation-related greenhouse gas emissions (GHG)
- Ensure a reliable, accessible, and equitable charging experience for all users
- Provide a safe project area for the users consistent with MARC region, DOT, FHWA, and AASHTO practices, guidelines, policies, and standards.

7.2.3 Technical Requirements

The technical requirements related to EV infrastructure for the CFI grant are required to comply fully with applicable sections of the National Electric Vehicle Infrastructure Standards and Requirements (23 CFR Part 680).12 These Standards specify technical aspects of chargers including connector types, power levels, minimum number of charging ports per station, minimum uptime (reliability standards), payment methods, and more; data submittal requirements; workforce requirements for installation, operation, or maintenance by qualified technicians; interoperability of EV charging infrastructure; traffic control devices and signage; network connectivity; and publicly available information. The following list is some of the minimum NEVI requirements that are recommended to be incorporated into the RFP:

7.2.4 Proposal Requirements

7.2.4.1 Scope

The contractor must provide all administration, design, construction, operations, and maintenance Work in accordance with the RFP. The following is a summary of the major items of Work:

- Design and construct (D&C) a minimum of four network-connected direct current (DC) 150 kilowatt (kW) charging ports capable of simultaneously and continuously charging four EVs at locations as indicated in provided Exhibits/Maps
- Operate and maintain (O&M) the EV charging infrastructure for a minimum of five years
- In accordance with O&M requirements
- Provide secure payment methods, accessible to persons with disabilities and persons with limited English proficiency
- Collect, process, retain, and share near real-time and static data for reporting to the FHWA.
- Provide a minimum of 20 percent of the Total Eligible Cost as the Project Company Share.

7.2.4.2 Past Performance Requirements

The RFP should include a section of the requirements of the past performance of the bidder. In the ever-evolving space of transportation electrification, many EVSE providers are not well established or do not have the financial and workforce capacity to deploy maintain, and operate for the 5-year period. Therefore, it is critical to review corporate financial details and all the staff qualifications before making a selection. The contractor and its design, construction, operations, and maintenance Subcontractor(s) have maintained, and throughout the term of the Contract and its design, construction, operations, and maintenance Subcontract(s) shall maintain, all required authority, license status, professional ability, skills and capacity to perform the Work.

7.2.4.3 Cost Estimate

The Federal share of the cost of a project carried out with CFI Program funds shall not exceed 80 percent of the total project cost (23 U.S.C. § 151(f)(10)). Cost sharing or matching is required, with the maximum Federal share being 80 percent of the total cost of the project. Awardees must provide at least 20 percent of the total project cost (not 20 percent of the Federal share) as a matching share.

To ensure a fair review of the cost from all contractors, it is very important to include a list in the RFP of all the eligible and ineligible costs per the CFI requirements. Below is a list of Eligible Project Costs for the Community Program of the CFI. MARC might choose to edit this list according to the specific needs and requirements of their project depending on existing conditions or future planned projects in the area.

In addition, to aid with the review and selection criteria, the RFP should include a cost breakdown template for the contractor to complete.