

Electric Vehicle infrastructure and policy for large cities in the Great Plains

by

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A REPORT

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Abstract

Electric Vehicles (EVs) have taken the world by storm as individual consumers, businesses, and government entities invest and adopt modern EV technology. This study investigates municipal involvement in local Electric Vehicle adoption across the Great Plains. This research was conducted using a multiple case study analysis. Selection of the three case study cities resulted from research into demographic and geographic similarities within the Great Plains. Data was sourced from documents and materials provided by federal, state, municipal entities, and documents from additional EV studies. The analysis was done as a comparative case study analysis to analyze the similarities and differences between the three selected cities. The findings reveal diverse strategies from municipalities including implementing codes for charging infrastructure, partnering with local stakeholders, supporting investment in local EV technologies, adopting EV city fleets, and public education initiatives. These findings provide valuable insights for municipal planners in the Great Plains seeking to develop recommendations for their own local EV infrastructure and policy. This study concludes by providing recommendations for other municipal entities within the region.

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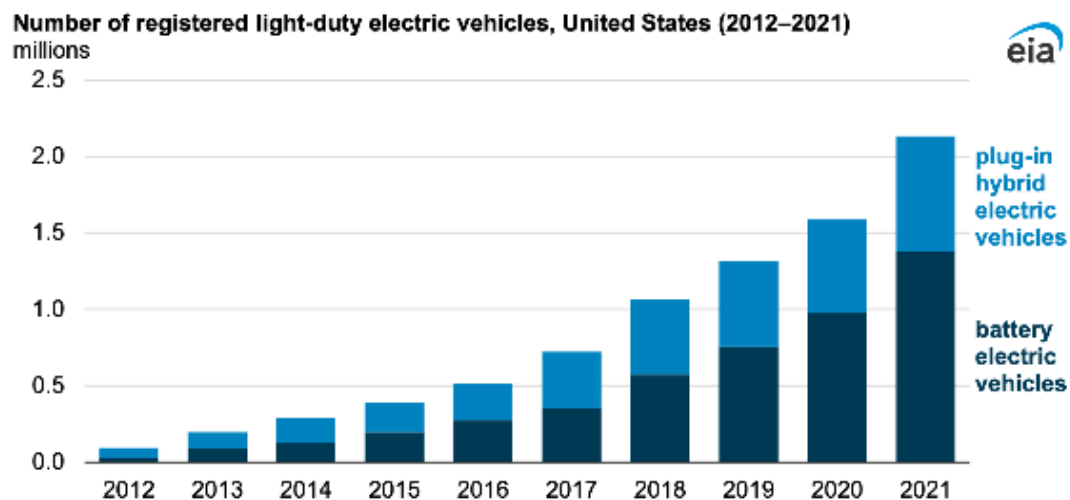
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Introduction & Research Justification

Electric vehicles (EVs) have increased in popularity across the United States over the past decade (Colato & Ice, 2023). This rapid growth is fueled by a growing emphasis on sustainability and significant advancements in EV technology. Accommodating this shift requires governments and stakeholders to collaborate on infrastructure plans and policies which supports widespread EV charging infrastructure adoption.

This research argues that the development of EV infrastructure in Great Plains municipalities is impacted by regulatory inconsistencies, funding limitations, and geographic challenges. By examining case studies of major cities in the region, this study identifies key policy strategies and infrastructure approaches that can accelerate EV adoption in similar environments.

Figure 1. Increase in Registered Electric Vehicles in the United States (Lynes & Dwyer, 2023)



Over the past decade, the United States has seen a significant increase of consumer interest in purchasing Electric Vehicles. EV sales increased across the nation as technological advancements in EV technology improved the driving range per charge, and purchasing cost of EVs became more affordable. Consumer driving for purchasing EVs includes:

- Increased Environmental concerns from the transportation industry

- Increased EV options to purchase

Increased Battery Capacity & Vehicle Driving Range

Increased Cost of Savings

Along with consumer changes, the United States adopted more policies and bills, encouraging widespread EV adoption and EV infrastructure build out. The federal government plays a significant role in shaping EV infrastructure and policies. Federal policies influence decisions made by state entities which then trickle down to municipalities. These policies also impact decisions made by large corporations and local businesses. One notable initiative is the federal target to make half of all new vehicles sold in 2030 produce zero emissions (U.S. Department of Transportation, December). A handful of Automakers, like Honda, followed suit announcing to only sell EVs by 2040 (Honda, 2021). The increase in EVs requires an extensive network of chargers to keep up with the increase of EVs on the roads.

While extensive research exists on EV adoption in high-density coastal cities, there is a significant gap in studies examining the challenges and opportunities unique to mid-sized cities in the Great Plains. Unlike urban centers with robust public transit networks, Great Plains municipalities should develop EV infrastructure within a car-dependent transportation system, creating distinct policy and infrastructure challenges. On top of a gap in research, there is also a gap in investment of EV infrastructure and policies in this region.

EV adoption in the central and southern Great Plains is higher than in other parts of the region, as shown in Figures 2 and 3. As defined by the U.S. Environmental Protection Agency (EPA), the Great Plains spans from Canada to Mexico, encompassing parts of Kansas, Missouri, Montana, Nebraska, North Dakota, South Dakota, Oklahoma, Texas, and Wyoming (EPA, 2014). While some states, like Texas, have seen significant infrastructure development, the rest of the Great Plains lags the East Coast, Midwest, and the West in EV adoption.

Areas with higher EV infrastructure development contain a higher population, more stable climate, less challenging terrain, and closer distances between large cities. The Great Plains has a unique climate, terrain, and geographic distribution of major cities. These qualities of the region provide its own challenges for EV's regarding Range anxiety, and weather concerns.

Figure 2. Electric Vehicle Charging Ports by State (U.S. Department of Energy, 2024)

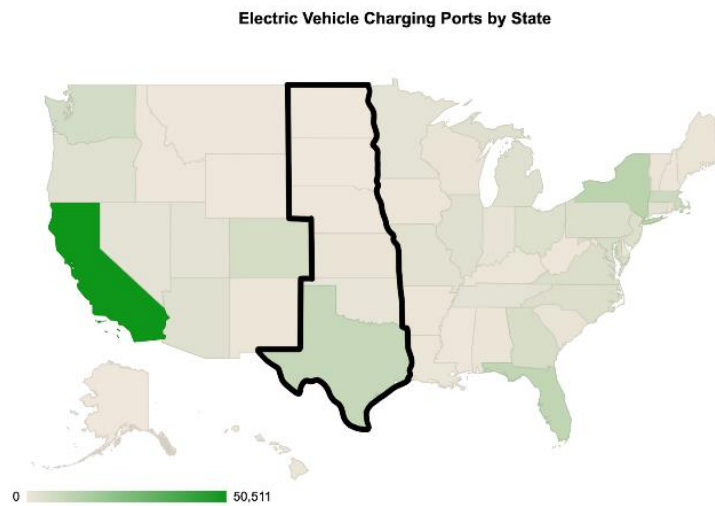
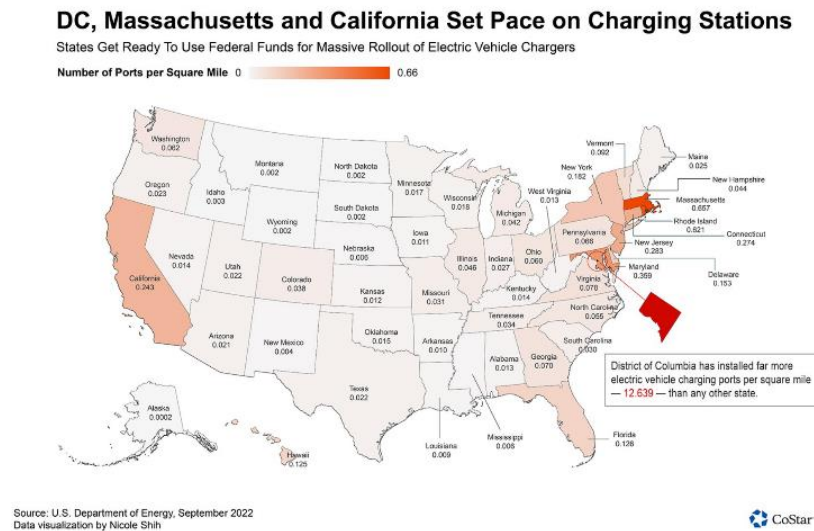


Figure 3. Number of charging ports per Square Mile (Shih, 2022)



Charging infrastructure is essential to Electric Vehicles as gas stations are to gas-powered cars. The U.S. Department of Energy defines EV infrastructure as “structures, machinery, and equipment necessary and integral to support an Electric Vehicle, including battery chargers, rapid chargers, and battery extension pack” (U.S. Department of Energy, 2009). The size and composition of the national public charging network will reflect federal, state, and local EV infrastructure initiatives.

Planning for EV infrastructure is a complex process requiring consideration of Federal, State, and Local funding mechanisms. Federal, State, and Local policy and plans can include:

- EV Master Plans
- EV Readiness Plans
- State & Local EV Ordinances
- State & Local Utilities
- Electrifying government fleets

Local municipalities hold a crucial role in fostering the adoption of Electric Vehicles (Light, 2021). They can bring together teams of diverse stakeholders to create public-private EV partnerships. Local planners should be able to identify existing relevant plans, policies and regulations, to identify changes needed to facilitate EV infrastructure development. In order to update plans, policies and regulations which incorporate EV policies into local ordinances. Municipalities should lead by example by providing education about EVs and executing plans for EV infrastructure development.

A 2021 report by Daniel C. Vock for the American Planning Association (APA) emphasizes the importance of local planners addressing charging challenges to ensure widespread access and Municipal planning in the United States can be a lengthy process due to its complex structure. Land use decisions rest with local governments that review and approve development proposals. To adapt to the growing number of EVs, local authorities EV readiness plans should address key considerations such as:

- Electric Vehicle Supply Equipment (EVSE) municipal codes and zoning regulations
- EVSE permitting processes
- Local Utility Grid Capacity
- EVSE education and Outreach programs
- Municipal EV adoption

Methods

This paper considers existing EV infrastructure plans and policies at federal and state levels to provide context for the case study cities.

This report aims to answer the following questions:

1. What Electric Vehicle Infrastructure Plans and Policies exist in large cities in the Great Plains?
2. What recommendations can be made for similar cities within the Great Plains?

To understand the current Electric Vehicle Infrastructure plans and policies in the Great Plains I used a multiple case study design. This method resulted in an in-depth study of qualitative data for infrastructure development and policies made by municipalities, states, and other involved parties. Data was collected during the Fall of 2022 – the Fall of 2023.

The case study cities provide an opportunity to investigate the actions done throughout similar cities in the Mid-Great Plains Region. Selection of the case study cities resulted from similar demographic and geographic constraints, to identify similarities and differences of EV infrastructure innovation.

Case Study Criteria:

- Located in Great Plains Region
- City Population
- Metropolitan Population
- City & State Climate
- City & State Terrain
- Location in comparison to other “Large Cities”
- Existing EV infrastructure

The research and analyses used a multi-study case study analysis to examine cities within the region. The city population and metropolitan population size can vary but needs to be classified

as a “Large City”. “Large City” is defined by the US Census as 50,000 with a metro-location of 500,000 to 2.5 million people (United States Census Bureau, 2023).

City and state climate and terrain serve as important controls for this case study because the Great Plains stretches from North to South, and through mountainous and flat land I’ve selected cities that exist in flat areas compared to mountainous and hilly regions. Drastic elevation changes can impact Electric Vehicles functionality, while flat land does not. This way consumer habits and infrastructure placements in different terrain will not be explored. Hot and or cold climates can also impact the Electric Vehicle. For example, extreme climate factors can deter people from purchasing EVs. Picking cities in areas that do not have extreme weather variants, or extreme terrain, will be used as a control to be able to compare other aspects.

Range anxiety stands as one of the top reasons consumers avoid purchasing EVs. The selection of cities in “close” proximity to other large proximity to other large metropolitans will be a constraint. If a city is more than 300 miles driving distance from a large metropolitan area, then it cannot be picked.

The case study cities need to have existing EV infrastructure plans and policies. From previous research, cities in the Great Plains have limited EV infrastructure compared to the East and West Coast. If a city has limited EV infrastructure plans and policies, there will be nothing to compare to.

The case study cities that have been selected for this study:

Kansas City, Missouri

Overland Park, Kansas

Tulsa, Oklahoma

Figure 4. Kansas City, Missouri Study Area and Population (U.S. Census Bureau, 2020)

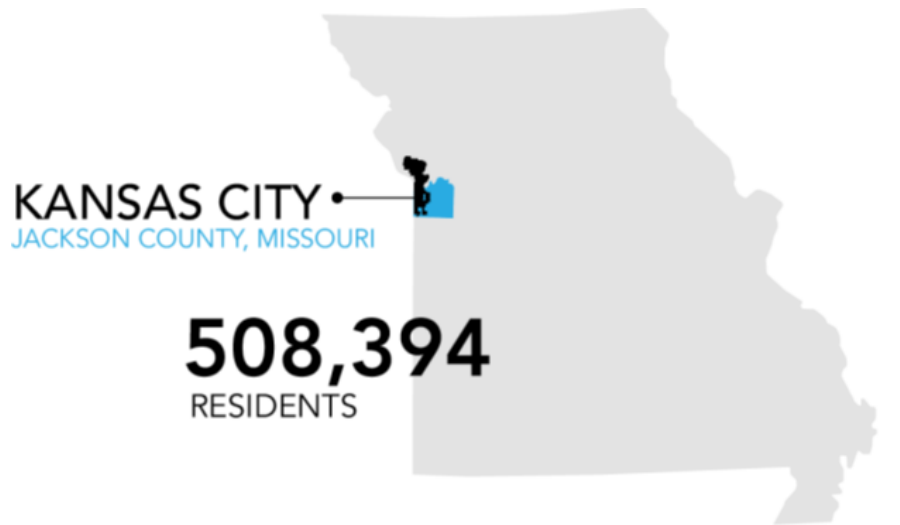


Figure 5. Overland Park, Kansas Study Area and Population (U.S. Census Bureau, 2020)

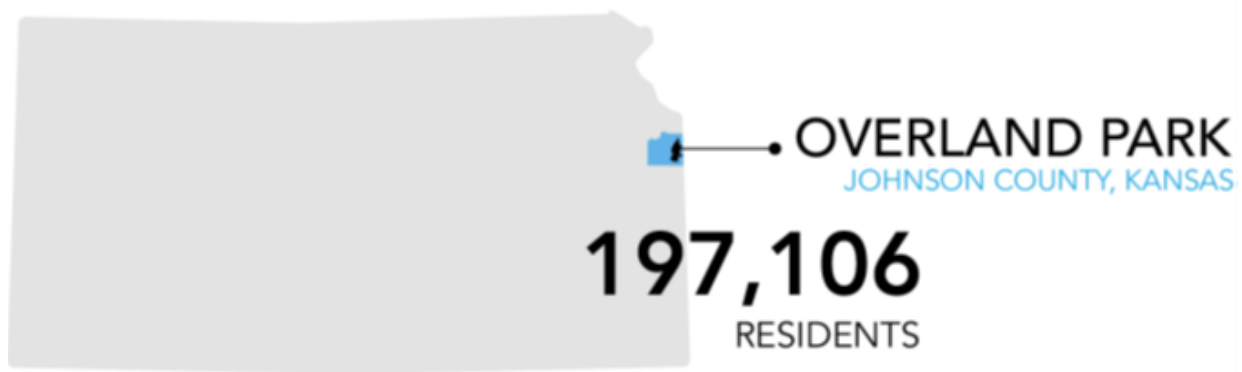
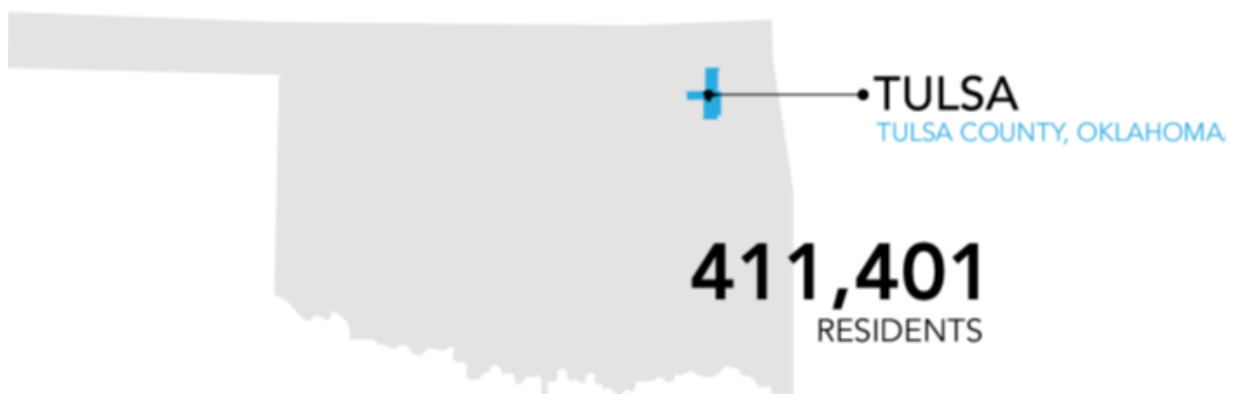


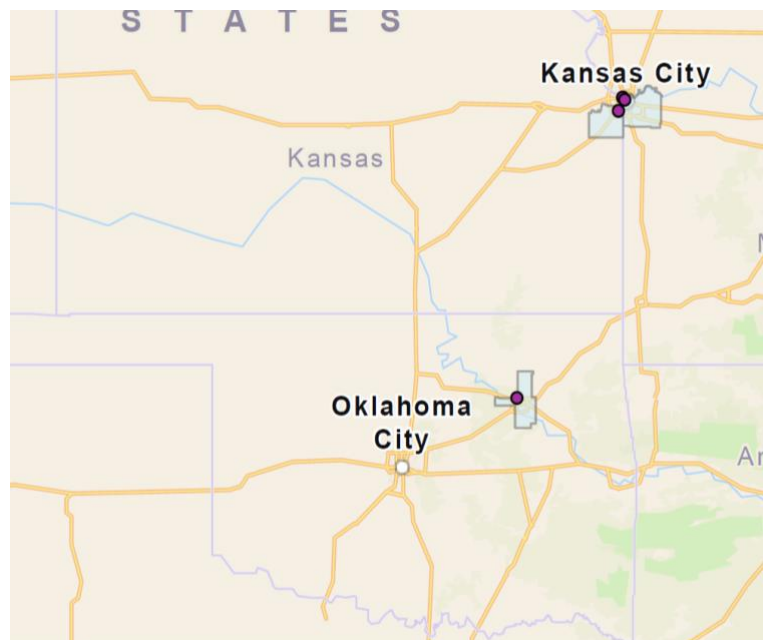
Figure 6. Tulsa, Oklahoma Study Area and Population (U.S. Census Bureau , 2020)



All three cities have data and resources on EV infrastructure plans and policies. Omaha, Nebraska was considered a case study city, but the lack of information on EV infrastructure led to it being not included in the study. The selected cities have implemented unique or noteworthy initiatives related to EV infrastructure and policy. The recommendations could be used for cities including Omaha, NE, Des Moines, IA, Wichita, KS, and Oklahoma City, OK, in addition to the three case studies.

Kansas City, Missouri and Overland Park, Kansas share a metropolitan area. These two cases present an interesting situation because they reside in the same metropolitan area but belong to two different states. Tulsa, Oklahoma represents a different area of the Great Plains Region. The metropolitan population is smaller but has a city population size like Kansas City.

Figure 7. Case Study Areas Boundaries and Proximity to each other (Google, 2024)



All three cities serve as major economic centers within their states. Strong economic growth is important for planning EVs because there could be a higher demand for EV infrastructure development (U.S. Department of Energy, 2024). Businesses and residents possessing higher disposable income tend to purchase EVs. One thing that makes Tulsa economically different is that it has a strong oil and gas industry (Oklahoma Oil & Natural Gas, 2023)

Although Tulsa is more south, the terrain and climate compares to Kansas City, and Overland Park. All three case study cities are located on relatively flat plains and have a moderate climate with occasional extreme temperatures. Although the cities can face extreme temperatures, it only happens a few days out of the year.

Table 1. Case Study Cities Criteria (United States Census Bureau, 2020)

	Kansas City, MO	Overland Park, KS	Tulsa, OK
Metropolitan Area Population	~2.39 million (shared with Overland Park)	~2.39 million (shared with Kansas City)	~1 million
City Population	~500,000	~200,000	~400,000
Economic Role	Major economic center	Major economic center	Major economic center, with a strong oil and gas industry
Terrain	Relatively flat plains	Relatively flat plains	Relatively flat plains
Climate	Moderate, with occasional extreme temperatures	Moderate, with occasional extreme temperatures	Moderate, with occasional extreme temperatures
Estimated Miles from next major city	~160 mi from Omaha, NE ~200mi from Wichita, KS ~240 mi from St. Louis, MO	~190 mi from Omaha, NE ~180mi from Wichita, KS ~260 mi from St. Louis, MO)	~100 mi from Oklahoma City, OK ~175mi from Wichita, KS ~290 mi from Dallas, TX

The methodology outlines a multiple case study analysis of Electric Vehicle Infrastructure Plans and Policies in Great Plains municipalities. A multi-method approach was used to collect the data to gain a comprehensive understanding of the selected cities. The Data collection consisted of reviewing official documents like city plans and EV policies from municipalities. While reviewing, elements pretraining to EV infrastructure were documented in an organized word file. Other online resources like government websites, news articles, and industry reports supplemented the data.

Data collection consisted of using a combination of methods. Pattern matching and explanation building identified recurring themes and patterns across the case studies. The key themes will be used to develop recommendations for future EV infrastructure development in the Great Plains. Maps and charts will be used to represent existing EV infrastructure in each case study city and state criteria: Local Infrastructure Analysis; State Infrastructure Analysis; NEVI Vision & Goals;

NEVI Public Engagement; State EV Laws; State EV Initiatives; State EV Utility Policies; Local EV Readiness Plans; City Plans; Municipal Codes; City Fleets; and Local Utilities.

A challenge of data collection was when data could not be accessed by the public. For example, some cities may have information involving a specific number of EV's in their fleet, while other cities only mention that they are using vehicles. Efforts have been made to gather relevant information, but limitations exist due to the constant change of the EV industry and policy landscape. The findings of this study will provide a snapshot of current practices, but future advancements and policy changes should be considered.

While case selection criteria will ensure some level of comparability, inherent differences between cities can make direct decisions challenging.

This research has several goals:

- Identify positive efforts and successful strategies implemented by municipalities within the Great Plains region
- Pinpoint areas where cities in the region can improve their EV infrastructure efforts
- Gain a deeper understanding of how cities approach EV infrastructure planning
- Help readers gain a deeper understanding of the process municipalities in the Great Plains use to approach EV infrastructure planning and policy
- Recommend practical EV infrastructure plans and policies implications for large Great Plains cities

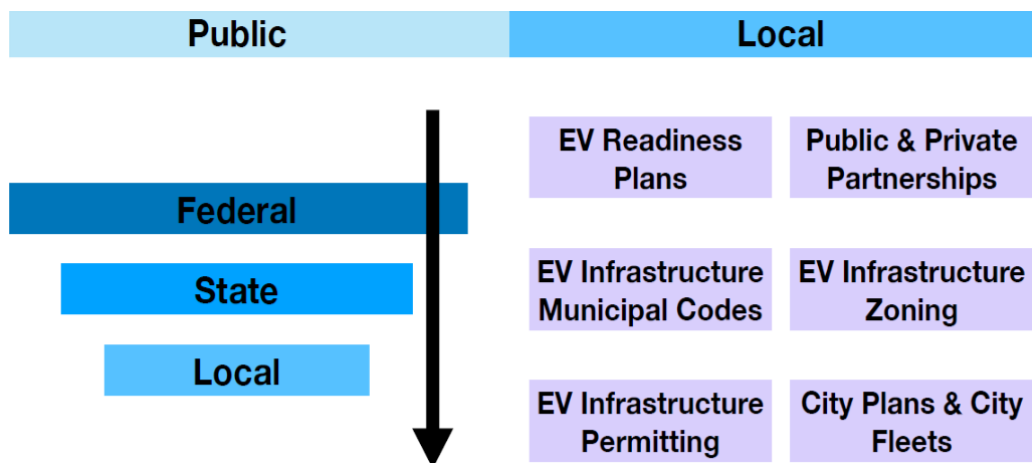
By using a multi-case study design and various data collection and analysis techniques, this research report will provide valuable insights into the current state of EV infrastructure development in large municipalities across the Great Plains region. The findings will inform policymakers, city planners, and various EV stakeholders as they work to create a more robust and accessible EV infrastructure network.

Policy & Infrastructure Context

For local municipalities and planners, federal influence on EV infrastructure and policy is crucial as it provides the framework for a robust EV network. Decisions made at the federal level influence the policies made by state entities, municipalities, and businesses like auto and EV charging companies (U.S. Department of Energy , n.d.). The Federal government serves as a main source for state and local entities to receive funding to reach their EV infrastructure goals.

Federal targets and initiatives provide guidance and incentives for local governments to integrate EV infrastructure into city planning strategies. For local planners, federal influence on EV infrastructure policy is crucial as it provides a framework for coordinated efforts and resource allocation.

Figure 8. Hierarchical Influence on Local EV Infrastructure (Elsey, 2023)



Many states have developed their own EV charging plans that set statewide goals and facilitate the deployment of statewide charging infrastructure. States can receive federal funding or create their own funding mechanisms to support build-out. States can also implement their own policies, including:

- Offering tax incentives or rebates for EV purchases
- Providing grants or subsidies for charging station installation
- Establishing a regulatory framework to encourage utility investment in EV charging

Kansas and Missouri developed a Regional Plan EV plan in December 2012 called the Electrify Heartland Plan. The plan gives recommendations for Alternative Fuel Vehicles (AFV's), including Electric Vehicles. This plan “produced a regional plan to prepare public resources and secure the economic and environmental benefits of plug-in vehicles within targeted metro areas with estimated 2.7M population” (Kansas – Missouri Community Readiness for EV and EVSE, 2012). It helped align cities in and around the Greater Kansas City Metropolitan plan (Metropolitan Energy Center and Kansas City Regional Clean Cities Coalition, 2012) for EV deployment throughout the region. Electrify Heartland began the EV infrastructure initiative in the region. It provided recommendations for cities in Kansas and Missouri to start developing their own sets of plans and policies that align with the regional goals. Recommendation examples include Planning and Zoning, permitting, incentives, and policies.

Electrify America launched to encourage cities to apply for funding and develop the initial stages of the EV charging network. This initiative aimed to invest and enhance EV infrastructure, accessibility, and educational programs across the United States for 10 years (Electrify America, 2024). A select group of cities received funding through Electrify America, enabling them to accelerate their EV infrastructure investments.

The state of Oklahoma was one of the states who originally capitalized on Electrify America funding. The funding was used to create the ChargeOK plan (Oklahoma Environmental Quality, 2020). The plans' overall goal was to increase EV adoption over gas-powered cars, mitigate harmful air emissions, and address EV charging capability concerns across Oklahoma. To do this, ChargeOK focused on two project categories:

1. Transportation Corridors – direct current fast charging (DCF) projects on designated electric vehicle transportation corridors
2. Single Point – Locations – DCFC/Level electric vehicle supply equipment (EVSE) charging projects for single destination locations or locations that serve as a community hub

Before any federal major EV initiative, in 2016, Volkswagen (VW) admitted to manipulating emissions tests to comply with Environmental Protection Agency (EPA) standards (Smith,

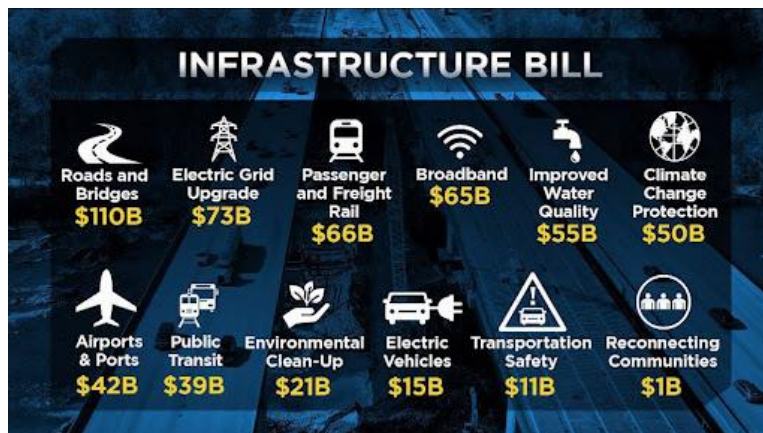
2020). Following this violation of the Clean Air Act, VW was required to establish a \$2.9 billion trust fund to help states mitigate excess emissions (Virginia Department of Environmental Quality, 2024). States could use these funds for various purposes, including EV charging infrastructure. To access these funds, states submitted Beneficiary Mitigation Plans (BMPs). These plans, drafted in 2017, allocated a maximum of 15% of funding towards EV charging infrastructure.

The Missouri Department of Resources developed a 10-year beneficiary mitigation span for awarding more than \$41 million to Missouri's specific projects by October 2027 (Missouri Department of Natural Resources, n.d.). Projects for funding included school buses, trucks, EV charging, transit shuttle & buses. The designated EV funding is limited to 15% of Missouri's total, around 6 million.

The State of Kansas receives nearly \$15.6 million over the next ten years for projects that reduce emissions (Kansas Department of Health and Environment, 2020). The Kansas Department Health and Environment is the lead agency to act on behalf of the trust for the State of Kansas. Projects: School Buses, Trucks, EV Charging, Transit Shuttle & Buses

On November 15th, 2021, congress passed the Bipartisan Infrastructure Deal, also known as the Infrastructure Investment and Jobs Act. “This law authorizes \$1.2 trillion for transportation and infrastructure spending with \$550 billion of that figure going toward "new" investments and programs” (U.S. Department of Transportation, 2023). The bill provided funding for grants and tax credits to invest in multiple infrastructure sectors: Roads & Bridges; Electric Grid Upgrade; Passenger & Freight Rail; Broadband; Improved Water Quality; Climate Change Protection; Airports & Ports; Public Transit; Environmental Clean-Up; Transportation Safety; Reconnection Communities; and Electric Vehicles. \$7.5 billion was dedicated for the build out of a national network of EV chargers across the United States (WH.GOV, 2021).

Figure 9. Funding Breakdown of the Bipartisan Infrastructure Bill (Mastriana, 2021)



NEVI

To help distribute the funding to the states, the Federal Department of Transportation established The National Electric Vehicle Infrastructure (NEVI) program. NEVI provided \$5 billion in funding for states to develop their State-wide EV Network (U.S. Department of Transportation, 2021). Funding was distributed, starting in 2022 and ending in 2026. States receiving NEVI funding must submit a plan that demonstrates how it will use the funds to prioritize building EV charging stations along designated Federal Highway Administration Alternative Fuel Corridors (AFC).

Figure 10. U.S. EV Corridor Map – Ready and Pending AFC Routes (U.S. Department of Transportation, 2022)



Alternative Fuels Corridor (AFC) criteria aim to first build out an EV network along the interstate highway system.

The FHWA AFC criteria include:

- Designated corridors feature EV Charging Stations spaced no more than 50 miles apart, with each station within one travel mile of the corridor.
- EV charging stations include at least four Direct Current Fast Charging (DCFC) ports with Combined Charging System (CCS) connectors capable of charging four EVs at 150 kilowatts (kW) each, with a total station power capacity of 600kW or more.

To continue to receive funds for their NEVI plan, states submit detailed reports on public engagement activities and outcomes. Acceptable public engagement involves diverse stakeholders, including the public, tribes, and local governments. Through the NEVI plan process, Missouri, Kansas, and Oklahoma conducted their own variations of public engagement.

Table 2. NEVI Public Engagement Efforts by State

	Missouri	Kansas	Oklahoma
Public Engagement Efforts	• Conducted a 26-question survey for public feedback • Held meetings with stakeholders and utilities • Led public education meetings • Limited further engagement beyond initial meetings	• Held meetings with stakeholders, focus groups, telephone town halls, and public outreach	• Categorized stakeholder groups (planning, technical, stakeholder organizations, equity communities, and public) • Provided a detailed 4-phase annual public engagement process • Defined communication methods and meeting formats
Future Engagement	• Future public engagement meetings planned, following national NEVI best practices.	• Ongoing engagement through the Kansas EV Corridor Planning group.	• Follow through with the 4-phase engagement plan.

	• Focused on defining engagement goals and providing foundational information.	• Focused on addressing concerns about charging availability and costs.	• Continue stakeholder and community-based engagement. • Annual plan updates.
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Public engagement for State NEVI plans varies. Kansas stands out for its proactive public engagement efforts. They conducted extensive public engagement activities including hosting meetings, conducting surveys, and having focus groups from 2017-2022. This approach identifies strong public interest in EV infrastructure deployment. In contrast, Missouri hosted limited public engagement activity. Missouri's NEVI did state that they plan to develop best practices for public engagement, and to eventually hold meetings. Oklahoma falls somewhere in-between. They have a clear four-phase annual public engagement, which outlines their outreach to stakeholders and to the public. No details on the feedback received appeared in their NEVI report. Overall, Kansas takes the lead with its comprehensive public engagement strategy.

NEVI plans outline clear fiscal goals, both yearly and 5-year, to demonstrate how the funds will be distributed. The plan first details their vision for Alternative Fuel Corridor completion. This includes contracting strategies for private entities involved in installation, operation, and maintenance of charging stations. Plans can also include how they will use the funding post-AFC completion.

Table 3. NEVI Plans Goals and Approach by State

	Missouri	Kansas	Oklahoma
Key Goals	• Serving communities and travelers • Leveraging existing infrastructure • Resilient and sustainable fueling	• Sustainable movement of goods and people • Modernizing transportation infrastructure • Promoting community investments	• Top 10 EV performance • Responsible resource development • Comprehensive charging plan • Data Gathering and evaluation • Access to charging stations

Strategic Approach	• 5-year phased deployment: planning, corridor gaps, then other projects	• 5 performance measures for tracking progress	• Builds on VW settlement, ODOT, and Governor's goals • Phased deployment: AFCs, regional, local routes • Renewable energy integrations
Alignment with Existing Plans	• General alignment with state goal	• General alignment with state goals	• VW Settlement goals, ODOT's LRTPS, Governor's Plan

Missouri prioritizes practicality, focusing on accessibility to charging stations and building a reliable network across the state. To do this the plan prioritizes fill-in gaps in existing corridors. Kansas has a more ambitious vision, aiming to be a leader in EV network development. They emphasize collaboration with stakeholders, reducing emissions through EV adoption, and ensuring equitable investment in disadvantaged communities. Kansas even tracks progress through specific performance measures related to these goals. Oklahoma aims to become a top 10 EV performing state. They have an ambitious goal focusing on building designated corridors to boost EV driver confidence, expanding regional and local routes for better connectivity, and even developing renewable energy sources to power EVs.

EV charging infrastructure deployment discusses the strategy and policies for deploying EV charging infrastructure. This section aims to provide as much detail as possible about planned locations and the overall strategy for installation. The locations should include the street addresses, and the strategy should prioritize installation along designated corridors (the Interstate Highway System). The details should also include new infrastructure deployment types, upgrades to existing infrastructure, and the utility territories where installations or upgrades will occur.

State Policies and Incentives

The federal government offers tax credits to incentivize the adoption of electric vehicles and the installation of EV charging equipment. For new EV purchases, a tax credit of up to \$7,500 is available under Internal Revenue Code Section 30D (IRS, 2024). This credit can reduce the cost of purchasing a new qualified plug-in EV. However, changes introduced by the Inflation Reduction Act of 2022 modified the rule for this credit, making it available to vehicles purchased from 2023 to 2032. In January 2024 consumers can transfer this tax credit to car dealers to reduce the purchase price of eligible new and used vehicles at the time of sale (U.S. Department of Energy, 2023).

For EV purchases, beginning January 1, 2023, buyers may qualify for a tax credit of up to \$4,000 for qualified used electric vehicles. The credit equals 30% of the sale price, capped at a maximum credit of \$4,000 (U.S. Department of Energy, 2024). It is important to note that these credits are nonrefundable, and no excess credit can be applied to future tax years. The federal government offers tax credits for EV charging equipment installed in residential properties. Consumers who purchase qualified residential charging equipment may receive a tax credit of 30% of the cost, up to a maximum of \$1,000 (U.S. Department of Energy, 2024). This incentive aims to encourage the widespread installation of EV charging infrastructure, supporting the growth of electric vehicles.

State EV infrastructure and policy initiatives are crucial for advancing the adoption of Electric Vehicles. Some states have developed EV charging plans. The plans are set to statewide charging station goals, and facilitate the deployment of charging infrastructure across urban, suburban, and rural areas. States can create their own policies, funding mechanisms, and strategies to support EV adoption and infrastructure Development. State registration fees and incentives, along with utility programs and partnerships, can promote EV adoption and support charging infrastructure development.

Missouri's incentives, including significant support for charging infrastructure, have shown a shift toward localized utility-driven rebates, as seen by local providers Evergy and Kirkwood Electric. This highlights a reliance on utility companies to drive residential and some commercial

EV adoption. Kansas, sharing Evergy's service, mirrors the residential rebate strategy. But, emphasized substantial support for commercial and multi-family dwelling charging infrastructure development. Oklahoma, in contrast, showcases a broader state-driven approach.

The incentives include direct financial assistance for clean school bus replacements, weight exemptions on alternative fuel vehicles, tax credits for commercial infrastructure, and extensive grant programs for public charging stations. Indicating a more proactive and comprehensive state-level investment in EV infrastructure and adoption.

Oklahoma's incentives stand out for their breadth and depth, demonstrating a strong commitment to foster a comprehensive EV ecosystem. The focus on public charging infrastructure, especially fast-charging, addresses range anxiety and promotes long-distance EV travel. Additionally, the inclusion of school bus replacement rebates and weight exemptions signals a commitment to environmental sustainability and broader adoption of clean transportation technologies.

Missouri and Kansas, while offering valuable residential rebates, appear to rely more on utility-driven initiatives, limiting the scope and pace of EV infrastructure development compared to Oklahoma's state-led programs. A key takeaway is that state-level coordination and investment, as seen in Oklahoma, can be effective in driving EV adoption and infrastructure development, while utility-driven programs can supplement these efforts by targeting residential adoption and localized charging needs.

Missouri's approach emphasizes internal state fleet conversion and tax exemptions to incentivize private AFV adoption, signaling a less comprehensive regulatory effort. The establishment of the Alternative Fuels Commission indicates a commitment to policy development and consumer education, but the state's direct regulatory involvement in private EV infrastructure development appears limited. Kansas prioritizes regulatory clarity within the utility sector, exempting EV charging station electricity resale from standard public utility regulations. Focused on streamlining utility involvement and conducting rate studies suggests a strategy aimed at fostering a favorable environment for private EV charging infrastructure development, without direct state ownership or operation.

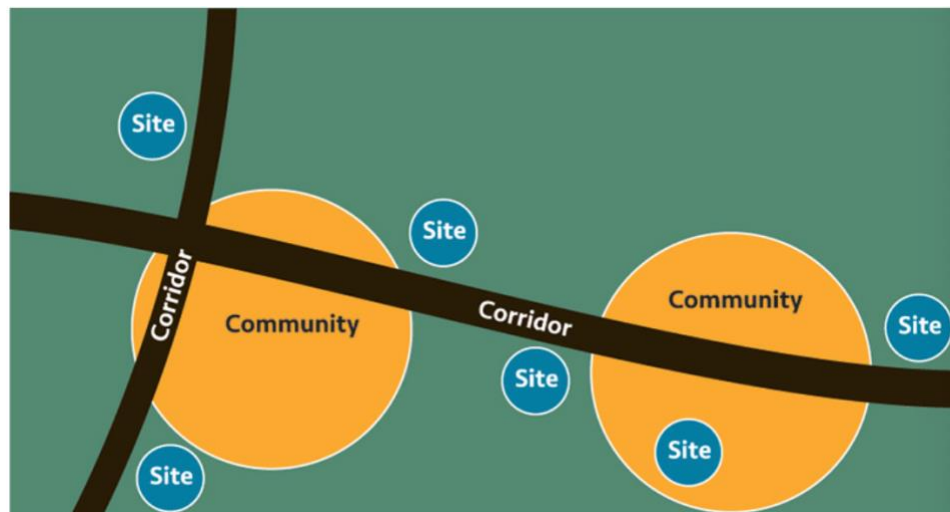
Oklahoma's multifaceted regulations encompass infrastructure development, taxation, and financial incentives. The state's ability to build and operate public charging stations in underserved areas demonstrates a proactive approach to addressing infrastructure gaps in rural regions. Oklahoma imposes a per-kilowatt-hour tax on public EV charging, which funds road infrastructure, and allows EV owners to claim this as an income tax credit. An approach to balancing infrastructure development with fiscal considerations. Oklahoma's C-PACE program and income tax credits for charging-related expenses further indicate a commitment to incentivizing both commercial and residential EV adoption. Additionally, Oklahoma encourages government and school fleet conversions to AFVs, while restricting municipalities from using electric system revenue for charging station construction

EV Infrastructure

EV infrastructure extends beyond installing charging stations. It represents a complex and interconnected ecosystem encompassing the physical charging hardware, the electrical grid and its capacity to support increased demand, the software and networks that manage charging and billing, the policies and regulations that govern its deployment and use, and the broader urban planning considerations that determine optimal locations and accessibility. Understanding this multifaceted nature is crucial.

Advancement in EVs and EV charging technology continue to evolve. To ensure consistency and predictability for EV users, the Federal Highway Administration (FHWA), with support from the Joint Office of Energy & Transportation, has implemented minimum standards for EV charging infrastructure. The standards encompass the number of charging ports, connector types, power levels, availability, payment methods, uptime/reliability, network connectivity, and interoperability. One of the fundamental pillars of EV infrastructure is the availability and accessibility of charging stations. Although most EV owners choose to do most of their charging at home, because of cost and convenience. Planning for an extensive EV network that can seamlessly integrate into an array of individuals lifestyles key.

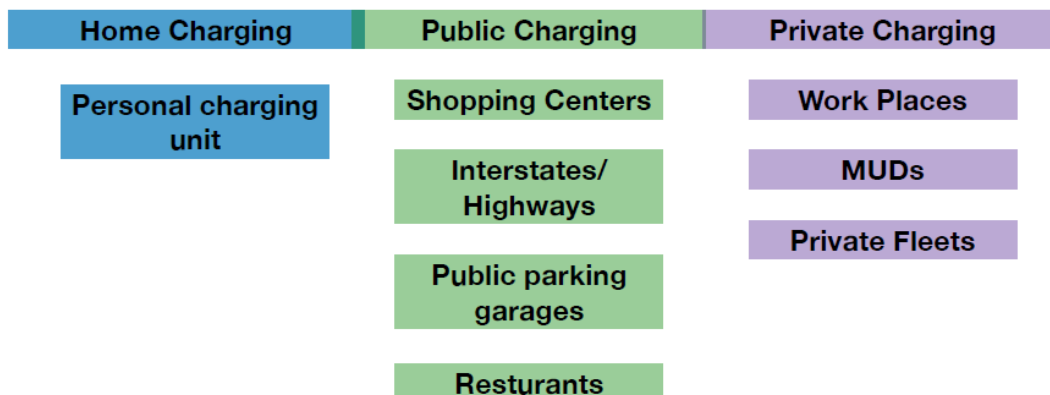
Figure 11. Levels of Infrastructure Planning (Community, Corridor, and Site)



The U.S. Department of Transportation divides EV infrastructure planning into three tiers: Corridor-level, Community-level, and Site-level planning (site). Corridor-level planning focuses on road and highway infrastructure: vital for long-distance travel. Community-level planning addresses the diverse infrastructure needs of regions or towns. It involves collaboration among local governments, transportation planning agencies, transit agencies, and community organizations to effectively develop infrastructure that meets the unique needs of each community. Site-level planning entails detailed plans for charger installation at specific locations.

Public charging is the visible part of the EV charging network. Public EV Charging stations are considered “EV charging stations that are available to all EV drivers and located in publicly accessible locations, such as commercial locations or along highway corridors” Private charging is more hidden and is found in personal garages, at apartment complexes, and certain types of workplaces. The NREL considers Private EV Charging as “EV charging stations that are available only to certain drivers for specific purposes, such as charging for transit fleets or employee-only charging at workplaces”.

Figure 12. Types of Locations of Electric Vehicle Charging



Level 1 Chargers are the slowest type of EV charger. They can be used in homes or any other 120-volt AC outlet EX: a regular household plug. Level 1 Chargers are the most convenient for home charging, and most EVs come with a charging cable to charge at home. 120-volts is small, so using a regular outlet chargers EVs at a slow rate. For example, eight hours of Level 1 charging can add about 40 miles of range to a mid-size EV. Level 1 chargers are rarely used for public charging stations due to the slow charging speed.

Level 2 Chargers are significantly faster than Level 1. The chargers use a higher voltage electrical service to charge the EV faster (240-volt residential or 208-volt commercial). Level 2 Chargers are found at both at home and public charging locations. To use Level 2 charging at home, a 240-volt service must be installed. Currently, Level 2 is the most common type found at public charging stations.

DC Fast Charging is the fastest way to charge an EV. DC Fast Charging stations can significantly reduce charging time compared to Level 1 or Level 2 charging, making long-distance travel more practical. The chargers use direct current electricity, to enable rapid charging. As of 2022 over 20% of public EV charging stations in the US were DC Fast Chargers. This number has increased as the government has provided funding for installing DC Fast Chargers. Installing DC Fast Chargers is key to expanding charging accessibility.

Table 4. Electric Vehicle Charging Level Specifications (U.S. Department of Transportation, 2023)

EV Charging Level	Voltage and Type of Current	Location	Charging Rate	Charging Duration
Level 1 (AC)	120V – AC	Residential	4 Miles/Hour	30 + Hours
Level 2 (AC)	240V – AC	Residential/ Commercial	12-30 Miles/Hour	8-12 Hours
Level 3	480+V – DC (DC Fast Charging)	Commercial	3-15 Miles/Minute	30 Minutes to 80 %

The data indicates varying levels of EV adoption across the three states in 2022. Kansas had the lowest number of registered EVs, while Missouri had a slightly higher number than Oklahoma. However, Oklahoma experienced a significant increase in EV registrations in 2022 compared to the previous year. The availability of charging infrastructure, particularly Level 2 and Level 3 chargers, is crucial for supporting EV adoption

EVs per Charger Port (Level 2 & 3): This metric provides an overall picture of the balance between the number of EVs and the more practical charging options. Kansas had the most favorable ratio, suggesting a better charging experience for EV owners compared to Missouri and especially Oklahoma, which had a significantly higher number of EVs per Level 2 or 3 charger.

State-level policies and incentives can play a significant role in promoting EV adoption and the development of charging infrastructure. For example, Oklahoma offered a one-time tax credit for first-time EV buyers in 2022. Kansas had a higher annual registration fee for EVs compared to standard vehicles. Missouri's EV registration fees were set to increase annually starting in 2022. The Infrastructure Investment and Jobs Act, enacted in November 2021, allocated funds to states for building out EV charging infrastructure, including \$99 million for Missouri, \$39.5 million for Kansas, and an unspecified amount for Oklahoma. These funds are intended to improve the availability and reliability of charging stations across the states.

Experts anticipate a continued increase in EV adoption in the coming years, which will necessitate further investment in charging infrastructure to keep pace with the growing number of electric vehicles on the road. States are developing plans to utilize federal funding and encourage private investment in charging networks.

Table 5. EV Registrations and Charging Port Availability by Level in MO, KS, and OK (2022)

Category.	Missouri (2022)	Kansas (2022)	Oklahoma (2022)
EVs Registered	17,900	7,600	16,300
Level 1	1 (17,900:1)	1 (7,600:1)	3 (5,433:1)
Level 2	1,846 (10:1)	817 (9:1)	385 (42:1)
Level 3 DCFC	292 (61:1)	153 (50:1)	622 (26:1)
EVs per Level 2 & 3 Port	6:1	5:1	35:1

Note: The ratios in parentheses indicate the number of electric vehicles per charging station of that specific level. The last row shows the ratio of electric vehicles to the total number of Level 2 and Level 3 charging ports combined.

Kansas City has a proactive early-stage planning strategy through the Greater Kansas City Plug-In Readiness Strategy and the Electrify Heartland Plan. These plans laid a comprehensive foundation for EV integration. The implementation of these plans led to a substantial charging network with 1,450 stations. The charging stations include a mix of Level 2 and DC fast chargers. Overland Park has 323 stations, which are predominantly Level 2 chargers. Tulsa's EV charging infrastructure, with 367 charging stations includes a mix of Level 2 and DCFC charging stations.

Table 6. Charging Station Availability and Types in Kansas City, Overland Park, and Tulsa

	Kansas City, Mo	Overland Park, KS	Tulsa, OK
Total Charging Stations	1,450	323	367
Level 2 Chargers	158	~95% total	167
DC Fast Chargers	102	Not specified	32
Free Public Charging Stations	108	Not specified	24

Case Studies of EV Infrastructure in Great Plains Cities

The successful integration of electric vehicle (EV) infrastructure and policies within a municipality relies on a general understanding of factors that shape urban environments. Planners play a pivotal role in navigating these factors by considering not only the technical aspects of charging station deployment but also the broader context of existing transportation networks, energy grids, and land use regulations. Their responsibilities extend to crafting long-term transportation and climate action plans, while also addressing the immediate practicalities of building and zoning codes, parking ordinances, and the dynamics of the local housing market. This perspective ensures EV infrastructure development is an integrated component of a sustainable and functional urban ecosystem.

Effective municipal EV infrastructure and policy develop partnerships across a diverse range of stakeholders. Collaboration with various city departments, including Transportation, Public Works, Capital Planning, Permitting, and Sustainability, is essential for aligning EV initiatives with broader municipal goals and operational realities. Engaging with local businesses, such as developers and car dealerships, provides valuable insights into market trends and implementation opportunities. Incorporating the expertise of local institutions like universities and, most importantly, the perspectives of community representatives ensures that EV infrastructure and policies are equitable, accessible, and truly serve the needs of all residents. This collaborative approach, guided by the strategic vision of planners, is fundamental to creating a successful and sustainable EV ecosystem within the municipality.

EV Readiness Plans

Municipalities can streamline EV adoption by creating EV readiness plans and implementing policies that address zoning, permitting, and other regulatory aspects. A 2021 report by Daniel C. Vock for the American Planning Association (APA) emphasizes the importance of local planners proactively addressing charging challenges to ensure widespread access and establish their comment as an EV leader.

To adapt to the growing number of EVs, local authorities EV readiness plans should address key considerations such as:

- Electric Vehicle Supply Equipment (EVSE) municipal codes and zoning regulations
- EVSE permitting processes
- Local Utility Grid Capacity
- EVSE education and Outreach programs
- Municipal EV adoption

Kansas City lacks a dedicated EV Readiness Plan, however as of April 2024 they do have a Request for Proposal open. Regionally, The Mid-America Regional Council (MARC), which serves as Kansas City's Metropolitan Planning Organization (MPO) and Council of Governments (COG), implemented an EV Readiness Plan. This plan includes updates to building codes to ensure new construction projects are equipped to accommodate future EV charging stations, streamlining the installation process for residents and businesses. The plan also outlines a streamlined permitting and inspection process for electricians and communities.

Overland Park adopted an EV Readiness Plan in 2024, which focuses on expanding its municipal EV fleet and public charging infrastructure. The plan's emphasis on shared public-fleet charging, standardized installation procedures, and exploring various ownership models indicates a pragmatic approach to building a sustainable and efficient EV network (City of Overland Park, 2023).

Tulsa, while not having a dedicated EV Master Plan, incorporates EV considerations into its broader Tulsa Mobility Innovation Strategy. This strategy, adopted in 2018, highlights a forward-thinking approach to integrating EVs within a larger vision of sustainable and equitable transportation, focusing on micromobility hubs and policy considerations for EV charging (Bynum, et al., 2022). The idea of the mobility hub creates connections for EV shuttles, electric charging infrastructure, and is an area designed for Autonomous Vehicles (AV).

Table 7. Comparison of Municipal EV Readiness Plans

	Kansas City, MO	Overland Park, KS	Tulsa, OK
Plan	MARC Regional Plan	EV Readiness Plan	Tulsa Mobility Innovation Strategy
Plan Focus	• Regional Plan • Infrastructure • Building Codes • Permitting • Public Education • Utility grid integration	• City-led • Municipal fleet electrification • Public charging infrastructure expansion • Public/private partnerships	• Integrated within broader transportation and environmental sustainability plans • Focuses on infrastructure expansion and policy considerations
Infrastructure Development	• Identifying key corridors for future charging stations • Exploring partnerships • Considers emerging technologies	• Expanding city-owned charging infrastructure • Encouraging private development • Explores shared public-fleet charging	• Expanding charging infrastructure through grant funding and strategic placement • Slower chargers in parking lots and garages
Policy and Regulation	• Updates to building codes • Streamlined permitting/inspection processes	• Defines "EV Ready Space" and "EV Capable Space" • Emphasizes standardized installation procedures	• Suggests integrating EV readiness criteria into building codes • Addresses data sharing, user fees, and charging station requirements.
Public Education/Engagement	• Includes training programs for EV technicians and first responders, and public education campaigns	• Focus on engaging the community for electrification	• Acknowledges the need for equitable access to EVs and charging infrastructure
Fleet Electrification	• Not a primary focus in the regional plan.	• Significant emphasis on transitioning the municipal fleet to EVs	• EV adoption is considered within the broader context of clean fuel technologies

Utility Integration	• Strong consideration of utility grid impacts	• Strong consideration of utility coordination	• Consideration of utility impacts
Funding	• Leverages regional resources	• Aims to gain funding through federal grants, and partnerships.	• Relies on grant funding
Key Strategies	• Regional cooperation, building code updates, and public education	• Public/private partnerships, and standardizing installation	• Grant funding, and building code integration

Overland Park’s detailed EV Readiness Plan stands out for its actionable recommendations and strategic planning, regarding fleet integration and public-private partnerships. Kansas City’s reliance on regional planning through MARC provides a comprehensive, multi-faceted approach, addressing not just infrastructure but also the regulatory and educational aspects of EV adoption. Tulsa’s integration of EV considerations within a broader mobility strategy reflects a long-term vision for sustainable transportation, though the lack of a dedicated EV plan may result in slower, less focused implementation. The focus on equity and advanced transportation technology centers shows a strategic approach to future mobility.

Municipal Plans

Various municipal plans were reviewed to supplement information for the EV readiness plans. The cases study cities implemented related EV infrastructure plans and policies in other official local plans and documents.

Tulsa's PlanIt Tulsa Transportation plan, and Environmental plan demonstrates the most actionable strategies for EV adoption (City of Tulsa, 2023). The transportation plan focuses on expanding charging infrastructure through grant funding and strategic placement of slower chargers, while the environmental plan emphasizes integrating EV readiness into building codes and utilizing existing programs for incentives (City of Tulsa, 2023). This dual approach,

combining immediate infrastructure development with long-term policy adjustments, indicates a commitment to transitioning to electric vehicles.

Overland Park's comprehensive plan, while acknowledging the importance of EV infrastructure through objectives like "EV Ready Space" and "EV for New Construction," focuses on improving regional transportation connectivity (City of Overland Park, 2024). Its inclusion of clear definitions for EV-related terms suggests a foundational understanding, but the plan lacks the detailed implementation strategies seen in Tulsa's plans.

Kansas City's KCMO Playbook, in contrast, offers a more generalized perspective on EV integration (Kansas City, 2024). While the plan acknowledges EVs as part of emerging transportation technologies and within environmental sustainability goals, it lacks specific strategies or action plans for infrastructure development. The plan's mention of EVs within larger transportation and environment contexts suggest a recognition of their importance, but the absence of concrete steps indicates a less focused approach compared to Tulsa and Overland Park. This discrepancy may reflect differing priorities or stages of EV readiness within each city.

Tulsa's comprehensive plans demonstrate the most proactive and detailed approach to EV integration, combining infrastructure development with policy adjustments. While Overland Park shows a foundational commitment with clear objectives, though lacking detailed implementation. Kansas City's plan, while acknowledging EVs, lacks the specificity and actionable strategies seen in the other cities.

Municipal Code

Kansas City's code provides a broad regulatory framework, detailing permitted uses, parking requirements, equipment design, and fee structures for both private and public charging stations. This approach emphasizes operational guidelines and standardization, ensuring clarity and consistency in infrastructure deployment. However, it lacks specific focus on future-proofing new residential construction that is evident in Overland Park's code.

Overland Park's regulations, particularly sections 16.110.AV and CB, prioritize integrating EV readiness into new residential developments, mandating provisions for future charging stations in single-family homes and multi-unit buildings. This forward-looking approach addresses the long-term infrastructure needs of a growing EV market, focusing on "EV Ready" and "EV Capable" spaces. Tulsa's municipal code, while also allowing for diverse charging station placements and parking considerations, distinguishes itself by emphasizing accessibility and safety. The code's requirement for unobstructed pedestrian pathways and clear signage underscores a commitment to integrating EV infrastructure seamlessly into the urban environment, while also ensuring public safety

Table 8. Comparison of Cities Municipal Codes

	Kansas City, MO	Overland Park, KS	Tulsa, OK
Scope/Focus	Operational guidelines, permitted uses, parking requirements, equipment design, and fee structures for both private and public stations.	Integration into new residential construction, "EV Ready" and "EV Capable" spaces, and definitions of EV terms.	Placement of charging stations, designated parking spaces, accessibility, safety, and clear definitions.
Permitted Uses	Private stations in all zoning districts; public stations in nonresidential uses.	Provisions for future charging in new single-family homes and multi-unit buildings.	Private stations in all zoning districts; public stations as accessory use to non-residential buildings.
Parking Requirements	EV charging stations can count towards minimum off-street parking requirements; fines/towing for non-charging use of EV spaces.	Designates percentage of parking spaces as "EV Ready" or "EV Capable" in multi-unit buildings.	EV charging stations can count towards minimum parking requirements; designated EV parking spaces.
Equipment/Infrastructure	Detailed definitions and standards for charging equipment, levels of charging, battery exchange stations, and EV infrastructure.	Defines Electric Vehicle Supply Equipment (EVSE) and "EV Ready" spaces.	Requires charging equipment to be positioned to avoid obstruction; clear definitions of EV and EV infrastructure.

Future Planning	Less emphasis on future-proofing new construction compared to Overland Park.	Mandates provisions for future charging in new residential developments.	Integrates EV charging considerations into development planning.
Accessibility/ Safety	Less focus on pedestrian accessibility.	less focus on pedestrian accessibility.	Requires unobstructed pedestrian pathways and clear signage for public stations.
Fees	Property owners can collect service fees.	Not heavily detailed.	Not heavily detailed.

Tulsa's comprehensive approach, which includes clear definitions and usage regulations, suggests a strategic effort to promote EV adoption by addressing both infrastructure development and user experience. Kansas City's operational focus provides a foundational regulatory framework, while Overland Park's emphasis on future-proofing new construction addresses long-term EV integration. However, Overland Park lacks the operational details that the other two cities have. Tulsa's approach balances infrastructure development with public safety and user accessibility, showcasing a more holistic strategy for EV adoption. Each city's code reflects its unique priorities and urban planning considerations, with Tulsa demonstrating a particularly robust and user-centric approach.

Municipal Fleets

Electrifying municipal fleets with EVs is another important step. This not only reduces the city's overall emissions but can also allow a municipality to set a positive example for the community.

Kansas City has initiated a multi-faceted approach to electrifying its city fleet, beginning with the introduction of 15 electric buses in 2021 (Green, 2021), followed by the integration of EVs and hybrids into the fire department's fleet in 2023 (KCMO 311, 2023). Partnerships with companies like Zum are underway to transition school buses to electric (Zum, 2024). The city's 2024-2025 budget indicates a strong commitment to expanding EV adoption across various municipal departments, including waste management, with plans to introduce its first electric trash truck (KCMO 311, 2024).

The Kansas City Fire Department started transitioning their fleet to EVs, to save an estimated \$14,000 per vehicle annually (KCMO 311, 2023). While the total number of EVs in the city's fleet remains unspecified, the allocation of funds for zero-emission vehicle replacements signifies a substantial push towards fleet electrification. Overland Park, with a fleet of approximately 480 vehicles, has a more gradual approach, currently maintaining 17 electric vehicles and outlining clear guidelines for future EV purchases across municipal departments.

Tulsa's fleet electrification strategy is distinguished by its ambitious "Connected 2050" plan, aiming for a zero-emission bus fleet by 2025 (Trotter, 2021). The city has already deployed electric buses with impressive range and performance.

Tulsa's Equipment Management Division (EMD) developed a Green Fleet Action Plan (GFAP), which received national recognition for its progressive goals. This plan focuses on transitioning the light-duty vehicle fleet to zero-emission vehicles, with targets for replacing petroleum-fueled vehicles and installing EV charging stations (City of Tulsa, 2021). The GFAP sets a physical goal of installing 50 EV charging stations by the end of 2025. Tulsa actively engages employees in emissions reduction through incentives and partnerships for educational outreach and infrastructure development.

Unlike Kansas City's broader, but less quantified, EV adoption, and Overland Park's more gradual approach, Tulsa's initiatives are marked by clear, aggressive targets and a comprehensive strategy that includes both public transit and light-duty fleet electrification.

Local Utilities

Local utilities are the backbone of the power grid and play a key role in EV infrastructure development. They can invest in building and upkeeping charging stations. Local utility providers can also offer special rates for EV charging and can offer rebates for installing charging stations for personal or business use. Utility websites can be a great educational source for learning about how electric vehicles and charging work. They can also provide training services for Electric Vehicle charging stations techs.

Electric vehicle infrastructure is reliant on the public utility grid. EV chargers draw electricity from the grid to fill up their vehicles. As electric utilities face pressure to maintain a dependable, clean, and cost-effective electrical supply, the integration of EVs introduces additional challenges and opportunities (Mehta & Vardhan, 2022).

Evergy, serving both Kansas City and Overland Park, presents a comprehensive approach to EV adoption. Their initiatives, showcased through the "Plug-In KC" and "Clean Charge Network" platforms, emphasize education and accessibility. They offer electric car test drives, an EV model finder, and detailed information on home charging, including standard outlet usage and Level 2 installation incentives (Plug-In KC, 2024). Both cities benefit from Evergy's residential charging rebates, with up to \$500 available for enrolling in a Time-of-Use (TOU) plan, which incentivizes off-peak charging. Further, Evergy extends support to businesses, offering rebates for workplace charging, fleet transitions, and public charging installations, with maximum rebates ranging from \$25,000 for workplace Level 2 chargers to \$65,000 for fleet conversions and \$40,000 for public DCFC units (Evergy, 2023). This multi-faceted approach aims to reduce the financial barriers to EV adoption across various sectors.

In contrast, the Public Service Company of Oklahoma (PSO), catering to Oklahoma City, primarily focuses on a specialized rate schedule for residential EV owners (Public Service Company of Oklahoma, 2024). Their Residential Service Plug-in Electric Vehicle Rate (RSPEV) plan leverages Advanced Metering Infrastructure (AMI) to offer significantly lower electricity rates during off-peak hours. This targeted approach directly incentivizes EV owners to shift their charging habits, thereby reducing overall electricity costs.

Table 9. A Breakdown of Utility Programs to Support Electric Vehicle Charging

	Kansas City (Evergy)	Overland Park (Evergy)	Oklahoma City (PSO)
Residential Incentives	- Up to \$500 rebate for home Level 2 charging with a Time-of-Use (TOU) plan - Requires EV registration and electrician installation	Rebates for residential charging installation	Residential Service Plug-in Electric Vehicle Rate (RSPEV)

		Information on Time-of-Use (TOU) rates	- plan for AMI meter customers - Lower rates during off-peak hours
Public Charging Incentives	Rebates for installing public DCFC chargers (up to \$40,000 per site)	Information on public charging rates	Not explicitly specified
Workplace /Business Incentives	- Rebates for installing workplace Level 2 chargers (up to \$25,000) - Business EV rate plans - Rebates for fleet EV charging infrastructure (up to \$65,000 for 10 Level 2 and 2 DCFC)	Information on workplace and business EV charging rates	Not explicitly specified
Information & Resources	- Plug-In KC website with EV basics, incentives, and charging information - Electric car test drives Online EV model finder - How to use standard outlets, and install level 2 chargers - Public charging location information	- Information on electric car test drives, EV model finder, and charging details - Time of use information	Focus on the RSPEV rate plan for residential customers
Time-of-Use (TOU) Plans	- Requires TOU plan enrollment for residential charging rebate - Business EV rate plans encourage off-peak charging	Provides information on TOU rates	RSPEV plan utilizes off-peak charging rates

While PSO's strategy effectively promotes off-peak charging through economic incentives, it lacks the broader educational and infrastructural support seen in Evergy's programs. Evergy's initiatives, with their diverse rebates and educational tools, create a more holistic ecosystem for EV adoption, addressing both individual and business needs more comprehensively than PSO's primarily rate-based incentive

Challenges and Policy Gaps in EV Adoption

The transition of Electric Vehicles in the Great Plains region is an inevitable part of the global EV movement. Municipal planners in the region need to address key themes and challenges as they develop EV policies and infrastructure. In the Great Plains, cities should adopt a holistic approach to EV policy development by streamlining permitting processes, upgrading grid capacity, educating the public, addressing challenges, adapting to social and technological changes, and ensuring equitable access to EV infrastructure.

Policy and Regulatory Frameworks

Strong policies and regulatory frameworks are foundational for EV infrastructure development across the Great Plains.

EV Readiness Plans help guide local municipalities towards comprehensive visions and goals that align with the greater region, state, and federal EV infrastructure initiatives. Municipalities who adopt local EV Readiness Plans guide their local governments agencies, and other local stakeholders to make decisions towards their overarching EV goals.

The absence of dedicated EV readiness plans in Kansas City and Tulsa highlights a critical need across the Great Plains. Although some municipal plans mention EV infrastructure, their generalized nature poses challenges for effective policy implementation. To ensure successful EV infrastructure development, it should become standard practice for all municipalities to integrate specific EV considerations into their Transportation, Utility, Comprehensive, and Environmental Plans.

While Kansas City, Overland Park, and Tulsa all had planning for EVs in various documents, they all lacked specificity. Their EV goals tended to focus on general goals like incorporating EV infrastructure in the city, encouraging EV adoption, and electrifying their local fleet. They all lacked details on how they would obtain these goals, and what they all would entail.

Building Codes and Zoning Ordinances regarding Electric Vehicles, and EV infrastructure are vital to local city governance. Building codes set minimum standards for the design, construction, and maintenance of buildings. Zoning ordinances regulate land use by setting rules for what you can or cannot do in an area. Codes and ordinances regarding EV infrastructure can help to future proof the city, by setting safety standards and charging equipment standardization.

Overall, Kansas City, Overland Park, and Tulsa all demonstrate a commitment to supporting EV adoption through their municipal codes. Kansas City offers the most detailed regulations governing every aspect of EV charging infrastructure. Overland Park focuses on preparing for the future, and Tulsa prioritizes practical regulations for existing developments. Overland Park and Tulsa are missing detailed objectives, and definitions of charging equipment.

Integrating sustainability and future-oriented planning into their strategies, planners in the Great Plains can create adaptable, resilient, and inclusive systems that are equipped for the challenges of the future. Outside of tailoring zoning codes and infrastructure plans for EV infrastructure, municipalities need to consider additional countermeasures to combat climate change.

While Electric Vehicles offer a pathway to reduce greenhouse gas emissions, achieving true sustainability requires a broader approach. Prioritizing walkable, high-density communities with active public transportation can be more important. However, the United States has a deeply ingrained car-centric culture, shaped by decades of infrastructure designed around individual automobile use. Despite efforts towards car-free living, the reality is that cars remain a dominant mode of transportation. The U.S., representing just 4% of the global population, owns approximately 20% of the world's vehicles (U.S. Department of Energy, 2021). Although cars won't disappear overnight, sustainability efforts can be advanced through EV integration.

None of the case study city plans and resources addressed the growing need for rezoning their cities to prioritize pedestrians and bicyclists over cars. But they all set goals for EV integration with their efforts to combat climate change. Environmental goals were stated in many of their municipal plans, and existing EV readiness plans, yet again they lack the detailed action steps in order to achieve these goals.

Cyber Security is critical when considering developing policies for EV infrastructure. EV changing networks compromise both the transportation and energy sector. This can lead to significant disruptions that could affect local transportation, the power grid, and public services. By actively addressing cybersecurity in their policy, municipalities can foster a secure, reliable, and trustworthy EV infrastructure. While reading through these plans there was a lack of mentioning cybersecurity policy.

Smart Charging Policies foster coordination with electric utilities to understand grid capacity. This helps municipalities work with their local utilities to develop cost-effective processes. The case study cities and their respective utility providers all had a hand in EV integration. However, there are no official policies that state what roles the municipalities and utilities share and or are responsible for, regarding charging infrastructure.

Infrastructure Expansion

Strategic EV infrastructure expansion in the Great Plains necessitates a thorough analysis of current charging locations to identify gaps and ensure equitable access. Data-driven methods should be used to optimize new station placements, considering traffic, population, and amenities. In the absence of widespread at-home charging options in MUDs due to a lack of policies and zoning codes, public charging infrastructure plays a vital role in supporting EV owners.

Grid Integration is crucial for grid reliability and efficiency in the face of increasing EV adoption. The evolving relationship between EVs and the grid necessitates careful planning and implementation of these strategies. Grid resilience needs to be addressed before pushing out big plans for installing EV infrastructure. Consideration of EV impacts on the area electrical distribution system encompasses EV charging infrastructure, utility rates for EVSE, net metering places, EV road tax issues, utility smart grid plans, and cost recovery for EVSE investments.

EVSE Permitting encourages the rapid deployment of charging infrastructure. Cities should also streamline the permitting process for charging station installations to encourage rapid

deployment. Tulsa and Kansas City both have regional and or local strategies to address EVSE permitting needs. Olathe did not have set standards for permitting.

Municipal Fleet adoption sets an example for the entire community. By transitioning municipal fleets to EVs, cities can demonstrate their commitment to sustainability and encourage private adoption. All three cities are actively pursuing fleet electrification, but their approaches vary. Tulsa has a strong emphasis on transit and a detailed action plan for light-duty vehicles. Kansas City is diversifying its EV integration across departments with ongoing budget support. Overland Park is taking a systematic approach to replacing its existing fleet. Each city's plan reflects its specific priorities and context, contributing to the broader movement toward sustainable transportation.

Incentive Programs

The increase of EV sales has various factors, and the cost of EVs has a significant impact on widespread adoption, as highlighted by Joule. “Although the rise in EV sales is supported by several factors, cost has been shown to be of significant importance for the large-scale adoption of new vehicle technologies” (Joule). Cost considerations encompass both the initial price of the vehicle and its operating expenses (fueling, and maintenance). Operation cost is dependent on the price of electricity, which can vary by region, type of generation, time of use, and access point.

The variations in incentive programs reflect differing state priorities and economic contexts. Oklahoma’s aggressive state-led approach, with its focus on public infrastructure and diverse incentives, signals a strong commitment to accelerating EV adoption. Missouri and Kansas, while providing valuable utility-driven rebates, may benefit from exploring more comprehensive state-level initiatives to enhance their EV ecosystems.

Evergy offers comprehensive resources and rebates across residential, public, and workplace charging. Emphasizes on Time-of-Use (TOU) plans for cost savings provides more consumer information and testing options than PSO. PSO primarily focuses on a specific residential EV

rate plan (RSPEV) for cost savings through off-peak charging. It does lack the level of publicly stated business and public charging programs compared to Evergy.

Public Engagement and Education

EVSE Education and Outreach programs are important for public acceptance and adoption. Educating residents about the benefits of EVs, addressing concerns about range anxiety, and promoting awareness of available charging infrastructure are key components of successful EV policies.

At the state level, Missouri, Kansas, and Oklahoma all either hosted public engagements meetings and public surveys or had it in their plans to conduct in the future. At the municipal level engagement has been done for various plans for all case studies. Along with the municipalities, some of the local utility agencies conducted their own research. Although engagement was conducted, there is a lack of overall policy regarding engagement and data collection. Local municipalities should establish a policy that requires upkeep on reflection on engagement efforts. These efforts can also include actively monitoring data collection for infrastructure usage patterns.

Both Evergy and PSO both had their own versions of public outreach. To ensure efficient widespread build-out the Municipalities should have a greater hand in educating their own communities. While researching I found it difficult to find information about local EV infrastructure and policies. Local municipalities should join forces with local utilities to provide more education and resources to the public.

Shifting social dynamics require planners to adopt new approaches. Youth activism, aging populations, and the rise of technology all influence community needs. Digitalization is transforming the world, and planners need to be aware of the emerging technologies and long-term implication of EV policies, and their role in smart city development.

Conclusions and Policy Recommendations

The main objective for these municipalities is to improve accessibility for EV users by expanding infrastructure in a way that is sustainable, efficient in its use of time and resources, ensures longevity, and avoids overloading the electrical grid. While a wide range of guidance exists from other cities EV Readiness plans and policies, this paper specifically focuses on providing tailored recommendations for large cities within the context of the Great Plains.

Even with the tailored recommendations offered in this paper, municipalities in the Great Plains should still conduct thorough investigations into the successes and challenges encountered by other cities in their EV infrastructure development. It is important to recognize that the recommendations provided cannot encompass the full spectrum of complexities inherent to integrating EV infrastructure into a city's existing systems and plans. Ongoing research and adaptation based on the experiences of others remain essential for informed and effective policymaking.

For a successful electric vehicle transition, municipalities must center equity in their approach. Equitable access policies should strategically deploy public charging infrastructure throughout all communities, prioritizing low-to-moderate income neighborhoods and rural areas. This focused effort will ensure that the advantages of EV adoption are available to everyone. It is also important to mention that although EV adoption is encouraged and supported by the idea of benefiting the environment, municipalities should prioritize and invest in walkable, high-density communities and active public transportation options. This approach recognizes that a sustainable and equitable transportation system encompasses more than just vehicle electrification.

Stemming from the identified critical gaps in key areas such as Infrastructure Expansion, Grid Integration, EVSE Permitting, and Municipal Fleet Adoption, the following policy recommendations are suggested for the Great Plains region. By implementing these recommendations, municipalities throughout the Great Plains can create detailed, and forward-thinking policies and regulatory frameworks. These proposed frameworks should provide cities

with the resources to improve the development of a comprehensive and sustainable EV infrastructure ecosystem.

EV Infrastructure Planning Recommendations

Municipal planning can plan for an environment conducive to transportation electrification and encourages the adoption of supportive policies and procedures. Specifically, Planners serve an important role in preparing for a robust local EV infrastructure system.

Planners shape local EV infrastructure by forecasting demand, setting goals, and creating master plans with updated zoning for charging stations. They strategically select sites and design networks, integrating charging into transportation and planning corridors equitably. Planners drive policy through incentives, permits, building codes, and public education. Collaboration with stakeholders, utilities, and regional entities is key. They also proactively tackle challenges like grid integration, tech advancements, funding, and data analysis for a sustainable future.

Developing Comprehensive EV Readiness Plans is important for all cities across the United States. These plans ensure that the goals and strategies have been tailored for that specific region. All large cities within the Great Plains should develop and adopt comprehensive EV Readiness Plans. The key steps to achieving this goal include:

- Mandate and Standardize EV Readiness Plans

- Set Specific Actionable Goals

- Detailed Implementation Strategies

Integrating EV Considerations into Existing Municipal Plans furthers a city's goal to build out a comprehensive EV network. Great Plains cities should implement policies requiring integration of EV infrastructure considerations into all relevant municipal plans.

EV Readiness Plans need to move beyond general goals (e.g., "encourage EV adoption") and include specific, measurable, achievable, relevant, and time-bound (SMART) objectives. For example, specific number of public charging stations to be installed in designated areas with a defined timeframe. A crucial step is the identification of potential funding sources, encompassing

grants and public-private partnerships, to support these efforts. Clear and detailed action steps need to be a part of the plans. The action plans should include setting clear timelines for the review and update existing building codes and zoning ordinances to accommodate and promote EV adoption.

Table 10. Relevant Municipal Plans for EV Integration Recommendation

Plans	Recommendation
Transportation Plans	Include EV charging infrastructure in transportation network planning, considering accessibility, location, and future demand.
Utility Plans	Detail the role of local utilities in supporting EV infrastructure deployment, including grid capacity upgrades, smart charging programs, and interconnection standards.
Comprehensive Plans	Incorporate EV infrastructure as a key component of long-term land use and development strategies, aligning with sustainability and economic development goals.
Environmental Plans	Clearly articulate how EV adoption and infrastructure development contribute to achieving local environmental targets and greenhouse gas emission reduction goals, with specific metrics and action plans.

Planners need to consider predicting future trends regarding land use and development. They need to consider things like equity, and future growth patterns (Suburban Sprawl/Urban Infill/Upzoning). Planners must anticipate these shifts to ensure that charging stations are strategically placed to serve future populations and development densities. For instance, increased urban density might necessitate more public and shared charging solutions, while continued sprawl could require a more distributed network across a wider geographic area.

The rise of E-Commerce and hybrid work models are reshaping retail spaces and downtowns. In the Great Plains, planners can consider investing in areas with mixed-use developments, rather than areas like large indoor shopping malls. Indoor shopping malls may seem like a good place for public charging, because of the number of downtown shoppers who would have to charge while shopping. However, large indoor shopping malls have been closing all around the region.

The prevalence of aging housing stock, increasing rental costs, and the importance of affordable housing in Great Plain cities, underscore the need for inclusive public EV charging infrastructure

planning. Planners must ensure that EV access extends to all residents, no matter their housing type. This requires a thoughtful reimagining of charging infrastructure locations across urban and suburban landscapes to accommodate diverse housing situations.

EV policies and public engagement strategies should proactively consider the diverse and evolving needs of all residents, including youth and aging populations. This necessitates ensuring comprehensive accessibility of both information and infrastructure. To enhance public education and engagement, planners should leverage digital platforms and emerging technologies such as interactive websites, virtual reality experiences, and social media.

Public education should emphasize the pivotal role of EVs and charging infrastructure in smart city development, highlighting benefits like optimized grid management, energy storage opportunities, and connected vehicle integration. Planners must remain informed about these advancing technologies to develop future-proof EV policies that align with our smart city vision.

Policy and Regulatory Frameworks

Building Codes and Zoning Ordinances can be achieved by mandating EV Ready requirements. Cities should update building codes to require a percentage of new residential and commercial buildings are “EV-ready”. EV-Ready buildings and spaces are pre-wired for future charger installation. The code can consider tiered requirements based on building type and size. For example, multi-unit dwellings and commercial properties would have greater EV Readiness requirements. EV Ready spaces should be considered amongst building codes, parking ordinances, and zoning ordinances.

EV-ready ordinances are particularly beneficial for Great Plains cities with their mix of urban and suburban areas. Addressing the potential lack of public charging in suburbs and limitations of existing housing, these ordinances should target multi-unit and commercial developments, city buildings, public parking, and parking structures. Integrating charging during construction is more efficient than retrofitting, and the growth potential of these cities makes this an ideal time for EV infrastructure integration.

Recognizing the need to protect EV charging infrastructure and users from harsh Great Plains winters, building codes and parking ordinances should specifically require covered or indoor charging spaces within parking garages and underground facilities for both public and private vehicles.

For effective EV infrastructure planning in the Great Plains, ordinances governing charging stations need to clearly define regulations for different charger levels, conditional or special use permits, and any limitations on public rights-of-way. To provide accessibility, these ordinances should initially permit Level 1, Level 2, and Level 3 charging stations throughout all zoning districts in cities. This approach allows for broad adoption while acknowledging the potential for future zoning adjustments based on evolving EV charger prevalence.

Permitting EV chargers across all zoning districts will foster broader regional expansion of this essential infrastructure. To future-proof our building codes and zoning ordinances in the Great Plains should incorporate language that anticipates advancements in EV technology and charging infrastructure, such as the integration of higher power and inductive charging capabilities.

Established permitting processes specifically designed for EV charging station installations streamline deployment. Develop specific strategies for effective partnerships with utility companies to facilitate necessary grid upgrades and the implementation of smart charging initiatives. Following the examples of Tulsa and Kansas City, cities need to develop and adopt clear standards and procedures for EVSE permitting.

Site Design criteria should be created for EVSE installations. This includes equipment standards, parking space design and location, and required EV parking capacity & minimum parking requirements. The design standards of equipment should include setbacks. Signage, road markings, notifications, lighting, and usage fees, help drivers understand the use of EV parking infrastructure.

To accelerate EV infrastructure deployment across the Great Plains, municipalities should simplify and establish dedicated permitting processes for EV charging stations. Developing

partnerships with utility companies is crucial for facilitating necessary grid upgrades and implementing smart charging initiatives. Following the lead of Tulsa and Kansas City, all municipalities within the Great Plains, including Olathe, should be mandated to develop and adopt clear, standardized procedures for EVSE permitting.

Comprehensive site design criteria for EVSE installations are essential. These standards should encompass equipment specifications, parking space design and location, and clear guidelines for required EV parking capacity and minimum parking requirements, including necessary setbacks. To ensure user-friendliness, clear signage, road markings, notifications, lighting, and information regarding usage fees should be standardized.

To enhance the reliability and user comfort of EV charging for Great Plain cities, design guidelines should prioritize weather protection. Public charging stations should be equipped with awnings to shield them from significant snowfall in winter and offer ample shade during hot summer months. Adhering to these design guidelines will also facilitate a more efficient approval process for covered charging infrastructure.

Given the diverse infrastructure landscape of Great Plains cities, with their mix of older, established areas and new developments, grid resilience planning is essential. Older, denser areas with potentially outdated grid infrastructure are particularly vulnerable to the increased electricity demands of EV charging. Conversely, new and upcoming areas present an opportunity to proactively build in sufficient grid capacity to support future EV adoption.

For sustainable EV infrastructure development in the Great Plains, it is essential to mandate the integration of EV infrastructure planning with comprehensive grid resilience planning at the local level. This involves conducting thorough studies to assess the potential impact of increased EV charging on the local electrical distribution system. Based on these assessments, cities should develop proactive strategies to upgrade grid infrastructure to accommodate the growing electricity demand. Implementing policies that encourage smart charging practices will help manage peak demand and optimize grid load.

To ensure the security and reliability of public EV charging infrastructure across the Great Plains, dedicated cybersecurity policies and protocols must be developed and implemented. Collaboration with cybersecurity experts during both the policy development and implementation phases is vital to establish strong and effective security safeguards.

Local Government Initiatives

Local governments can take tangible steps to demonstrate leadership in EV adoption and earn recognition by strategically installing public and workplace EV chargers and by actively transitioning their own municipal fleets to electric vehicles. Providing comprehensive training to relevant staff members on EV operation and maintenance is another valuable action that contributes to their standing.

An additional way for local governments to gain recognition is by prioritizing the installation of public EV chargers that are powered by renewable energy sources, showcasing a commitment to both electric mobility and clean energy. By working collaboratively on a regional level, actively engaging in public education initiatives, incorporating EVs into municipal fleets, thoughtfully planning for city-funded EV projects, and consistently leading by example, local governments can effectively drive EV adoption within their communities and beyond.

Establishing a Regional EV Incentive Working Group would foster collaboration by bringing together representatives from state governments, utilities, industry stakeholders, and consumer advocacy groups. This platform would facilitate the sharing of best practices in designing and implementing effective EV incentive programs, enabling states to learn from each other's experiences. Exploring avenues to harmonize certain aspects of these programs across the Great Plains region could also reduce complexity and improve clarity for consumers.

Recognizing the interconnectedness of many Great Plains cities, particularly those within or near metropolitan areas, it is crucial to foster and formalize partnerships between local municipalities and their respective utility providers. This collaboration is important to deliver consistent and impactful public education and outreach initiatives concerning electric vehicles and charging infrastructure. The partnerships should encompass the joint creation of educational resources,

including brochures, websites, and videos, alongside the co-hosting of public workshops and events. The mutual sharing of data and insights regarding public awareness and charging infrastructure demands will further optimize these endeavors, ultimately leading to the development of joint online resources offering comprehensive information on local EV policies, charging locations, utility programs, and available incentives across the region.

Local Governments hold a vital leadership role in educating their own communities about local EV infrastructure, policies, and benefits. This can be achieved by integrating EV information into existing municipal communication channels like newsletters, websites, and social media. Hosting local EV awareness events and providing test drive opportunities can offer firsthand experience. Training municipal staff to address basic EV-related questions ensures residents have access to information, and creating easily accessible online maps and information about local charging stations can further support EV adoption.

Building public confidence in electric vehicles is a key aspect of promoting their adoption across the Great Plains. This requires directly addressing relevant concerns and actively showcasing the advantages of EV ownership. Given the distances between major urban centers and popular destinations in the region, with the prevalence of surrounding rural areas, range anxiety represents a barrier for EV consumers. To overcome this, comprehensive public education campaigns are vital. These campaigns should focus on clearly communicating the increasing driving range capabilities of current EVs, raising awareness of the growing and accessible charging infrastructure network, and providing practical, readily available resources for effective trip planning tailored to the distances and charging options within the Great Plains region.

Local governments should make it easy for residents to locate public charging stations through the development and dissemination of user-friendly online maps, intuitive mobile applications, and the implementation of clear and consistent signage. Public education efforts should consistently highlight the increasing availability and ease of access to the growing network of charging infrastructure.

To pinpoint areas of improvement for the case study cities, and the other cities in the Great Plains, it is important to identify gaps in the current system. One way to do this is by conducting surveys and focus groups to gather feedback from residents about their experiences with EV

charging and infrastructure. Analyzing data on EV adoption rates, charging station usage to identify specific areas where improvements are needed.

Great Plains local governments have a significant opportunity to lead the way in EV adoption. This can be achieved by transitioning their municipal fleets to electric vehicles, while also ensuring successful implementation and maintenance through comprehensive staff training. To build a strong foundation for EV integration, local governments should begin with thorough fleet analyses to identify electrification opportunities. Key steps then include purchasing EVs for municipal fleets, installing fleet EV chargers, and adopting clear, expedited approval and review timelines for fleet transition. Additionally, developing comprehensive policies and plans to guide all aspects of vehicle procurement, operation, maintenance, and charging will ensure a smooth and efficient transition. Given the significant impact of extreme temperatures on EV range in the Great Plains, cities adopting EV fleets should also consider designating heated fleet parking spaces to mitigate potential range loss and maintain optimal vehicle performance, particularly during winter months.

Utilities

Establish a strong collaborative relationship with the local electric utility, with the primary goal of developing and promoting utility-led EV programs. These programs should incorporate charging incentives to encourage EV adoption, offer EV-specific rate structures to make charging more affordable, and provide options for charging with renewable energy sources. Facilitating connections between fleet operators and individual EV owners with the utility is another crucial aspect, enabling a better understanding of how to effectively manage grid load in the face of increasing EV usage.

A comprehensive perspective is essential when considering the broad impact of electric vehicles on the electrical distribution system. This requires a thorough examination of various interconnected factors, including the development of robust EV charging infrastructure, the establishment of fair and appropriate utility rates for EV supply equipment (EVSE), the implementation of effective net metering policies, addressing any EV road tax considerations,

understanding and aligning with utility smart grid plans, and determining suitable cost recovery mechanisms for investments in EVSE.

To optimize the integration of EVs with the public utility grid, particularly during periods of peak demand, several key strategies can be employed. These include the implementation of Time-of-Use (TOU) rates, which incentivize charging during off-peak hours, and Dual Metering systems, which allow for specialized rates and dedicated monitoring of EV charging. Demand Response programs enable utilities to manage peak loads by signaling customers to temporarily reduce their electricity consumption, including during EV charging sessions. Real-Time Pricing (RTP) sends dynamic price signals to consumers, promoting cost-effective charging behavior that can be synchronized through smart meter programming. Finally, Vehicle-to-Grid (V2G) technology offers a more advanced solution, leveraging the energy stored in EV batteries to support the grid during peak load events or emergencies, thereby enhancing overall grid stability and resilience.

To effectively support the growing electric vehicle (EV) market, planners should grow strong partnerships with utility providers to guarantee the electrical grid possesses the necessary capacity. Proactive engagement with local utility companies is crucial for evaluating the grid's ability to handle the anticipated surge in EV charging demand, offering valuable insights into potential infrastructure upgrades needed to accommodate increased EV adoption. These focused efforts will ensure the city's EV infrastructure is robust and capable of meeting the evolving needs of its residents.

Establishing smart charging policies and fostering utility coordination are also vital. This includes mandating the development of formal agreements or Memorandums of Understanding (MOUs) between municipalities and their utility providers. These agreements should clearly define roles, responsibilities, and procedures for the deployment and management of EV charging infrastructure.

Policies should actively promote and incentivize smart charging practices to optimize grid utilization, lower energy costs for EV owners, and mitigate peak demand. This can be achieved through time-of-use rates, demand response programs, and interoperability standards for charging equipment and grid management systems. Clear communication channels and processes

between municipalities and utilities regarding EV infrastructure planning, deployment, and any grid-related limitations or opportunities are also essential.

Optimizing utility-led incentive programs represents another significant opportunity. Utilities should be encouraged to expand their rebate programs for EV charging infrastructure across residential, workplace, and public charging sectors. Actively promoting and educating consumers about the advantages of Time-of-Use (TOU) rate plans for EV charging is also important, emphasizing the potential for cost savings by charging during off-peak hours and encouraging the adoption of smart charging technologies that automatically adjust charging times based on TOU rates and grid conditions through offered incentives.

Final Statement

The examination of EV infrastructure plans and policies across three Great Plains cities: Kansas City, MO; Overland Park, KS; and Tulsa, Oklahoma reveals a region demonstrating progress towards broader electric vehicle goals. While each city showcases distinct successes in certain aspects of EV readiness, they also present clear opportunities for further development and refinement. A common thread observed across these case studies is the general lack of detailed action steps and implementation strategies within existing city plans. This absence of concrete guidance may hinder the effective and timely deployment of necessary EV infrastructure.

Moving forward, municipalities in the Great Plains should prioritize robust and actionable EV infrastructure plans and policies. A critical element of this endeavor is the development of strategies that are resilient to fluctuations in federal funding. While initiatives like the Bipartisan Infrastructure Law offer significant opportunities, the long-term success of EV infrastructure development should not be solely reliant on external financial support, given the potential for shifts in governmental priorities at various levels. Instead, cities should cultivate local policies and resources that independently encourage seamless EV infrastructure installation. This includes recognizing that direct ownership and operation of public chargers by the city is not a prerequisite for a thriving EV charging network. Rather, the focus should be on establishing clear policies, comprehensive plans, and readily available resources that empower private sector investment and streamline the installation process.

Updated codes can facilitate adoption through new development, and improved permitting processes make EV charger installation more accessible. Clear design guidelines, signage, parking regulations, and protections benefit both EV users and charger owners. Cities should encourage designs that accommodate extreme weather conditions and ensure build-out planning aligns with diverse urban landscapes. Proactive planning involves anticipating future land use development and patterns to strategically position charging infrastructure for long-term success. While cities do not necessarily need to own and operate public EV chargers for a successful network, investing in local EV plans and policies are establish the foundation for local EV integration.

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