METRO COG

ELECTRIC VEHICLE READINESS STUDY

METROCOG

FARGO-MOORHEAD METROPOLITAN COUNCIL OF GOVERNMENTS

HDR

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Glossary of Terms

Alternating Current (AC)	An electric current that reverses direction multiple times per second. Current flowing in power lines and normal household electricity from a wall outlet is alternating current.
Battery Electric Vehicle (BEV)	An electric vehicle that exclusively uses electricity to charge batteries, which then discharge to electric motors to propel the vehicle.
Connector	The plug at the end of the charging cable that fits into the charging port. Serves as the physical interface that connects the vehicle to the power source. The design & specifications of the connector determine its compatibility with different vehicles and charging stations. Common connector types include J1772, CCS1, CHAdeMO, and NACS.
Disadvantaged Community (DAC)	A group of people with environmental justice concerns (most impacted from a combination of economic, health and environmental burdens) and those with predominantly low-income persons and/or communities of color. Also commonly referred to as underserved communities.
Direct Current (DC)	An electric current flowing in one direction only, used in high-power charging applications.

DC Fast Charging (DCFC)	Chargers which convert AC power to DC power that flows directly into the vehicle's battery to provide faster and higher-power charging. Commonly referred to as "fast charging."
Electric Vehicle	A vehicle propelled by one or more electric motors using energy stored in rechargeable batteries.
Electric Vehicle Infrastructure Plan (EVIP)	Plans developed in coordination with federal initiatives, such as the NEVI program, to develop and deploy the necessary charging infrastructure to support EVs.
Electric Vehicle Supply Equipment (EVSE)	The equipment that takes power from the grid and supplies it to an electric vehicle. This equipment makes up a charging station.
EV Sales Market Share	The percentage of new vehicle sales that are EVs.
EV Market Share	The percentage of registered vehicles that are EVs.
Federal Energy Management Program (FEMP)	The Federal program working to promote energy efficiency and the use of renewable energy resources.

Great Plains Institute (GPI)	A nonpartisan, nonprofit organization, the GPI's mission is to accelerate the transition to net-zero carbon emissions for the benefit of people, the economy, and the environment.
Greenhouse Gas (GHG)	Any gas that absorbs infrared radiation in the atmosphere. GHGs include, carbon dioxide, methane, nitrous oxide, ozone, and more.
Hybrid Electric Vehicle (HEV)	A vehicle powered by an internal combustion engine in combination with a battery pack that may be used to power an electric motor for propulsion.
Internal Combustion Engine (ICE)	An engine that generates power by burning gasoline, oil, or other traditional fuels.
Justice40 Initiative	U.S. initiative directing 40 percent of the benefits of federal investments to disadvantaged communities for environmental justice and social equity.
Kilowatt (kW)	The rate at which specific work is done or which energy is transmitted. Charging power is defined in kilowatts. A charger delivering 10 kW of power into a battery over an hour will have provided 10 kWh of energy to the battery.
Light-Duty Vehicle (LDV)	Any vehicle with a gross vehicle weight rating of 10,00 pounds or less. Most passenger vehicles are light-duty vehicles.

Level 1 Charging	A charger utilizing a 120-volt power outlet to charge an EV. This method typically provides a power output of 1.9 kW, delivering approximately 2-5 miles of range per hour of charging.
Level 2 Charging	A charger utilizing a 240-volt AC power supply to charge an EV, offering a power output that ranges from 6.6 kW to 19.2 kW. This charging level typically provides around 10-30 miles of range per hour of charging.
Fargo-Moorhead Metropolitan Council of Governments (Metro COG)	The Metropolitan Planning Organization for the Fargo-Moorhead area.
Metropolitan Planning Organization (MPO)	A federally mandated and federally funded transportation policy-making organization in the U.S. that is made up of representatives from local government and governmental transportation authorities.
Minnesota Department of Transportation (MnDOT)	The Minnesota Department of Transportation oversees the state's transportation system in the U.S. state of Minnesota.
National Electric Vehicle Infrastructure (NEVI)	A federal initiative and formula program established under the Infrastructure Investment and Jobs Act to enhance the deployment of EV charging infrastructure across the U.S.

North Dakota Department of Transportation (NDDOT)	The North Dakota Department of Transportation oversees the state's transportation system in the U.S. state of North Dakota.
Plug-In Hybrid Electric Vehicle (PHEV)	A vehicle that is propelled from both batteries and an internal combustion engine, with the batteries typically providing 20-50 miles of all-electric range.
Port	An element of a charger that provides power to charge one vehicle at a time. A charger will typically have one or two ports. A single port is able to charge one vehicle at a time but may have multiple different connector types.
Range	The measure of how many miles an EV can travel before needing to charge. Range is based on battery size (kWh) and vehicle efficiency (miles/kWh).
Transportation Network Company (TNC)	A company offering prearranged rides or car rentals for a fee using an online-enabled platform, such as a smartphone application, like Uber and Lyft.
United States Department of Energy (DOE)	The Federal department working to address the United States' national energy policy production, conservation, and energy-related research.
United States Department of Transportation (DOT)	The Federal department that works to fund, coordinate, and deliver the United States' transportation network.

Executive Summary

The Fargo-Moorhead region, served by the Fargo-Moorhead Metropolitan Council of Governments (Metro COG) encompasses seven member jurisdictions and six associate jurisdictions. Metro COG is an important partner in transportation projects for the Fargo-Moorhead region and leading this Electrification Vehicle (EV) Readiness Study (Study) to assess existing conditions in the area, engage local stakeholders and partners, and begin tapping into identification of resources for EV projects. This Study will be an important first step in supporting the Fargo-Moorhead region's exploration of EVs.

The Study emphasizes a planning process that integrates industry trends, community goals, technical understanding, and the strategic application of policy to support residents and businesses adopting EVs and expand charging access throughout the Fargo-Moorhead area. Recognizing the relationship between EVs and sustainability, the Study included collaboration among stakeholders to address the potential role of EVs in the area. The transition to electrified mobility is intended to complement existing efforts that support alternative modes of transportation such as public transit and bicycling. While the adoption of EVs over ICE vehicles is not the sole solution, it is a significant component in the broader strategy to reduce GHG emissions within the region.

PURPOSE OF THE STUDY

The EV Readiness Study provides actionable recommendations for developing an effective EV planning process. This approach can be used to actively engage city and regional leaders, utilities, business partners, and the public to adapt to evolving transportation trends. Forecasting an anticipated increase in transportation electrification in the Fargo-Moorhead area, the Study offers a series of strategies and next steps that Metro COG can work towards implementing to align the region's goals for reduced emissions with growing interest in EVs. Support and management from entities outside of Metro COG, including those in the private sector, will be needed to complete the work to support future electrification efforts in the area's transportation system.

CURRENT EV INDUSTRY TRENDS

As of June 2024, the Fargo-Moorhead area has around 900 registered EVs (registered in Cass and Clay County), reflecting a growing trend in EV adoption. This increase aligns with national trends, where EV sales continue to rise significantly because of advancements in technology and growing consumers awareness of the benefits of electric mobility.

Forecasts indicate that by 2035, the number of registered EVs in Cass and Clay counties could reach between 11,000 and 18,000, accounting for approximately 4% to 7% of all vehicles in the area. To accommodate this growth, it is projected that the

region will require between 1,600 and 1,900 publicly accessible charging ports. While most charging will likely occur at home, the publicly accessible chargers will serve workplaces, community centers, retail locations, and residents who do not have access to at-home charging.

WHY GET READY?

By prioritizing EV readiness, Metro COG can develop a regional vision that elevates sustainability practices, supports grid readiness, enhances regional connectivity, and promotes equitable access to charging infrastructure for the Fargo-Moorhead region. This proactive approach aligns with existing regional efforts to coordinate with national initiatives and maintain consistency across jurisdictions.

STAKEHOLDER ENGAGEMENT

Stakeholder engagement is a crucial component of the EV Readiness Study, as it allows Metro COG to gather input from diverse perspectives and build support for EV initiatives with Fargo-Moorhead's communities. By actively engaging stakeholders throughout the Study process, Metro COG establishes that the final recommendations and strategies reflect the needs and priorities of the entire Fargo-Moorhead community. Metro COG's stakeholder engagement efforts include:

- Conducting surveys to assess current EV usage and awareness among residents of Metro COG's member jurisdictions.
- Holding in-person and online meetings with key stakeholders, such as utilities, state and local government representatives, non-profits, and businesses with EV interests.
- Participating in community events, like the annual EV Car Show, to educate the public and gather feedback.
- Collaborating with a project Working Group made up of local public agencies, utilities, and private industry stakeholders.

RECOMMENDED STRATEGIES

The strategies outlined in the Study prioritize actions that foster collaboration among Metro COG's agency partners and member jurisdictions to enhance support residents and businesses adopting EVs. These strategies fall into two categories: **High Priority** and **Longer-Term Priority**.

- **High-Priority**: These initiatives may require prompt action and are expected to yield quick results. As the Fargo-Moorhead region enhances its EV readiness approach, key high-priority strategies include developing charging infrastructure and promoting EV usage.

- **Longer-Term Priority**: These initiatives focus on sustainable growth and often require more investment. To foster ongoing development, it is crucial to adopt long-term strategies that support EV infrastructure expansion. Prioritizing

these actions will further solidify a framework that supports the level of electrification progress the region would like to pursue.

NEXT STEPS

It is recommended Metro COG consider navigating emerging projects with agency partners and member jurisdictions as EV readiness efforts continue to take shape. Metro COG should also consider leveraging funding opportunities to integrate electrification initiatives into future planning efforts, such as the Metropolitan Transportation Plan (MTP). To continue strengthening EV readiness in the area, Metro COG is encouraged to pursue the following studies:

- Conduct a Phase 2 EV Readiness Study within 3-5 years to adapt to evolving regional conditions, funding opportunities, and market dynamics.
- Work towards developing a comprehensive approach for integrating EV infrastructure into utility master planning.
- Facilitate studies at the agency partner and member jurisdiction level to address localized needs.

In addition to the recommended studies, it is also recommended Metro COG incorporate discussions on EV infrastructure into future Transportation Technical Committee (TTC) meetings, which could help facilitate ongoing collaboration and strategic planning. Metro COG is encouraged to explore further options for enhancing EV readiness, such as collaborating with private sector partners or seeking out innovative funding sources.

Overall, this EV Readiness Study provides a comprehensive framework for the Fargo-Moorhead region to consider when pursuing electrification efforts that support the use of EVs among residents and businesses. Through strategic investments, collaboration with private partners, policy updates, and community engagement, this Study charts a path for Fargo-Moorhead to reduce emissions, expand charging access, and establish itself as a model for electrified mobility solutions.

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1. Introduction

The Fargo-Moorhead Metropolitan Council of Governments (Metro COG) is also the Metropolitan Planning Organization (MPO) for the Fargo-Moorhead Metropolitan Planning Area (MPA). Metro COG serves a bi-state area with an MPA that covers 14 townships in Cass County, North Dakota and 16 townships in Clay County, Minnesota. There are seven member jurisdictions and six associate jurisdictions within Metro COG.[1]

The Electric Vehicle (EV) Readiness Study (Study) will establish a vision for EV readiness in the Fargo-Moorhead region by identifying key partnerships and actionable strategies, while facilitating community support for EVs. The Study will provide local jurisdictions with an understanding of EV feasibility, assist in identifying current and potential barriers to EV adoption, and inform cities, counties, and other planning partners on infrastructure-related best practices to meet current and future EV needs throughout the metropolitan area.

Battery electric vehicles (BEVs) have zero tailpipe emissions, leading to improved air quality and reduced greenhouse gas (GHG) emissions. These sustainability benefits are important, as the transportation sector generates the largest share of GHG emissions of any U.S. economic sector, accounting for 28% of total GHG emissions (**Figure 1**). Additionally, transitioning from internal combustion engines (ICE) to EVs results in overall energy savings, even when the electricity is generated from coal or natural gas.

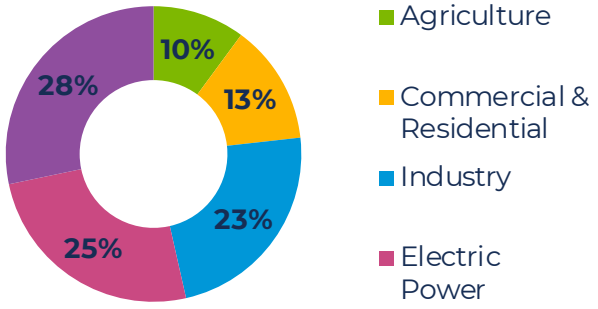


Figure 1: Total U.S. Greenhouse Gas Emissions by Economic Sector[2]

Targeting cleaner air through EVs requires collaboration and coordination between many different stakeholders, reflecting Metro COG's distinct role in supporting the

[1] Metro COG: https://www.fmmetrocog.org/about/our-communities
[2] U.S. Environmental Protection Agency, GHG Inventory Report (2022): https://www.epa.gov/ghgemissions

integration of EV charging and transportation needs aligns with other regional priorities around energy, environment, housing, and economic development. Metro COG's efforts also include regional planning and decision making, addressing issues that go beyond local boundaries, such as air quality and transportation efficiency. Acknowledging this, Metro COG has the opportunity to serve as the liaison for EV readiness and provide resources to its communities that are newly navigating the planning and funding process.

As the region's federally designated MPO, Metro COG is also charged with reducing pollution through ongoing transportation projects. By leading initiatives that promote sustainable transportation solutions, Metro COG aligns with its mission to enhance regional collaboration and improve environmental outcomes. This cooperative approach is essential for implementing effective strategies that contribute to cleaner air and a healthier community.

Purpose

Metro COG's EV Readiness Study aims to provide clarity and direction to prepare for increased EV adoption in the Fargo-Moorhead region. The Study aligns with ongoing planning efforts, including city and regional plans, to create a cohesive approach to EV integration. To facilitate this process, the Study analyzes projected EV trends, assess charging infrastructure needs, and evaluate grid capacity.

What and Why

The EV Readiness Study provides a recommended approach to preparing for the increased adoption of EVs that can be considered by partner cities, agencies, and organizations within the region. The Study provides information on anticipated EV growth, where it is anticipated to occur, and considerations for stakeholders to meet the demands of the anticipated growth.

Metro COG recognizes that the growing demand for EVs is significantly driven by the private sector and that both public and private entities will need to evolve to provide the charging infrastructure required to support widespread EV adoption.[3] Metro COG is leading the EV Readiness Study as a facilitator between stakeholder groups to prepare the community and service providers to meet the needs of residents and visitors seeking EV services. By proactively planning for anticipated consumer demand and private sector involvement, Fargo-Moorhead can enhance its regional competitiveness and improve residents' quality of life. This involves identifying key partnerships and actionable strategies that will help make the area well-equipped with the necessary infrastructure and support systems for EVs.[4]

[3] 2045 Fargo-Moorhead Metropolitan Transportation Plan (2019): http://www.fmmetrocog.org
[4] Metro COG EV Readiness Study (2024): https://fmmetrocog.org

Report Organization

The contents within the Study offer an assessment of current EV infrastructure in the region, forecasts projected EV growth, identifies gaps and opportunities, and proposes actionable steps to build a robust EV ecosystem through recommended high priority and longer-term priority strategies. By providing a clear roadmap, Metro COG's EV Readiness Study facilitates the region's efforts to accommodate the increasing number of EVs on the road.

Table 1 below outlines the chapters included in the report and the information contained in each chapter:

Table 1: Report Organization Overview

Chapter	Description
Existing Guiding Policy	Gives context to existing policy guiding increased EV adoption, charging infrastructure deployment, and overall readiness in the Fargo-Moorhead area.
EV Basics	Provides information on what EVs are, their benefits and limitations, and addresses common EV concerns.
EV Ecosystem	Introduces what the EV ecosystem is and the stakeholder types that play a role within it.
Current EV Industry Trends	Provides data on how the EV industry is shaping nationally, regionally, and locally.
Why Get Ready	Gives context to understanding why EV readiness is important.
How to Get Ready	Analysis of Fargo-Moorhead area EV projections, charger amounts to serve those EV projections, and grid impacts.
Stakeholder Engagement	Discusses the stakeholder engagement workshop that informed the high priority and longer-term priority strategies.
Recommended Strategies	Recommends how EV readiness can be enhanced through specific strategies that are assigned to a stakeholder type.
Next Steps	Identifies potential funding sources, recommended studies to consider in the future, and next steps Metro COG/member agencies can take towards EV Readiness.

Existing Guiding Policy

Federal

As the transition to EVs accelerates, the U.S. federal government has taken a proactive role in shaping policies that support this shift. These initiatives aim to reduce GHG emissions, decrease reliance on fossil fuels, and stimulate economic growth through innovation and job creation in the clean energy sector. The U.S. has set an ambitious target of 50% EV sales market share in the U.S. by 2030, with aims to advance smart fuel efficiency and emissions standards across the country.[5] By aligning local strategies with national objectives, metropolitan areas can effectively leverage federal resources and incentives to enhance their infrastructure and promote EV adoption. Key federal initiatives include:

Infrastructure Investment: The Bipartisan Infrastructure Law (BIL) allocates substantial funding to the development of a comprehensive charging network across the nation. With $5 billion designated for highway corridor charging and an additional $2.5 billion for competitive grants, the focus is on ensuring that charging infrastructure is accessible, especially in low-income and rural areas. This investment is critical for addressing range anxiety and supporting long-distance travel. Additional U.S. flagship programs from the BIL will invest $10 billion in clean transportation and over $7 billion in EV battery components, critical minerals, and materials.[6]

Tax Credits: The Inflation Reduction Act extends and expands tax credits for purchasing EVs. These credits are designed to make EVs more affordable for consumers by reducing the upfront costs, encouraging broader adoption across different vehicle types, including light-, medium-, and heavy-duty vehicles.[7]

Research and Development Grants: The U.S. Department of Energy (DOE) provides grants for EV charging and clean transportation-focused research projects. Funding priority is emphasized on projects in rural and underserved communities. Charging deployments highlighting innovative mobility solutions and increased charging accessibility are given priority.[8]

These federal policies provide a framework that regions like Fargo-Moorhead can build upon, so that future EV readiness initiatives and planning efforts are comprehensive and aligned with national goals.

[5] Biden-Harris EV Charging Action Plan (2021): https://www.whitehouse.gov
[6] Bipartisan Infrastructure Law: https://www.transit.dot.gov/BIL
[7] Internal Revenue Service: https://www.irs.gov/clean-vehicle-tax-credits
[8] Alternative Fuels Data Center: https://afdc.energy.gov/laws

State

North Dakota

North Dakota is implementing the federally required National Electric Vehicle Infrastructure (NEVI) program through its Electric Vehicle Infrastructure Plan (EVIP), led by the North Dakota Department of Transportation (NDDOT).[9] This initiative is supported by a diverse steering committee, including the state's Public Service Commission and Department of Commerce, alongside various utilities and industry stakeholders.

To advance community involvement, NDDOT conducted a public engagement effort, gathering input that highlighted a lack of awareness about EVs and charging infrastructure. Stakeholders expressed optimism that enhanced EV infrastructure could boost commerce and recognized the importance of assessing existing conditions. NDDOT's EVIP outlines several key goals for North Dakota:

- **Alternative Fuel Corridors**: A complete build-out of existing alternative fuel corridors by 2026.
- **Regional Connectivity**: Maximize available federal funds to create an interconnected fast-charging system that supports regional, national, and international travel.
- **Transportation Accessibility**: A comprehensive system that helps provide the traveling public with safe, convenient access to a variety of transportation and energy options.
- **Public Private Partnerships:** Establish public-private partnerships for the installation and operation of EV charging infrastructure.

Additionally, there is an established Clean Cities and Communities coalition for North Dakota, which works to promote alternative fuel vehicle adoption and alternative fuel infrastructure deployment across communities in the state.[10]

Minnesota

Minnesota is striving to lead the Midwest in plug-in EV adoption.[11] The state's EVIP highlights its commitment to achieving a 20% share of light-duty EVs, including both PHEVs and EVs, by 2030. The Minnesota Department of Transportation (MnDOT) is leading efforts to enhance EV readiness, focusing on improving

[9] North Dakota Department of Transportation, Electric Vehicle Infrastructure Plan (2023): https://www.dot.nd.gov
[10] North Dakota Clean Cities: https://cleancities.energy.gov/coalitions/north-dakota
[11] Accelerating EV Adoption: A Vision for Minnesota (2019): https://www.pca.state.mn.us

connectivity for interstate travel while prioritizing disadvantaged communities in the deployment of EV infrastructure.

Minnesota's key strategies include expanding charging infrastructure (e.g., workplace charging and fast-charging stations), implementing incentives and educational programs to accelerate EV sales, and prioritizing renewable energy sources for EV charging.[12] Additionally, utilities are playing a big part in Minnesota's EV adoption efforts. Minnesota utilities and co-operatives are involved in most areas regarding utility EV programs supporting EV adoption. Many utility providers are supporting increased EV charging availability through rebates, investment in distribution infrastructure, and cost-share for fast charger projects.

As Minnesota continues to advance its EV readiness initiatives, organizations like the Great Plains Institute (GPI) play a pivotal role in shaping the future of EV adoption across the state. GPI has launched the EV Smart Program in Minnesota with funding support from MnDOT's Clean Transportation Pilot Program. EV Smart provides a structured framework for municipalities to achieve their EV readiness goals through technical assistance and peer collaboration. This approach not only fosters greater awareness and accessibility of EVs but aligns with Minnesota's EV adoption targets. By coordinating with regional and national initiatives, Minnesota aims to create a consistent approach to EV infrastructure and support the transition to cleaner transportation options.[13]

Metro COG

The Fargo-Moorhead Metropolitan Transportation Plan (MTP), developed by Metro COG, plays a pivotal role in shaping transportation policy and infrastructure within the region. Known as *Metro Grow*, this plan emphasizes the integration of emerging transportation technologies, including EVs, into the regional framework. It outlines a commitment to allocate a specific percentage of flexible Federal Highway Administration (FHWA) funds towards transit-related capital purchases, including EV charging infrastructure.

Additionally, *Metro Grow* encourages collaboration among local jurisdictions to enhance multimodal transportation options and promote equitable access to EV charging stations throughout the region. By prioritizing vehicle fleet electrification and supporting the deployment of EV infrastructure, Metro COG is positioning the Fargo-Moorhead area to meet future transportation needs while promoting environmental sustainability and economic development.

[12] Minnesota Department of Transportation, EVIP (2023): https://talk.dot.state.mn.us/ev-infrastructure-plan
[13] Minnesota Department of Transportation, NEVI: https://www.dot.state.mn.us/nevi

Metro Grow Policy Direction (8 Areas)

1. Safety System & Security
2. Travel Efficiency & Reliability
3. Walking & Biking
4. Transit Access
5. Maintain Transportation Infrastructure
6. Environmental Sustainability
7. Economic Development & Transportation Decisions
8. Emerging Transportation Trends[14]

County

Through relevant key initiatives, Cass and Clay Counties have demonstrated their commitment to fostering an environment that supports the growth of EV usage and infrastructure, setting goals for residents to have convenient access to charging options as the demand for EVs continues to rise.

The Cass County Comprehensive & Transportation Plan emphasizes the importance of enhancing EV infrastructure as part of the region's transportation framework. NDDOT has designated I-29 and I-94 as alternative fuel corridors, facilitating the installation of EV charging stations throughout the county.[15]

The Clay County 2045 Comprehensive Plan highlights the county's transportation vision, which encourages the use of micro transit, micromobility services, ride-hailing services, and new shared mobility options. The Plan emphasizes the need for supportive infrastructure as EVs become a larger percentage of the vehicle fleet mix.[16]

[14] Metro GROW 2045 Metropolitan Transportation Plan: https://www.fmmetrocog.org
[15] Cass County Comprehensive and Transportation Plan (2018): https://www.casscountynd.gov
[16] 2045 Clay County Comprehensive and Transportation Plan (2022): https://claycountymn.gov

Local

Metro COG serves a bi-state area with a planning area that covers 14 townships in Cass County, North Dakota and 16 townships in Clay County. There are seven (7) member jurisdictions and six (6) associate jurisdictions. **Figure 2** depicts Metro COG's associate jurisdictions shown in navy and member jurisdictions color coded by pink, purple, green, bright blue, or yellow.

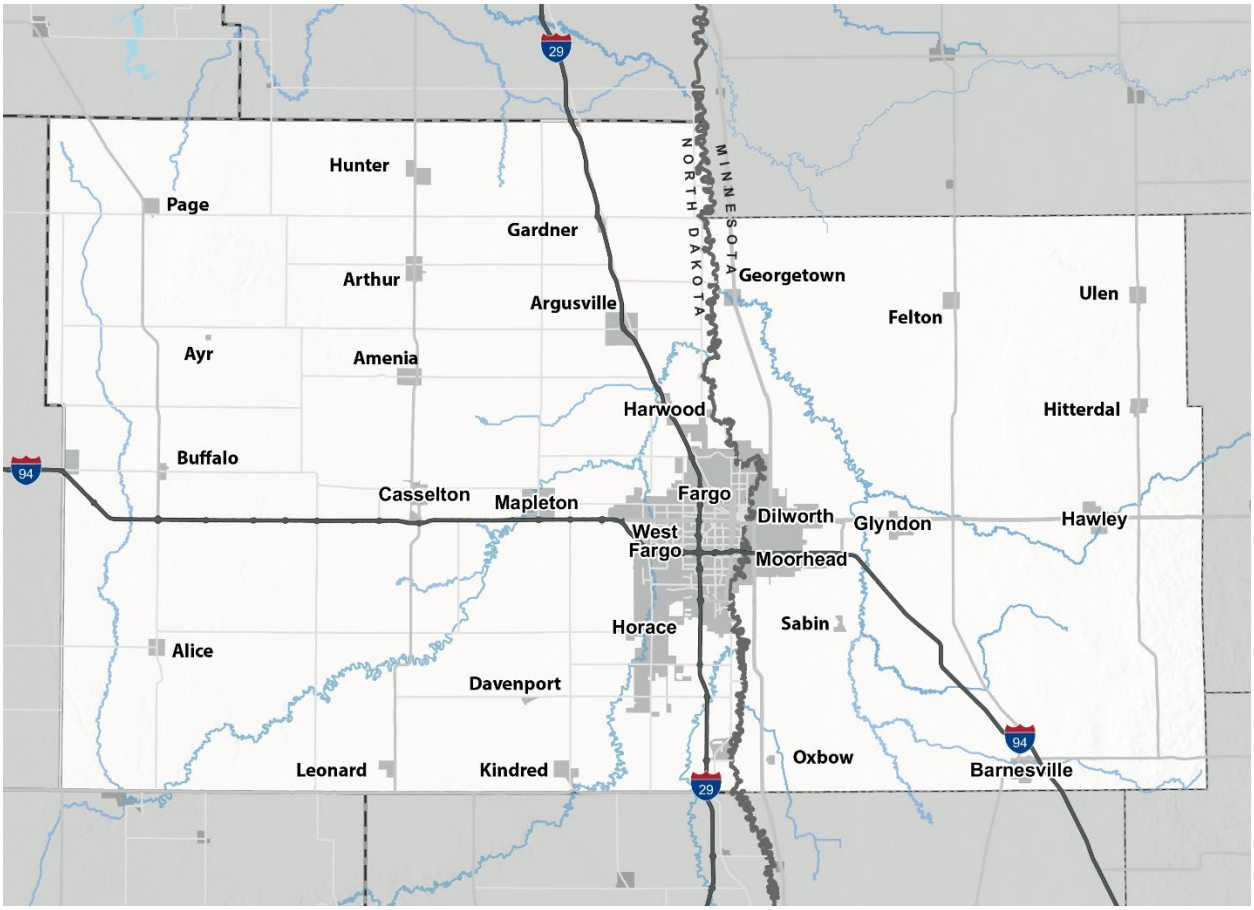


Figure 2: Greater Fargo-Moorhead Metropolitan Area[17]

North Dakota

Fargo, North Dakota

Fargo, North Dakota serves as a pivotal member jurisdiction of Metro COG, driving the collective vision and development of the Fargo-Moorhead metropolitan area. The city's 2030 Comprehensive Plan emphasizes Fargo's commitment to sustainable

[17] Metro COG: http://www.fmmetrocog.org/about/our-communities

transportation solutions, including the transition to EVs. The plan encourages the installation of charging stations throughout the city to facilitate EV use, highlighting that leading this transition can significantly reduce energy consumption and environmental impacts associated with gasoline reliance. By integrating the installation of EV infrastructure into future planning efforts, Fargo aims to enhance mobility options and promote cleaner transportation alternatives, aligning with the broader goals of the EVIP and the anticipated growth in EV usage in the Fargo-Moorhead region.[18]

West Fargo, North Dakota
As one of North Dakota's fastest growing communities, West Fargo is actively shaping the future of the Fargo-Moorhead area through coordinated planning and collaboration.[19] West Fargo's focus on sustainable development is evident in its commitment to environmental stewardship, economic prosperity, and an equitable distribution of community resources. [20] This approach reflects West Fargo's active support for Metro COG's efforts in shaping the region's strategy for EV adoption.

Horace, North Dakota
The City of Horace is located southwest of the primary metropolitan center of the Fargo-Moorhead area, serving as a primary connection between the northern and eastern part of the region. By 2045, Horace aims to be a vibrant community that balances high quality of life with economic growth, while honoring its historical heritage and environmental stewardship. The city is strategically planning for future development, leveraging its proximity to the metropolitan area as a catalyst for guiding land use, zoning, and infrastructure decisions. Transportation initiatives in the area focus on incorporating a flexible policy framework that addresses improvements in both vehicular and multimodal transportation systems to align with community needs.[21]

Minnesota

Moorhead, Minnesota
The City of Moorhead is a vital partner of Metro COG, actively contributing to the region's growth and development. Moorhead has several relevant goals and strategic policies outlined in its 2022 Comprehensive Plan that can be aligned with electrification efforts in the Fargo-Moorhead region. The city has stated its intention to work with agency partners and member jurisdictions to implement regional initiatives, including increased multimodal connectivity and equitable access. Additionally, the city has set goals of adapting and preparing for new forms of transportation, technology, and infrastructure to enhance mobility. The city supports

[18] City of Fargo, Comprehensive Plan Go2030: https://fargond.gov
[19] City of West Fargo: https://www.westfargond.gov
[20] City of West Fargo, 2045 Comprehensive Plan (2018): https://www.westfargond.gov
[21] City of Horace, 2045 Comprehensive and Transportation Plan (2020): https://www.fmmetrocog.org

the establishment of EV charging stations by considering innovative funding mechanisms, including partnerships with Moorhead Public Service, private entities, and federal and state funding sources. Additionally, Moorhead supports a diverse range of curbside uses, such as EV charging stations, throughout the city. [22] Collaborating with Metro COG to enhance the region's collective efforts towards EV readiness further demonstrates Moorhead's commitment to advance EV adoption.

City of Dilworth, Minnesota

The City of Dilworth contributes to Minnesota's broader goals for sustainable transportation and reduced emissions through several actions. The city fosters a vision for sustainable growth in the area and a well-connected transportation system. Dilworth works with Metro COG, MnDOT, and other local and regional planners to stay involved in regional connectivity through state and county improvement projects. 23 Additionally, Dilworth participates in Minnesota's GPI EV Smart Program, which provides vital resources and technical assistance for the community's own EV readiness goals. 24 By participating in the Study, Dilworth is actively shaping its role in contributing to the region's strategy for EV adoption.

Metro COG's Role

This EV Readiness Study reflects a collaborative effort of the Metro COG, its agency partners and member jurisdictions. As a central planning agency, Metro COG is responsible for developing a strategic vision for EV Readiness that aligns with both local needs and federal guidelines. This involves assessing and analyzing forecasted EV trends, identifying charging infrastructure requirements, and evaluating grid capacity to ensure the region is prepared for anticipated growth in EV usage. By coordinating with its member jurisdictions, utilities, charging providers and other stakeholders, Metro COG aims to create a cohesive framework that supports the transition to electrified mobility in the region.

[22] City of Moorhead, Comprehensive Plan (2022): https://www.ci.moorhead.mn.us
[23] City of Dilworth, Comprehensive Plan (2018): https://www.cityofdilworth.com
[24] Great Plains Institute, EV Smart (2023): https://betterenergy.org

2. EV Basics

What is an EV?

Electric vehicles differ from traditional gas-powered vehicles, formally known as ICE vehicles, in two fundamental ways: the fuel source that enables propulsion and how refueling the vehicle is conducted. Conventional ICE vehicles produce direct emissions through the tailpipe, as well as through evaporation from the vehicle's fuel system and during the fueling process. Conversely, all-electric vehicles produce zero direct emissions. Plug-in Hybrid EVs (PHEVs) produce zero direct emissions when they are in all-electric mode, but they can produce evaporative emissions. When using the ICE, PHEVs produce tailpipe emissions. However, their direct emissions are typically lower than those of comparable conventional vehicles.[25]

EVs use one or more electric motors for propulsion from energy stored via rechargeable batteries located on the vehicle. "Refueling" occurs by delivering electricity to the onboard batteries using electricity from the power grid and energy recaptured during braking (known as regenerative braking).[26]

There are also differences in the key terms and acronyms as related to the different classifications of EVs (**Table 2**). The electric range is defined as the distance an EV can travel before needing to charge.

Table 2: Frequently Used EV Terminology

Term	Acronym	Definition	Average all-electric range (miles)
Hybrid Electric Vehicle	HEV	A vehicle that is powered by an electric motor as well as an internal combustion engine. The battery is recharged through regenerative braking and the internal combustion engine.	0 (increases ICE efficiency)
Plug-in Hybrid Electric Vehicle	PHEV	A vehicle that is powered by an electric motor as well as an internal combustion engine. The battery is recharged by being plugged in.	20-40
Battery Electric Vehicle	BEV	A vehicle that relies on only electric motors for propulsion and draws its energy exclusively from the vehicle's battery pack. A BEV is a type of ZEV and can also be referred to as an all-electric vehicle.	250-350

[25] Alternative Fuels Data Center | Emissions from EVs: https://afdc.energy.gov/vehicles/electric-emissions
[26] Regenerative Brakes: How Do They Work? (2023): https://www.kbb.com

Term	Acronym	Definition	Average all-electric range (miles)
Fuel Cell Electric Vehicle	FCEV	A vehicle that uses electricity to power an electric motor but uses hydrogen to produce electricity rather than drawing electricity from only a battery. A FCEV is a type of ZEV.	300-400

HEVs are the most established EV type, followed by PHEVs and then BEVs. Over time, BEVs are expected to become the dominant EV type as the technology continues to improve. For this reason, the Study is mostly focused on readiness for BEVs. **For this report, the term EV will be used to reference vehicles that plug in to charge the battery, which are BEVs and PHEVs**.

How Charging Works

Charging infrastructure for battery electric vehicles is well-developed and includes electrical delivery, charging, and communications wiring. Charging technologies can support current demand and scale to meet growing needs. Refueling EVs occurs through charging the vehicle's batteries. The concept of charging batteries is familiar for consumer electronics, but an unfamiliar idea to most drivers who have only experienced refueling ICE vehicles at gas stations. Electrical terminology for charging is outlined in **Table 3**.

Table 3: Charging Terminology

Term	Definition (as it relates to EVs)
Electric Vehicle Supply Equipment (EVSE)	All equipment used to deliver energy to an electric vehicle to recharge the vehicle's battery. Commonly referred to as a charger.
Connector	A device that plugs into the vehicle to enable charging. Connector types determine vehicle-charger compatibility.
Port	Provides power to charge one vehicle at a time. One port can house multiple connector types.
Charger	The unit that houses EVSE. Sometimes referred to as a charging station.
Station	A site with one or more EV charging ports at the same address.
Kilowatt (kW)	The rate energy is transferred to a vehicle. The more kW, the faster the vehicle will charge and the larger the power requirements to charge the vehicle.

Term	Definition (as it relates to EVs)
Kilowatt-Hour (kWh)	The total amount of energy that can be stored to a vehicle's batteries. Generally, a larger EV battery pack with a higher kWh rating allows a vehicle to travel more miles on a single charge. However, range is also a function of efficiency, e.g., a bus with a 660-kWh pack may have less range than a light-duty vehicle (LDV) with a 70-kWh pack due to differences in energy consumption.

An example of an EV charging station with associated terminology is shown in **Figure 3**. The example shows two chargers at one station.

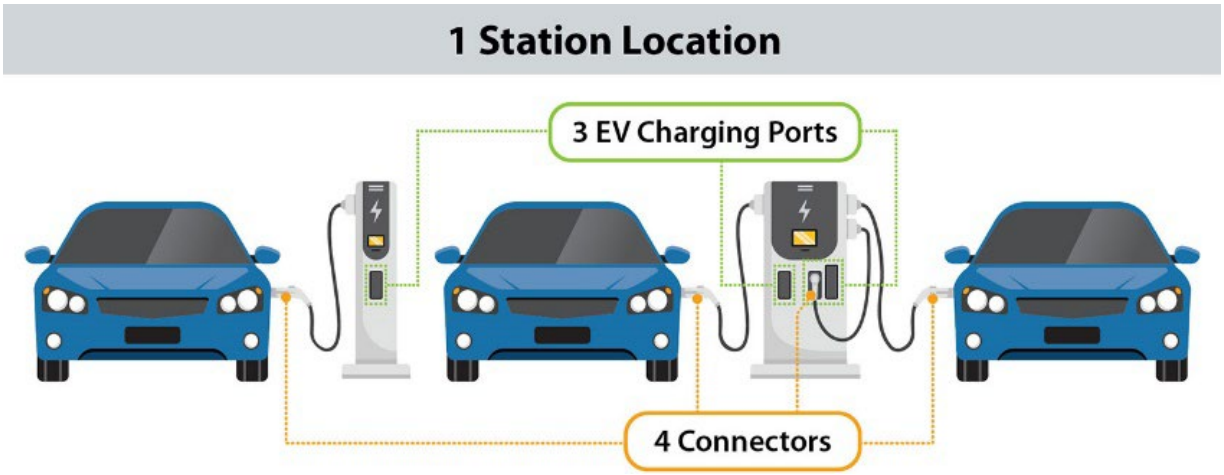


Figure 3: Station Location Terminology

Another unique feature of EV charging versus traditional ICE fueling is that there are different levels of charging that affect how long it takes for a vehicle to charge. The three main levels of charging are:

- **Level 1 (L1)**: Used almost exclusively as a home charging option due to its slow charging speeds. This AC charging method typically provides a power output of 1.9 kW, delivering approximately 2-5 miles of range per hour of charging.
- **Level 2 (L2)**: Level 2 charging is used as a home charging solution for EV owners who want a faster charging option at home and as a public charging option at locations where vehicles are parked for long durations

(such as at workplaces). This AC charging method typically provides a power output that ranges from 6.6 kW to 19.2 kW. This charging level offers around 10-30 miles of range per hour of charging.

- **Direct Current Fast Charging (DCFC)**: Fastest charging option and is used for quick recharging at destination locations with shorter dwell time (i.e., retail stores) and travel stops for long-distance travel. Sometimes referred to as Level 3 (L3) charging. There is a wide range of DCFC power levels and charging speeds that range from 50 kW up to 350 kW (NEVI requires 150 kW minimum per port).

The connector at the end of the charging cable fits into the vehicle's charging port and serves as the physical interface that connects the vehicle to the power source. The design and specifications of the connector determine its compatibility with different vehicles and charging stations. Multiple connectors and connector types can be available on one EV charging port, but only one vehicle will charge at a time.[27] The following connector types can be found:

- **J1772**: For L1 and L2 charging.
- **Combined Charging System (CCS)**: For DCFC for most non-Tesla vehicle models on the market today.
- **CHAdeMO**: For all charging levels for select vehicle models.
- **J3400 (Tesla)**: For all charging levels, originally for Tesla vehicles — most vehicle manufacturers have made commitments to incorporate J3400 connectors beginning in 2025. Recently adopted as the North American Charging Standard (NACS). [28]

Adapters are common to allow for cross-connector compatibility, but automakers committing to the J3400 standard in the U.S. will improve the charging experience for EV drivers.

Table 4 summarizes the characteristics of each charging type.

Table 4: Charging Types Overview

	Level 1	Level 2	DCFC
Voltage	120V AC	208-240V AC	400-1000V DC
Typical Power Output	1.9 kW	7-19 kW	50-350 kW
Power Equivalent (example)	Hair dryer	Clothes dryer	Multiple homes

[27] National Renewable Energy Laboratory, EV Charging Infrastructure Trends (2023): https://afdc.energy.gov
[28] SAE J3400 Charging Connector: https://driveelectric.gov/charging-connector

	Level 1	Level 2	DCFC
Estimated Electric Range Added per Hour of Charging	2-5 miles	10-30 miles	180-240 miles
Estimated BEV Charge Time from Empty	40-50 hours	4 - 10 hours	20 minutes -1 hour
Typical Locations	Home (single-family)	Home (single and multi-family), Workplace, and Public (retail, recreation centers, convenience stores/travel stops)	Public (retail, recreation centers, convenience stores/travel stops)
Pros	Minimal/no electrical upgrades required	Faster charging speed than Level 1 and lower infrastructure needs than DCFC	Fastest charging speed
Cons	Slow Charging speed	Requires infrastructure upgrades to install. Charging speed limits public use to longer duration parking sites (i.e., workplace)	High cost of infrastructure upgrades required high cost of power
Average Installation Costs	Free for EVs that come with an L1 connector	$20,000 per port (commercial site) $1,000-$3,000 (single-family home)	$1,500-$2,000 per kW

EV Benefits

EVs have numerous benefits, ranging from improved air quality to lower operating costs to energy independence.

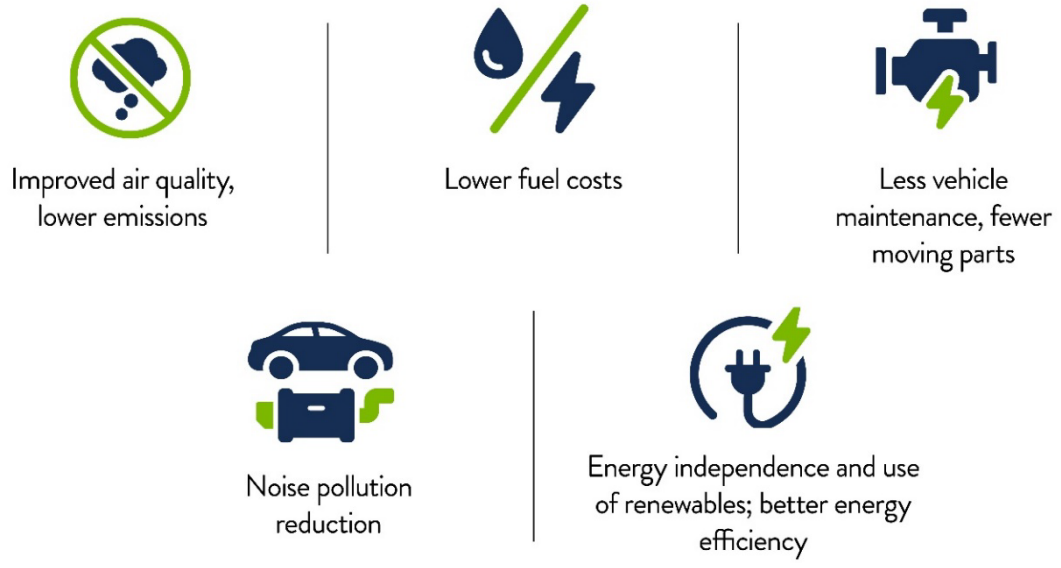


Figure 4: EV Benefits Overview

Improved Air Quality & Lower Emissions

Vehicle emissions can be divided into two general categories: air pollutants, which contribute to smog, haze, and health problems; and GHGs, such as carbon dioxide and methane.[29]

The elimination of tailpipe emissions prevents harmful pollutants from entering the atmosphere. A study by the American Lung Association found that the shift to 100 percent sales of zero-emission passenger vehicles by 2035 and medium- and heavy-duty trucks by 2040 would avoid up to 110,000 premature deaths and nearly 3 million asthma attacks by 2050.[30] Tailpipe emissions are one factor in a vehicle's life cycle emissions. Another factor is the emissions associated with fuel pathways, which include extracting, refining, producing, and transporting the fuel.

Reduced Operation Costs

Drivers can save money on fuel and maintenance by owning an EV.

Fuel Costs

Electricity is generally cheaper and more consistent with pricing than gasoline and diesel. As EVs are more efficient in using energy to move the vehicle, the amount saved on fuel depends on the number of miles driven and the price of gas and electricity. There are multiple online calculators available for drivers to estimate how much they could save based on their driving habits. The Alternative Fuels Data Center's Vehicle Cost Calculator, a DOE website that contains a multitude of EV resources, offers drivers a user-friendly tool on calculating personal vehicle efficiency.[31] For example, by comparing a Tesla Model Y with a Toyota RAV4 and using the default driving habit values along with an average price of gas of $3/gallon and electricity priced at $.12/kWh, the tool estimates an annual fuel savings of over $700 by driving the EV.

Vehicle Maintenance

EVs do not need oil changes, cooling system flushes, transmission servicing, or replacements for air filters, drive belts, or spark plugs. Additionally, brakes last longer than those in ICE vehicles due to regenerative braking. However, EVs typically wear down tires faster due to their higher torque and weight. Despite this, Consumer

[29] Alternative Fuels Data Center: https://afdc.energy.gov/vehicles/electric_emissions
[30] American Lung Association, Zeroing in on Healthy Air (2022): https://www.lung.org/clean-air/electric-vehicle
[31] Alternative Fuels Data Center | Vehicle Cost Calculator: https://afdc.energy.gov/calc

Reports estimates that an EV owner saves an average of $4,600 on maintenance and repair costs over the life of the vehicle compared to gas-powered vehicles.[32]

Energy Independence and Use of Renewables

EVs are powered by American-made electricity, reducing the need for imported oil and providing more stable prices than gasoline, which is subject to global market fluctuations. Most electricity costs are controlled by each state's Public Service Commission (PSC), resulting in a high degree of stability. Electricity can be produced from local and renewable resources, enhancing resilience and sustainability. In geographic areas with cleaner electricity, EVs and PHEVs have a more significant emissions advantage over gas and diesel vehicles, while in areas with higher-polluting electricity, EVs and PHVs may not show as strong of a life cycle emissions benefit.[33] In May 2024, 46% percent of the electricity generated in North Dakota and 36% in Minnesota was renewable, ranking 15th and 19th in the U.S. respectively.[34] The U.S. average was 26%. Wind generation in North Dakota has more than doubled from 2016 to 2022 and a 400 MW wind farm is scheduled to come online in the state in 2025. Minnesota passed a bill that requires utilities to supply Minnesota customers with electricity generated or procured from carbon-free resources, beginning at an amount equal to 80% of retail sales for public utility customers in Minnesota in 2030 and increasing every 5 years to reach 100% by 2040.[35]

Increased Energy Efficiency

Most of the energy in gas-powered vehicles is lost to heat. Only 12-30% of the energy stored in gasoline is used to move the vehicle, while over 77% of the electrical energy delivered to EVs is used to move the vehicle.[36] EVs have shown to be over four (4) times more efficient than gas vehicles on a mile per gasoline gallon equivalent.[37] These efficiency increases lead to reduced energy use and lower fuel costs.

Barriers to Adoption

EVs are a rapidly improving technology and the industry is still relatively in its infancy. There are common concerns among the public that discourage potential consumers from considering an EV. The facts about these common EV concerns are

[32] Consumer Reports, Vehicle Maintenance Research (2020): https://consumerreports-EV maintenance
[33] Alternative Fuels Data Center: https://afdc.energy.gov/vehicles/electric-emissions
[34] Electric Power Monthly, U.S. Energy Information Administration (2024): https://www.eia.gov/electricity
[35] Minnesota Commerce Department, Minnesota 100% Clean Energy by 2040 (2023): https://mn.gov/commerce
[36] U.S. Department of Energy, Office of Efficiency and Renewable Energy: https://www.fueleconomy.gov
[37] Alternative Fuels Data Center, Maps and Data: https://afdc.energy.gov/data

important for consumers to be aware of as some of these concerns can be addressed in part through additional context.

Lack of Charging Infrastructure

Nearly half (49%) of consumers who reject the idea of buying an EV say their primary reason is a lack of charging station availability according to J.D. Power.[38] Charging infrastructure is a critical piece of EV readiness and a main driver of the Study. However, sometimes there is a lack of awareness of existing charging infrastructure due to the comparatively lower visibility of chargers versus gas stations.

Consumers who take long-distance trips have a common concern termed "range anxiety" regarding the purchase of an EV. This anxiety stems from the perception that EVs have a shorter range compared to gasoline-powered vehicle and that charging options may be limited along their route. The 2024 Plug-In America EV Driver Survey Report reveals that 66.5% of consumers cited battery range concerns at the time of purchasing or leasing an EV, but this concern significantly decreased to 35.9% after they had owned or leased the vehicle.[39]

There is a large variety in the range of available EV models, from 100 miles to 500 miles, with most models falling between 250 and 350 miles.[40] This reduction in range compared to similar gas-powered vehicles requires more refueling during long-distance travel. Historically this has been a challenge to find reliable charging along long-distance travel routes. This challenge is the target of dedicated federal funding through the NEVI program.

The NEVI program provides a total of $5 billion to U.S. states to administer the buildout of a charging network that places chargers at least every 50 miles along interstate corridors and designated non-interstate alternative fuel corridors. Stations must also be within one travel mile of the interstate exit.

High Purchase Costs

EVs have historically cost more than comparable ICE vehicles and most models available to date have been in the luxury market. This trend is mainly due to the high cost of EV battery packs, the most significant expense when manufacturing an EV. However, battery prices have decreased significantly over the last 15 years as shown in **Figure 5**. The DOE's Vehicle Technologies Office estimates the cost of an EV lithium-ion battery pack for a LDV declined 90% between 2008 and 2023. The 2023 estimate is $139/kWh on a usable-energy basis for production at scale of at least

[38] J.D. Power, Press Release (2023): https://www.jdpower.com
[39] Plug In America, EV Driver Annual Survey Report (2024): https://pluginamerica.org
[40] Edmunds, Electric Car Range and Consumption (2023): https://www.edmunds.com

100,000 units per year. That compares to $1,415/kWh in 2008. The decline in cost is due to improvements in battery technologies and chemistries, as well as improvements in manufacturing and increases in production volume.[41] Battery cost cuts could allow EVs to achieve parity with ICE vehicles as early as 2025 in some markets. [42]

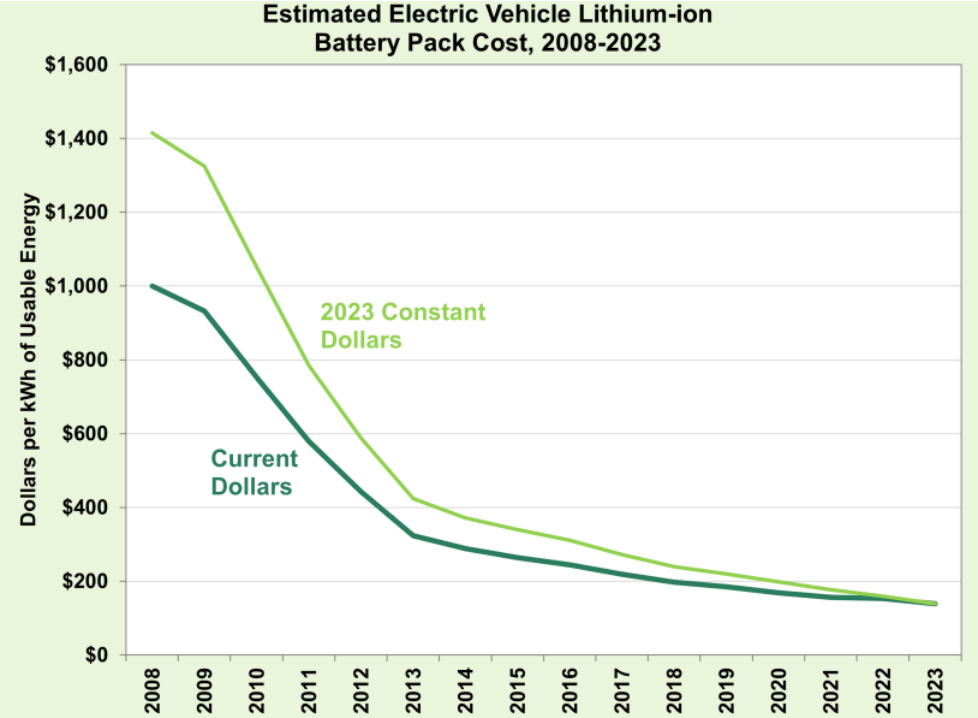


Figure 5: Lithium-ion Battery Pack Prices 2018-2023, $2023 dollars

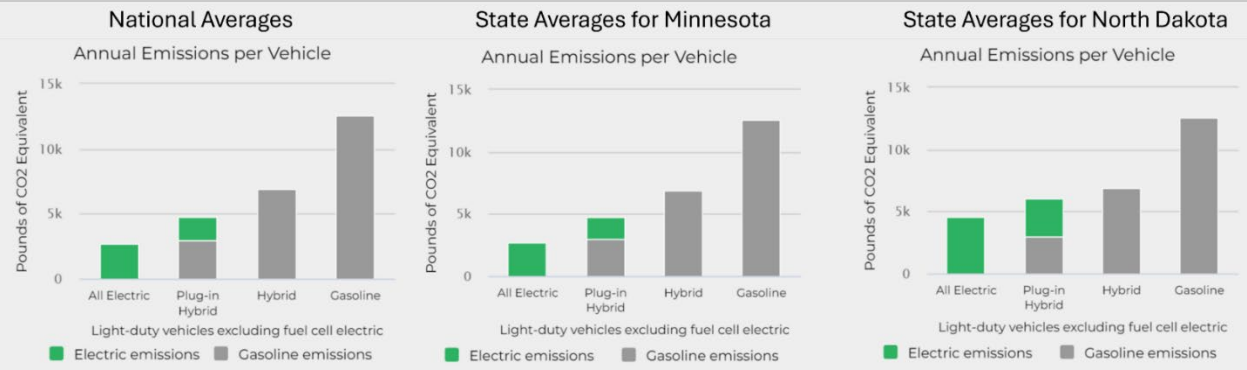
Environmental Concerns

Two main concerns about EVs and the environment are the impacts related to battery manufacturing and electricity powering EVs that is generated from fossil fuels.

A common concern is that the environmental impacts of building an EV battery negate the positive impacts of operating the vehicle. EV batteries are made of materials such as lithium, cobalt, manganese, graphite, steel, and nickel. These materials are mined from all over the world, which produces emissions in the mining, processing, and transporting processes. This leads to a typical EV creating more carbon pollution than a gasoline car during manufacturing. However, this

[41] Office of Energy Efficiency and Renewable Energy, Vehicle Technologies Office (2024): https://www.energy.gov
[42] Bloomberg, Electric Vehicles (2023): https://www.bloomberg.com

increase in manufacturing emissions is outweighed by the amount of GHG emissions saved from driving an EV over time, as shown in **Figure 6**.[43]



Note: Based on assumptions with 2022 data from U.S. Energy Information Administration

Figure 6: Fuel-Cycle Emissions in the U.S., Minnesota, and North Dakota

All-electric vehicles and PHEVs that operate solely on electricity produce zero tailpipe emissions. However, the different processes of generating electricity, such as power plants, may generate emissions. In regions that rely on cleaner energy sources for electricity production, all-EVs and PHEVs generally exhibit a significant advantage in life cycle emissions compared to conventional vehicles powered by gasoline or diesel. A recent study conducted by UC Berkeley quantified GHG reductions using an extensive roadside CO_2 monitoring network, revealing a correlation between increased EV adoption and a notable decline in carbon emissions in the San Francisco Bay Area. These findings underscore the effectiveness of EVs in lowering regional carbon emissions, particularly in areas with cleaner energy sources.[44] Conversely, in areas with higher emissions from electricity generation, the life cycle emissions benefits of all-EVs and PHEVs may not show as strong a life cycle emissions benefit.

In 2024 and using the U.S. average renewable energy mix, a compact electric SUV with a range of 300 miles generates 52% less GHG emissions over its life cycle compared to a similar gasoline-powered vehicle, shown. While the GHG emissions associated with electricity production and distribution (using the current share of renewable energy) are roughly twice those of gasoline production and distribution, this increase is significantly outweighed by the tailpipe emissions from gasoline vehicles as shown in **Figure 7**.[45]

[43] Alternative Fuels Data Center: https://afdc.energy.gov/vehicles
[44] U.C. Berkeley News (2024): https://news.berkeley.edu/2024/04/04/evs-are-lowering-bay-area-s-carbon-footprint/
[45] Office of Energy Efficiency and Renewable Energy, Vehicle Technologies Office (2024): https://www.energy.gov

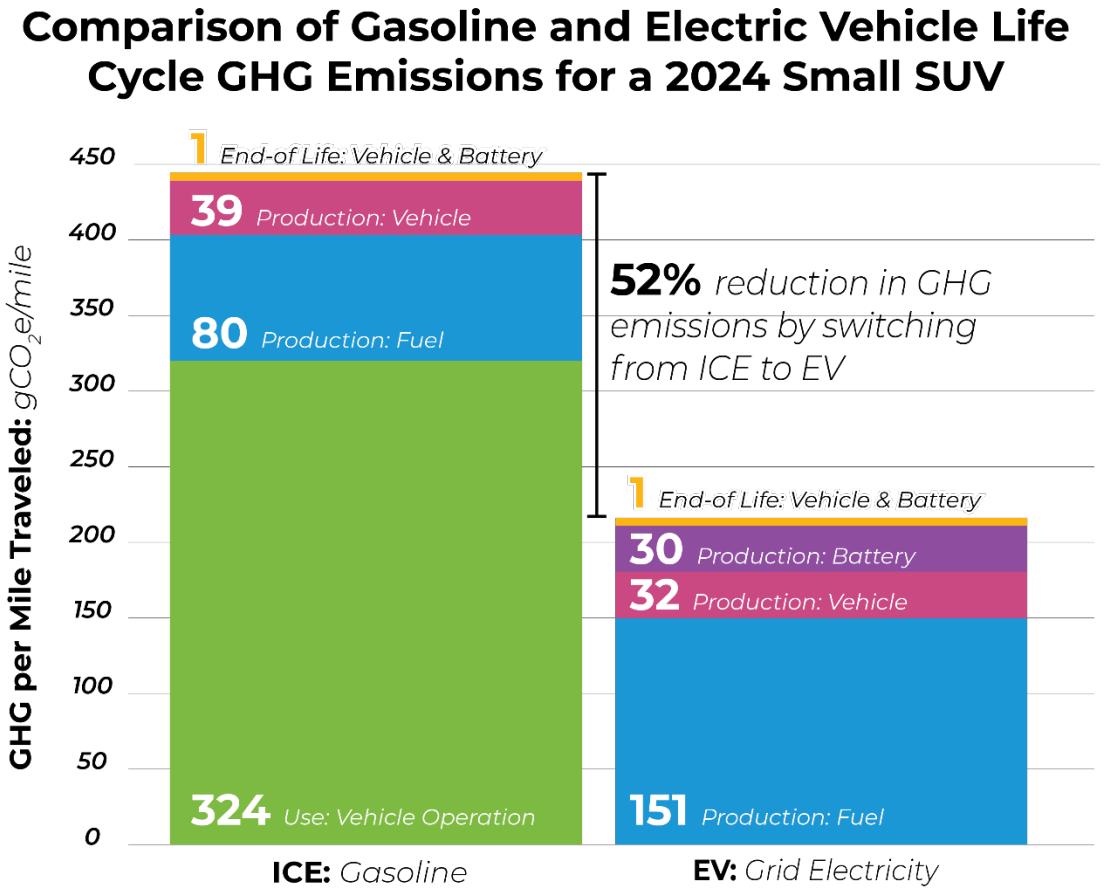


Figure 7: Comparison of Gasoline and Electric Vehicle Life Cycle

The longer EVs are operated, the more environmental benefits they bring. Additionally, there are companies such as Redwood Materials working on how to recycle the materials from EV batteries, with the goal of creating a closed-loop supply chain where materials can be recycled into new batteries. Another example is Repurpose Energy, which is taking retired EV batteries and converting them into energy storage solutions for renewable energy. While there is a long way to go in the sustainability of EV batteries, there are companies actively working on improving this issue.

Another concern is that EVs do not provide environmental benefits if they are powered by fossil fuels. EVs powered by electricity generated from fossil fuels do generate more life-cycle emissions, but even in this scenario EVs are responsible for less emissions than ICE vehicles. A 2019 study found that an EV running off of just 13% renewable energy still produces 55% less GHG emissions than an ICE vehicle

over the vehicle's lifetime.[46] However, this number jumps to a nearly 95% reduction in emissions if the grid is 100% renewable, showcasing the direct sustainability ties between renewable energy and the environmental benefits of EVs.

EV Technology Trends

A significant amount of research and development is being done in the industry related to EV batteries. Batteries are the most important factor when it comes to the range an EV can drive under a single charge, how fast they will charge, how long the battery will last, and how much they cost to produce (**Figure 8**). Manufacturers know that improving these factors is important to increase sales, so it is expected that consumers will see improvements over time.

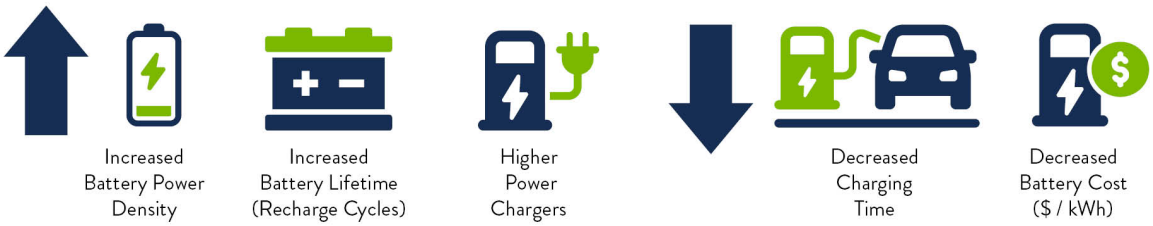


Figure 8: EV Technology Trends

A significant amount of these investments is expected to take place in North America. The Inflation Reduction Act (IRA) passed in 2022 aims to increase EV investments domestically and reduce the reliance on other countries for battery materials and manufacturing. As a result, over $100 billion of EV investment has been announced since the passage of the IRA, including over $72 billion in battery manufacturing.[47]

[46] CG Research Networks, The Climate Change Mitigation Potential of EVs (2019): https://cgscholar.com
[47] Bloomberg NEF, Zero-Emission Vehicles Factbook (2023): https://assets.bbhub.io

3. EV Ecosystem

EVs are unique in that the infrastructure needed to support them involves a separate set of stakeholders than the traditional gas station model. Chargers can be placed in appropriate areas where there is electricity available and the capacity to support them.

As part of the Study, different stakeholders were engaged to determine what EV readiness means to them. Stakeholders were grouped into two main categories: providers and consumers. Providers remove barriers to EV ownership through the unique services they provide. Consumers are different types of existing/potential EV owners who are the recipients of the providers' services. **Table 5** provides an overview of the stakeholders accounted for in the Study.

Table 5: Stakeholder Overview

	Stakeholders	Description	Needs (Consumers) or Role (Providers)
Providers	City Departments	Member jurisdiction departments, including Planning & Development Services, Fire & Rescue, Public Works, and Innovation & Technology.	Facilitate a safe and fair EV experience that supports both consumers and businesses.
	EV Industry	Businesses involved in the production and sale of EVs.	Produce high quality EVs at a range of price points and educate consumers on the EV user experience.
	Charging Providers (Charging Networks/ Businesses/Site Hosts/Developers/ Auto Dealers)	Any business that could provide or facilitate charging infrastructure.	Provide ample charging opportunities to meet consumer demand while meeting business objectives.
	Utilities	Utility companies within the Fargo-Moorhead area.	Develop and manage grid capacity for EV growth and provide power for charging stations.
Consumers	General Public/ Potential EV Users	Residents of Fargo-Moorhead communities.	Education on EV ownership and charging infrastructure availability.
	Homeowners	Existing/potential EV owners who are homeowners looking for or are currently equipped with charging at their single-family residence.	Information on home charging installation process and rate structures.

	Stakeholders	Description	Needs (Consumers) or Role (Providers)
	Residents without Home Charging Access	Existing/potential EV owners who are not able to charge at their residences are commonly renters.	Access to reliable and convenient public chargers (both L2 and DC fast chargers) with quality amenities nearby.
	Tourists/Fast Charging Users	Existing/potential EV owners traveling to/through Fargo-Moorhead that will need to charge quickly along their trip to Fargo-Moorhead or residents in the area looking for fast charging.	Access to reliable and convenient public DC fast chargers with quality amenities nearby.

These stakeholders are connected in many ways, creating an integrated EV ecosystem (**Figure 9**). Consumers need services from the providers to enable EV adoption, and the providers need the charging demand created from consumers adopting EVs. This interconnected nature creates the need for collaboration and coordination to foster an EV-ready community.

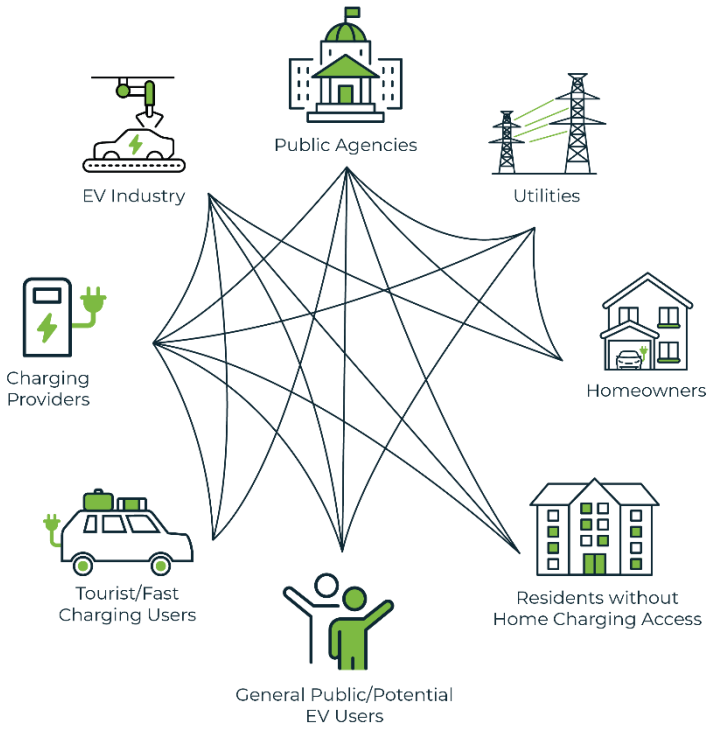


Figure 9: EV Ecosystem

Potential Stakeholders

Discussions with stakeholders are critical to achieve clear, achievable, and funded actions for partners. In the Fargo-Moorhead region, these stakeholders include:

- NDDOT
- MnDOT
- Clay County
- Cass County
- Municipalities and Public Agencies
- Business Community
- Utility Providers

4. Current EV Industry Trends

National Trends

The EV market is experiencing significant growth in the U.S., driven by an increase in model availability and strong commitments from automakers. The Environmental Defense Fund's (EDF) EV Market Report projects the number of light-duty EV models on the market reaching 197 by the end of 2025, up five percent from the previous EV Market Report's projection.[48] New EV models available in the U.S. are increasingly including trucks and SUVs with third-row seating, catering to diverse consumer needs. This expanding selection supports broader adoption as consumers find more options that fit their lifestyles.

Many LDV manufacturers have committed to significantly increasing EV sales over the coming years. Some automakers are also focusing on electrifying their entire vehicle fleets within the next decade. This trend is mirrored in the medium- and heavy-duty vehicle sectors, where manufacturers are pledging to boost EV sales and expand model availability. See the EDF's EV Market Report for key auto manufacturer commitments.

In 2023, approximately 1.2 million EVs were sold in the U.S., marking a significant increase in EV sales, accounting for around 10% of the total market share, as shown in **Figure 10**. It's worth noting that there is a wide variety of EV adoption trends throughout the U.S., indicating varying interests in electric vehicles across different regions.

Source: Alliance for Automotive Innovation

Figure 10: EV Market Share, January 2020-December 2023

[48] Environmental Defense Fund, EV Market Update (2023): https://www.edf.org

The push for electrification is supported by advancements in battery technology, which have made EVs more affordable and efficient. Additionally, policy initiatives at both federal and state levels are creating a favorable environment for EV adoption. As a result of these commitments and regulatory frameworks, the market is expected to continue to see a diversifying range of EV models, enhancing consumer choice and driving further adoption. This collective effort between the public and private sector continues to propel the EV industry,

Regional Context

Existing EV Adoption and Charging Trends

North Dakota & Minnesota

As of 2023, Minnesota ranked 23rd (6.37%) and North Dakota ranked 50th (1.32%) of U.S. states in EV sales market share 2023 year to date. Statewide registration data as of January 2024 is shown in **Table 6**.

Table 6: North Dakota & Minnesota Statewide Registrations (as of January 2024)

State	Battery Electric (BEV)	Plug-In Hybrid (PHEV)	Total EVs	Total Registered Vehicles	EV Share (BEV + PHEV)
Minnesota	35,300	15,350	50,650	7,420,000	.68%
North Dakota	800	700	1,500	747,400	.20%
Combined	**36,100**	**16,050**	**52,150**	**8,167,400**	**0.64%**

As of September 2024, there are 104 publicly accessible charging stations in North Dakota and 847 in Minnesota.[49] Two resources to track available charging stations are the Alternative Fuels Data Center and PlugShare.

[49] Alternative Fuels Data Center: Electric Vehicle Charging Station Locations (energy.gov)

Fargo-Moorhead MPA

Data gathered from Cass and Clay counties shows approximately 900 registered EVs in the two counties, constituting less than one percent of vehicles registered in the area, as shown in **Table 7.**

Table 7: Cass and Clay County EV Registrations (as of July 2024)

County	Battery Electric (BEV)	Plug-In Hybrid (PHEV)	Total EVs	Total Registered Vehicles	EV Share (BEV + PHEV)
Cass	443	304	747	175,500	.43%
Clay	112	62	174	70,500	.25%
Combined	**458**	**321**	**921**	**246,000**	**.37%**

While EVs make up a small share of total vehicles registered, they have been increasing in the Fargo-Moorhead region the last few years, as shown in **Figure 11**.

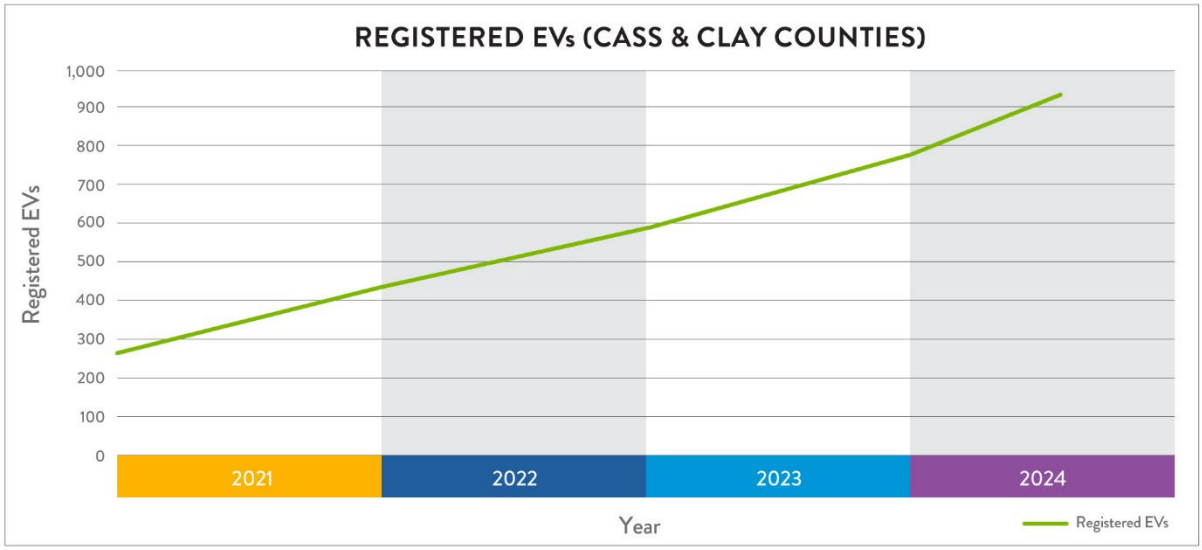


Figure 11: Registered EV's (Cass & Clay Counties)

As of September 2024, there are 23 active publicly accessible charging stations with a total of 74 ports in the Fargo-Moorhead area. There is a mix of Level 2 and DCFC charging stations with some stations having both options, as shown in **Figure 12**. Station locations range from parking ramps to car dealerships to retail locations.

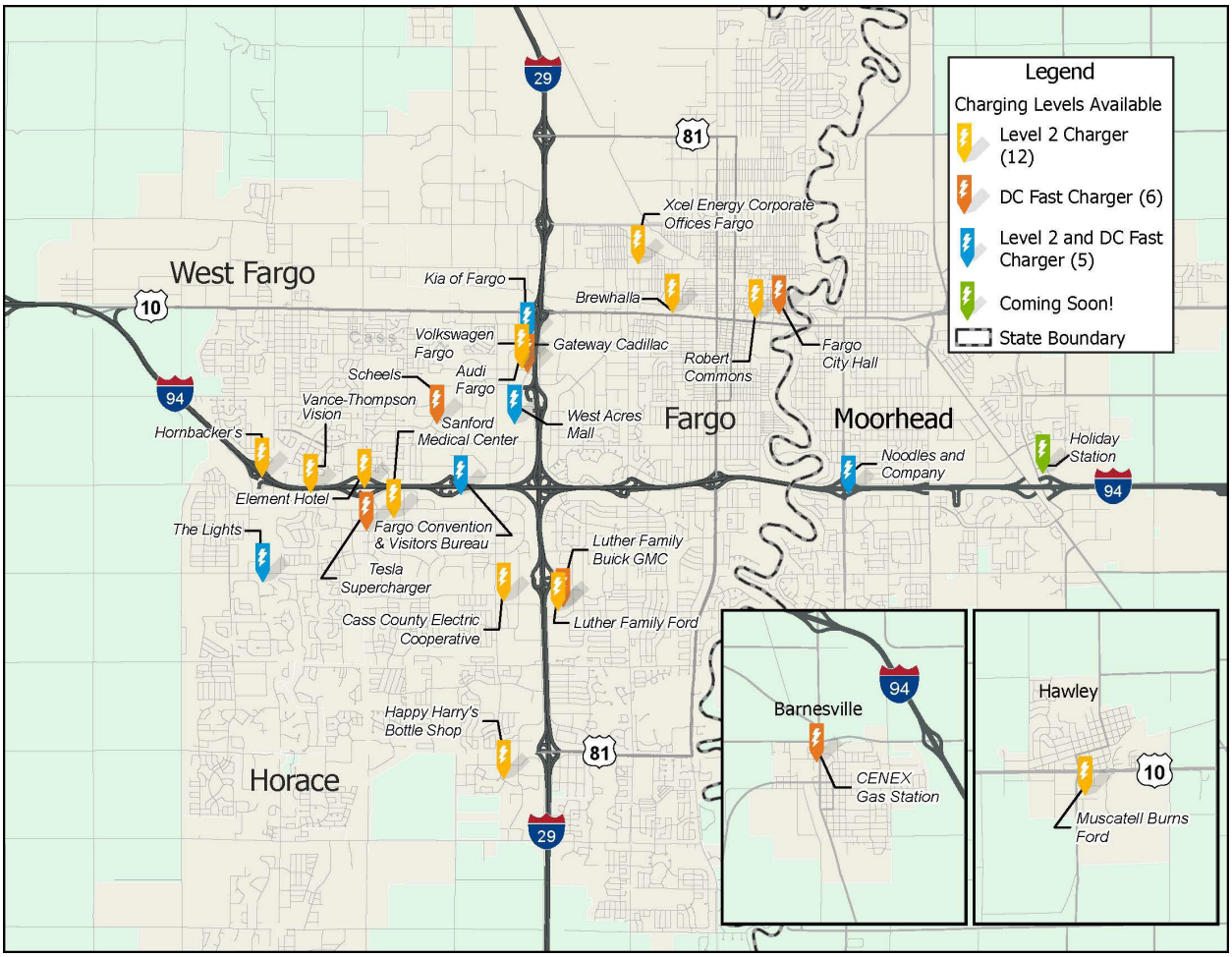


Figure 12: Existing Charging Station Locations in Fargo-Moorhead
Minnesota awarded a Round 1 NEVI site to the Holiday gas station in Moorhead, which will expand the fast charging offerings in the area.

EV Adoption and Charging Forecast

EV growth is expected to continue over the coming years. This growth will require an increase in charging infrastructure to meet demand. Forecasts were completed on EV adoption and charging required to quantify EV readiness needs.

The growth of EVs around the world has widely followed an S-curve of adoption, the common growth curve seen with the adoption of disruptive technologies (**Figure 13**). This growth curve is expected to be present in the Fargo-Moorhead region as well.

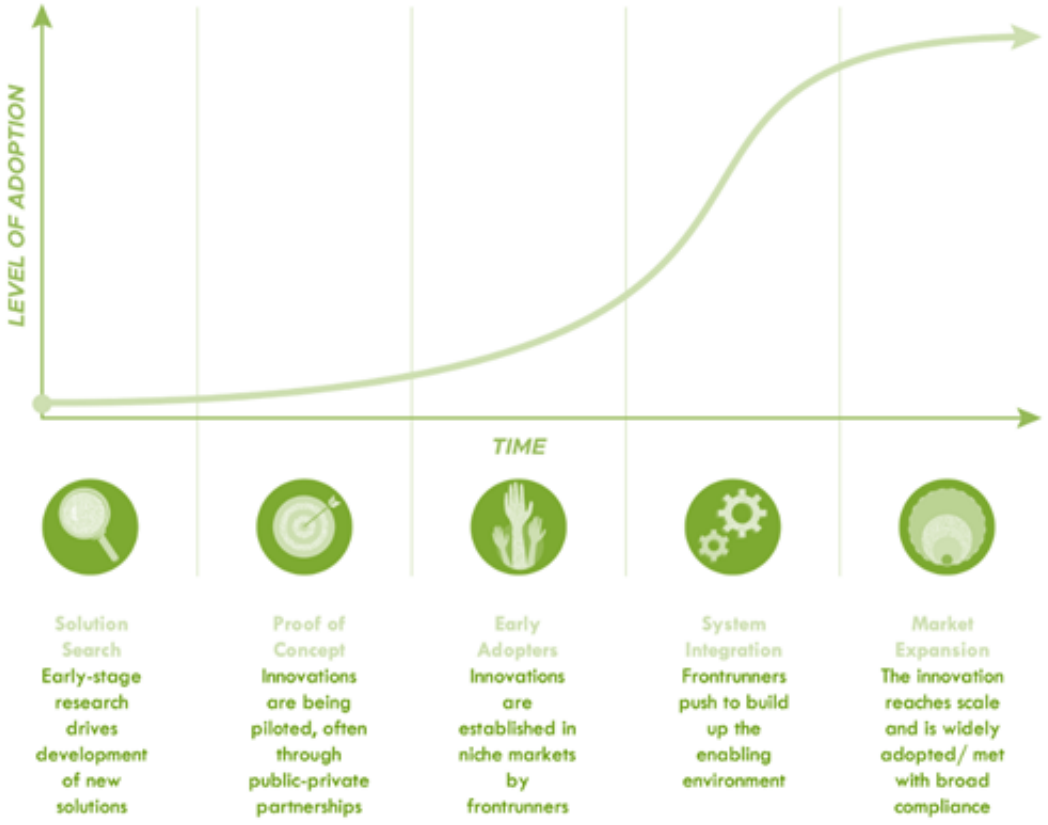


Figure 13: Typical Adoption Phases of Disruptive Technologies[50]

The S-curve approach, also known as the Diffusion of Innovations, takes its name from the characteristic "S" shape of the adoption trend line. Over time, the S-curve comes to fruition due to the different rates of growth as adoption increases. The Metro COG region is most likely in the early adopters phase. The transition from linear to exponential growth in EV adoption was the subject of the EV adoption forecast.

To quantify this potential growth, an EV adoption forecast was created for a 10-year planning horizon to estimate the range of EVs that could be registered in Clay/Cass counties by 2035. Three growth scenarios were considered to account for the uncertainties in EV adoption. The three scenarios were based on EV sales market share in 2035:

- Slower growth: 20%

[50] Harnessing the Power of S-Curves – RMI (2022): https://rmi.org/insight/harnessing-the-power-of-s-curves/

- Medium growth: 30%
- Faster growth: 40%

The S-curve growth for each scenario is shown in Figure 14. The year exponential growth starts occurring and how steep that growth is are the two main factors to monitor moving forward.

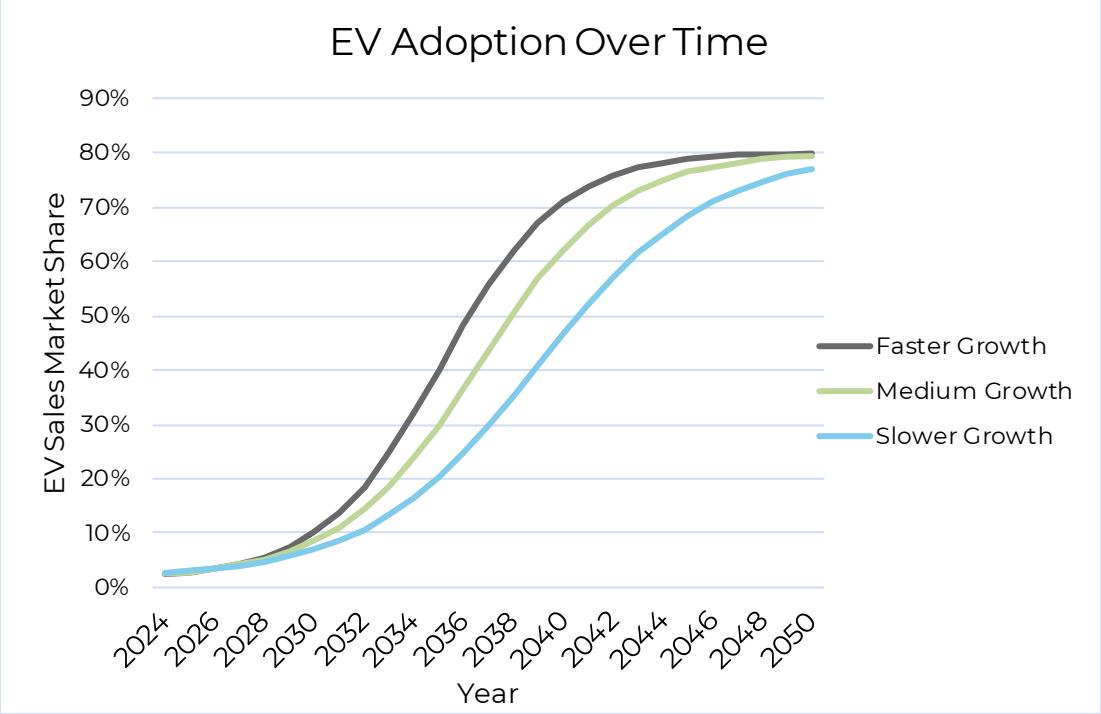


Figure 14: S-curve EV Adoption Growth

The forecast estimates that between 11,000-18,000 EVs could be in the region in 2035 (**Table 8**). This would be substantial growth in EVs, but EVs would make up just 4-7% of the total number of vehicles registered.

Table 8: EV Adoption Forecast Results

Category	2035 Estimates
EV Sales Market Share (New Vehicle Sales)	20 - 40%
EV Market Share (All Registrations)	4 - 7%
Total EVs Registered	11,000 - 18,000
- *Total BEVs Registered*	*9,000 - 15,000*
- *Total PHEVs Registered*	*2,000 - 3,000*
Total Vehicles Registered	280,000

The length of time for EVs to impact the total vehicle mix is shown for the medium growth scenario in **Figure 14**. ICE vehicles would peak around 2035, but EVs would not overtake ICE vehicles until after 2050. This is due to the 10-20 year lifespan of most vehicles causing a long duration for the entire vehicle fleet to turn over.

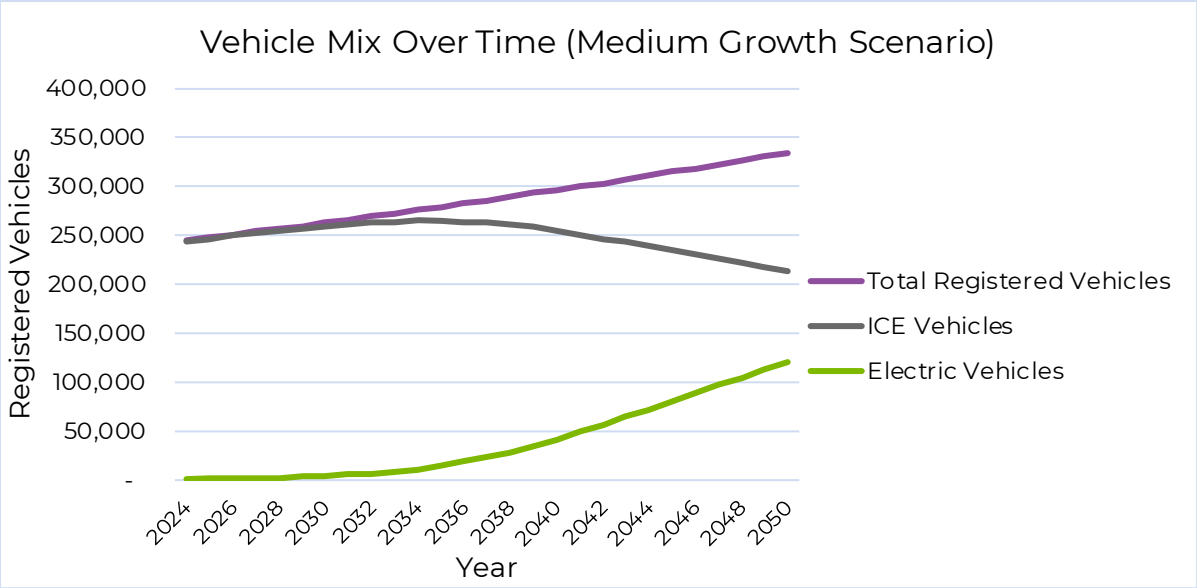


Figure 15: Registered Vehicles Forecast Results

Using the number of EVs forecasted to be in the Fargo-Moorhead area in 2035, the amount of charging needed to support these EVs was estimated. To perform this analysis, the Electric Vehicle Infrastructure Projection Tool (EVI-Pro) Lite, developed by the U.S. Department of Energy's National Renewable Energy Laboratory, was used.[51]

The inputs and results of this analysis are shown in **Table 9**. One of the important aspects of forecasting the distribution of charger types and an input in the EVI-Pro Lite tool is the percent of EV drivers that have access to home charging. If more EV drivers charge at home, less publicly accessible charging is needed and vice versa. Metro COG estimates that in 2035, 48% of the areas housing units will be renter occupied.[52] It was assumed that these housing units will not have access to home charging. This is not a perfect metric to project EV home charging because some homeowners will elect not to charge at home and some renter occupied units will have access to home charging, but it is a conservative value that ensures publicly accessible charging needs are not under forecasted.

[51] Alternative Fuels Data Center, EVI Pro-Lite: https://afdc.energy.gov/evi-pro-lite
[52] Metro COG, 2050 Baseline Demographic Forecast: https://www.fmmetrocog.org/application/files/8916/7389/2933/FM-Metro-Population-Projection_FINAL_November_2022.pdf

The EVI-Pro tool projects consumer demand for charging infrastructure for a given level of EVs and breaks down the results by the following charging categories:

- **Single Family Charging**
  - Private-access ports for residents of detached single-family homes as well as townhomes and twin homes. Includes a mix of Level 1 and Level 2 ports.
- **Shared Private Charging**
  - Private-access Level 2 ports for residents of apartments, condominiums, duplexes, and mobile homes as well as private-access ports at workplaces/hotels that are exclusive to employees of a company/hotel guests.
- **Publicly Accessible Level 2 Charging**
  - Ports available to the public at various locations (retail, workplace, recreation center, healthcare facility, education facility, community center, transportation facility, neighborhood, office).
- **Publicly Accessible DC Fast Charging**
  - DC fast charging ports available to the public at high-traffic locations (retail and recreation center locations).

Table 9: EV and Charging Forecast Results

Inputs (Based on 2035 Forecasted Values)			
Growth Scenario	**Slower Growth**	**Medium Growth**	**Faster Growth**
% of New Vehicle Sales are EVs	20%	30%	40%
% of EVs to overall vehicles registered	4%	5%	7%I
Plug in Electric Vehicles	11,000	14,000	18,000
Forecasted Charging Ports Needed			
Single Family	4,990	6,350	7,820
Shared Private	870	1,110	1,310
Publicly Accessible Level 2	1,140	1,450	1,700
Publicly Accessible DC Fast Charging	120	160	200
Total Charging Ports	**7,120**	**9,060**	**11,030**

The medium growth scenario was used in the charger siting analysis discussed in Chapter 6.

5. Why Get Ready?

As market dynamics evolve, automakers in the U.S. have reached a pivotal moment where they can increasingly produce substantial quantities of EV models. However, the complex landscape of EV adoption presents challenges that require careful navigation. Preparing for EV readiness is essential for several reasons:

- **Public safety**: Understanding where vehicles reside and how and where they charge helps the City to be prepared for potential issues like vehicle and electrical fires and limit the potential for blackout events.
- **Reliable and convenient charging is available for everyone who wants it**: If charging is concentrated in only certain areas, barriers are in place for those without charging access.
- **Maximizing sustainability benefits**: Increasing readiness reduces barriers to EV adoption, thus maximizing the sustainability benefits that EVs bring while maintaining consumer choice.

By prioritizing EV readiness, Metro COG can work towards a regional vision that elevates sustainability practices, ensures grid readiness, enhances regional connectivity, and promote equitable access to charging infrastructure for the Fargo-Moorhead region.

Sustainability

Regional efforts in the Fargo-Moorhead area have promoted sustainability through various policy initiatives aimed at transitioning to EVs and alternative fuels. This focus on sustainability is driven by the desire to reduce transportation-related emissions in the region.

One key initiative is the installation of EV charging stations throughout the region. By providing convenient and accessible charging infrastructure, the region is encouraging the adoption of EVs among residents and visitors. Additionally, the EV Readiness Study is evaluating infrastructure improvements through an environmental resiliency lens, supporting the Fargo-Moorhead area's efforts to be well-equipped for the growing demand for EVs.

Planning efforts in Fargo-Moorhead also emphasize the importance of reducing GHG emissions through use of alternative energy sources and sustainable transportation solutions. [53] To support these goals, plans across various member jurisdictions aim to leverage federal and state programs that promote the

[53] City of Fargo, Comprehensive Plan Go2030: https://fargond.gov

installation of EV charging stations. Further, the region is working to support Moorhead Metro Area Transit (MATBUS) in implementing hybrid or electric buses.

The overall focus of these sustainability efforts is to create a more environmentally conscious and resilient transportation system in the Fargo-Moorhead region. By prioritizing the installation of reliable and convenient charging infrastructure and exploring alternative modes of transit and energy production, Fargo-Moorhead is taking proactive steps towards enhanced sustainability in the region. [54]

Grid Readiness

The electric utility or power grid is a complex system that can face demands or limitations at one or multiple component levels including power generation, transmission-scale and distribution-scale infrastructure.

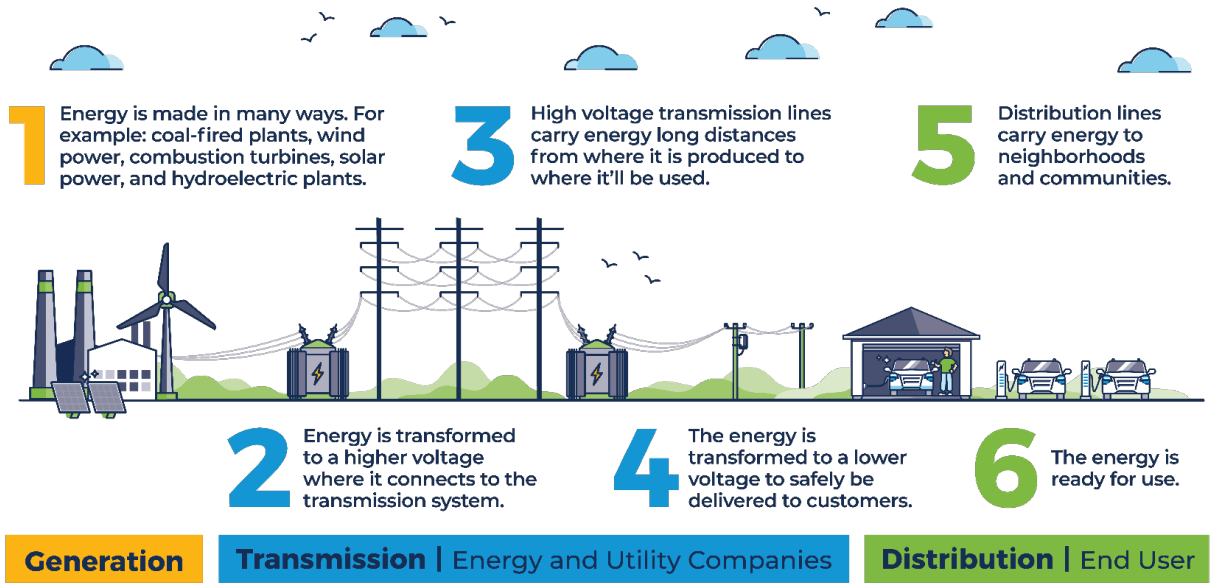


Figure 16: Visualization of the Electric Grid

To manage the anticipated surge in demand from EVs, it is critical to prepare the grid at selected sites to handle increased load. This preparation involves strategically planning to balance energy use based on the type of energy sources employed. For example, solar energy can reduce demand during peak hours if charging stations are located where people congregate during the day (e.g., workplaces and shopping centers). By aligning charging infrastructure with renewable energy generation patterns, utilities can optimize grid performance during high-demand periods. This proactive approach not only enhances grid reliability but also supports the

[54] City of Moorhead, Comprehensive Plan (2022); https://www.ci.moorhead.mn

integration of sustainable energy solutions into the transportation sector. Ongoing coordination with local utilities is essential for this effort. More infromation on grid readiness is available in Attachment A: Grid Impacts Analysis.

Regional Connectivity

The Study highlights existing regional efforts working to align national initiatives and encourage consistency across the Fargo-Moorhead region. A key focus within the Fargo-Moorhead region is on utilizing renewable energy for EV charging and installing fast charging stations along interstates and highways statewide by 2030, as outlined by MnDOT and NDDOT.

Additionally, the implementation of recommendations from the Regional EV Midwest Plan is a key focus of agency partners in the region, including Minnesota.[55] Emphasizing the importance of supporting multimodal transportation options and a variety of curbside uses, including EV charging stations. Regional leaders in the Fargo-Moorhead area recognize the necessity to adapt to emerging transportation technologies and infrastructure to enhance regional mobility.[56]

To promote EV charging infrastructure across the region, strategies include establishing creative funding mechanisms through partnerships with utilities and private entities, alongside seeking federal and state funding. This collaborative approach is essential for fostering an environment conducive to EV adoption, ensuring that the region is prepared for the anticipated increase in EV usage and infrastructure needs.

Equitable Access

It is crucial to adopt equitable EV adoption strategies that considers the needs of disadvantaged communities across the Fargo-Moorhead region, including those that are designated as Justice40 census tracts or historically underserved neighborhoods. Justice40 is a federal initiative for addressing environmental and climate justice concerns with a focus on underserved communities who have historically faced disproportionate burdens of transportation-related pollution and environmental hazards. The goal of the Justice40 initiative is to ensure at least 40 percent of the overall benefits from federal investments in climate and clean energy initiatives are directed toward these communities. This includes not only EVs, but solutions such as electrified micromobility and zero-emission transit services. [57]

[55] Alternative Fuels Data Center | Regional EV Midwest Plan: https://afdc.energy.gov

[56] City of Moorhead, Comprehensive Plan (2022); https://www.ci.moorhead.mn

[57] U.S. White House (2021): https://www.whitehouse.gov

Inclusive EV adoption will involve Metro COG collaborating with agency partners and member jurisdictions to implement equitable access initiatives synchronously.

Integration into the EV Readiness Study

The integration of equity into the Study emphasizes that efforts extend beyond increasing the number of EVs on the road. This approach encompasses a broader range of solutions, including electrified mobility, accessible charging deployment and low-emission transit services, which are vital for promoting sustainable transportation options. By working to address the environmental injustices faced by historically underserved communities, the Study provides an array of options that may support a more equitable transportation landscape in Fargo-Moorhead. Additionally, incorporating federal initiatives such as the Justice40 initiative into future EV readiness planning enables the Fargo-Moorhead region to prioritize actions that promote inclusive access to EVs.

Working towards a regional strategy that fosters improved coordination and collaboration on EV readiness planning among local governments, stakeholders, and communities is essential. The Study may support Metro COG, its agency partners. and member jurisdictions in strategically prioritizing actions that direct the benefits of regional EV adoption to the communities that need it most.

Engaging with disadvantaged communities and incorporating their perspectives into the planning process is vital for employing equitable EV adoption practices. Meaningful stakeholder outreach was conducted as part of the Study, providing community members with opportunities to share their insights on electrification initiatives and efforts in the Fargo-Moorhead region.

Continued EV readiness planning may also work to mitigate the environmental impacts of transportation emissions in disadvantaged communities. This includes investing in clean energy infrastructure, reducing pollution, and improving air quality. The Fargo-Moorhead region is currently in attainment for all EPA standards (determined as areas with concentrations of criteria pollutants that are below the levels established by the National Ambient Air Quality Standards (NAAQS) set by EPA). Although the Fargo-Moorhead region is in attainment for air quality, Metro Grow outlines a proactive planning approach for the Fargo-Moorhead Area, making alternative modes of transportation a priority for future transportation network investments to maintain air quality.[58] The integration of the Metro Grow initiative with the EV Readiness Study will be critical in equitably promoting EVs and charging infrastructure across the region.

[58] Metro GROW 2045 Metropolitan Transportation Plan: https://www.fmmetrocog.org

6. How to Get Ready

Achieving EV readiness involves forecasting what potential EV growth could look like in the community and what strategies support meeting demand for the expected levels of growth. The following discusses best practices across the industry and the EV forecast analysis performed to inform the development of strategies in the Fargo-Moorhead region.

Industry Best Practices

Through stakeholder engagement, three key topic areas were identified to guide research into EV Readiness best practices important to the Fargo-Moorhead region: **Public Charging Network Development**, **Zoning and Building Code Guidance**, and **EV Education and Outreach**. A comprehensive overview of the best practices introduced are provided in **Attachment B: EV Readiness Best Practices**.

Public Charging Network Development

Creating a public charging network that increases accessibility to the EV ecosystem is a thoughtful process that must consider the specific character of the community it serves. The following sub-topics delve into these considerations and potential tools.

Availability of Public Charging: Supporting public charging investments at community centers, libraries, and curbside installations can accelerate EV adoption across a broader demographic by providing locations for charging at regularly accessed locations.

EV Mobility Hubs: EV Mobility Hubs are centralized locations that can support multiple transportation modes and provide access to transfers from one mode to another. This is especially helpful to complete the "first/last mile" portion of a trip. These Hubs can reduce carbon emissions by combining transit access with charging infrastructure for EVs and e-bikes.

Local Economic Development: EV charging can support complementary public policy goals, such as economic development and tourism. With a typical dwell time between 20 minutes to 2 hours, strategic investments in public EV Chargers can encourage drivers to spend time in the community, boosting foot traffic and sales revenue for retail shops and restaurants.

Strategic Charger Deployment: The power demand from EVs will put an increased strain on the electric grid's distribution system. Strategically placing chargers in areas with excess capacity can significantly reduce the need for grid upgrades. Additionally, installing chargers in locations where vehicles are parked during non-

peak hours will further alleviate strain on the grid. Working closely with utility providers to identify the needed improvements to the grid to meet demand, charging infrastructure installations can be coordinated with other energy efficiency upgrades, such as LED streetlight conversions and curbside charging.

Solar-Powered EV Chargers: Solar-Powered EV chargers are a great power source for EVs during the day and can reduce the demand that EVs have on the grid. They can also be a major resource during power outages, which can leave EV drivers without the ability to charge. Cities can consider equipping some EV charging stations with solar panels and battery energy storage systems (BESS) to affirm EV drivers are able to charge while power is being restored.

Zoning and Code Guidance

Local codes and during regulations are a major factor in barring or easing the transition to EV infrastructure. The following sub-topics discuss different government requirements and best practices that are being used to reduce barriers to EV adoption.

Land Use & Zoning Regulations:
Land use and zoning codes may have existing language and policies that pose barriers to EV adoption. In many cases, this language is not intentional but can have impacts that restrict or limit this use and should be revisited by each jurisdiction.

Define EVSE in Zoning Code: Since EV chargers are a type of automotive fueling, many zoning codes do not distinguish between EV charging and gas stations, even though EV charging does not pose the same environmental risks as gas stations, and this can limit where chargers can be installed. When creating a separate code for EV chargers, zoning codes should include definitions of charging stations by power level.

EVSE as a Permitted Land Use: Cities can regulate in which zoning district chargers can be allowed as a principal or accessory use or if conditional/special use permits are required for certain charging levels (e.g. DCFC charging stations). In most cases, particularly concerning Level 2 chargers, it's recommended that EV chargers be classified as permitted accessory use in all zoning districts.

EV Education and Outreach

The information associated with EV and EVSE spans a broad audience and can be a daunting conversation for community leaders and the public. The following sub-topics highlight tactics and tools used across the nation to engage and educate communities on the EV ecosystem.

Community Education: Before making any investments in public charging stations, cities can engage various communities to gather data on current EV adoption intentions, provide EV education, and set goals. Public engagement efforts can seek input on charger locations and educate residents on EVs and available vehicle purchase incentives.

Public Fleet Conversions: Prioritizing the conversion of public or non-profit vehicle fleets that operate in disadvantaged neighborhoods can reduce tailpipe pollutant emissions in these areas and introduce residents to electric vehicles.

Dealership Outreach: As part of public engagement efforts in support of EV adoption, cities can engage with local new and used car dealerships to encourage them to accept transfer of the Clean Vehicle Credit, which allows EV purchasers to receive the discount at point-of-sale.

Employer Outreach: Workplace charging is the second most utilized method of charging an EV after at-home charging. For potential EV adopters who have a long commute or lack access to at-home charging, the availability of workplace charging can greatly influence the decision to purchase an EV.

Utility Outreach: Engaging utility providers both early and frequently throughout an EVSE project can help ensure utilities are aware of potential upgrades needed and allow the project timeline to proceed smoothly. Both the U.S. Department of Transportation (DOT) and Federal Energy Management Program (FEMP) offer EVSE project planning checklists including guidance on utility coordination.

First Responder Outreach: Though rare, EV battery fires can produce intense heat and be difficult to extinguish. Municipal fire departments should consider completing training to safely respond to and extinguish EV fires. The Alternative Fuels Data Center (AFDC) compiles EV safety training resources for first and second responders.[59]

[59] Alternative Fuels Data Center | EV Safety Training Resources https://afdc.energy.gov/vehicles/electric-responders

Analysis and Assessment

Building a foundation for EV integration requires a comprehensive understanding of potential EV growth and the strategies necessary to support this anticipated increase. A charger siting analysis and grid impact assessment were performed to develop recommended strategies for accommodating EV growth within the region.

The analysis identified potential sites for publicly accessible charging stations, along with an exploration of their impacts on the power grid. The primary purpose of this analysis is to pinpoint strategic locations that enhance the efficiency, convenience, and accessibility of charging infrastructure in the Fargo-Moorhead area.

To guide this analysis, three key questions were established to structure the methodology and build upon each step of the process, as illustrated in **Figure 16**.

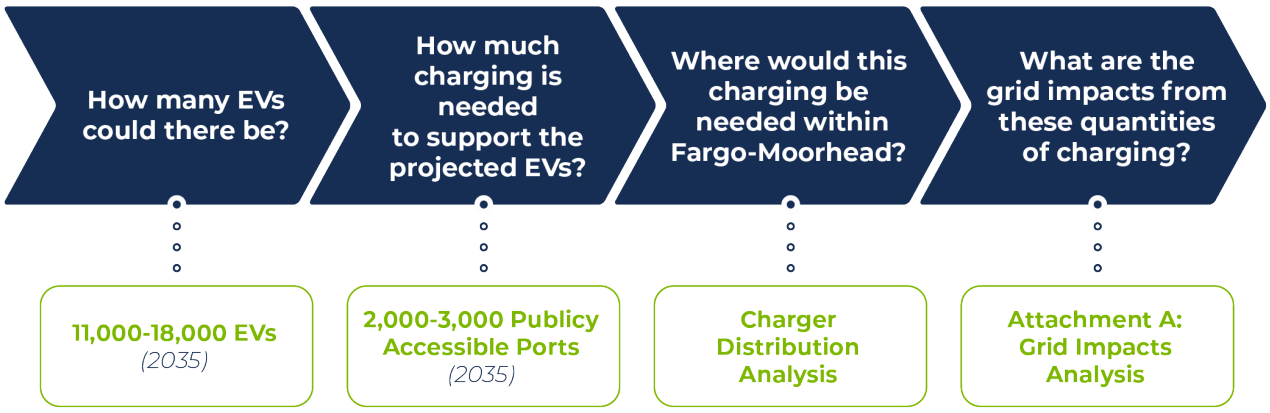


Figure 17: Analysis Process Overview

Charger Distribution Analysis

The distribution of publicly accessible chargers throughout the Fargo-Moorhead region is important to provide convenient charging access for all EV drivers living and traveling through the area while also ensuring there is enough market demand to financially support the distribution. An analysis was completed to forecast how the charger amounts recommended by the EVI-Pro Lite Tool could be distributed based on travel patterns.

A travel modeling tool was used to simulate typical travel patterns for all trips occurring within the region, including parking activities. The analysis focused mostly

on where vehicles park, the amount of parking, and the duration of parking activities. The parking durations were broken into out the following scenarios:

- <30 minutes: DCFC
- 30 minutes-2 hours: 50% DCFC, 50% Level 2
- >2 hours: Level 2

This separation was created to differentiate between DC fast charging needs and Level 2 charging needs. For trips with shorter parking durations, EV drivers will likely be seeking out the faster charging speeds that DC fast chargers offer.

The distribution of L2 and DCFC chargers for the medium adoption scenario is shown in the maps below (**Figure 17** and **Figure 18**). L2 chargers are distributed all over the area due the high quantity of chargers projected, but DC fast chargers are focused on high activity destinations such as the West Acres Mall and downtown Fargo. This distribution analysis can provide charging providers and utilities where concentrations of charging demand could be.

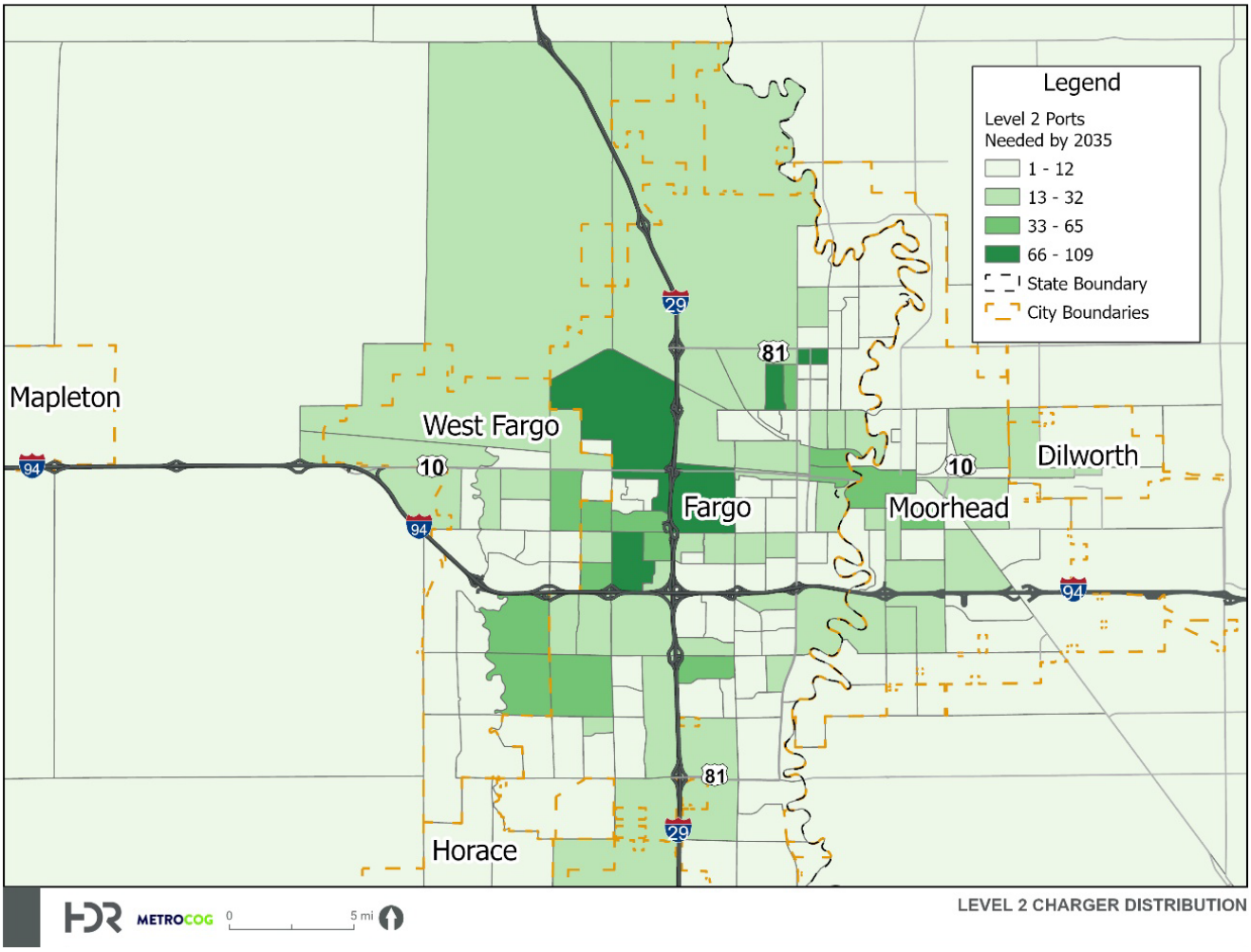


Figure 18: Level 2 Charger Distribution

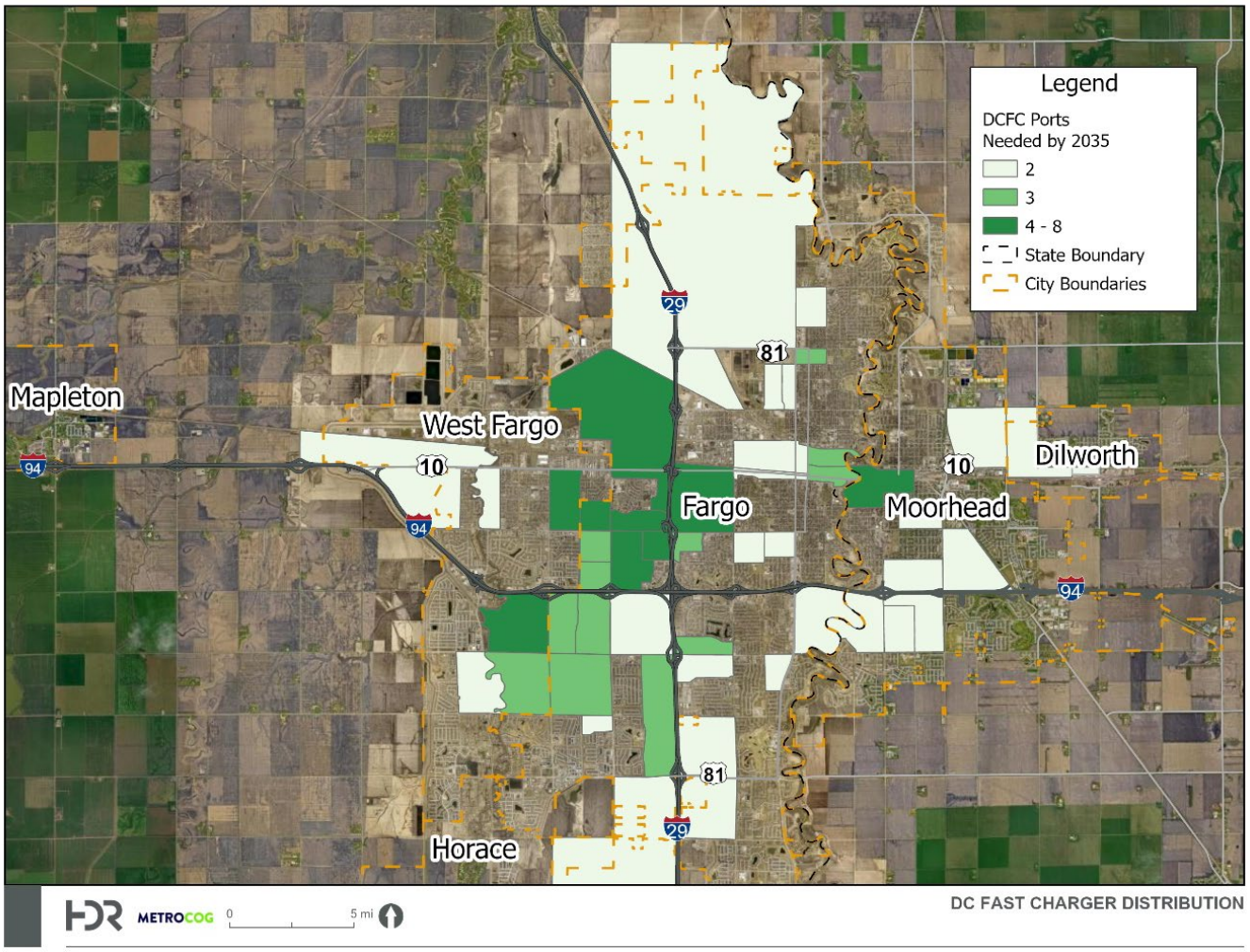


Figure 19: DC Fast Charger Distribution

Distribution analysis is one to way to estimate what charging distribution could look like. Another method is by matching charging station types with existing land uses.

The EV charging station transect (**Figure 19**)is a tool that focuses on the dynamic nature of EV charging stations. While conventional gasoline- and diesel-powered vehicles are refueled at stations often placed near interstate exits and along commercial corridors, EV charging infrastructure exists at many different land uses.

Each charging type serves a unique purpose and when combined together, create a well-functioning EV charging ecosystem that meets the needs of all EV users. Future planning for EV charging in the Fargo-Moorhead area can focus on the distribution of community, commercial destination, workplace destination, and distance destination charging types.

EV CHARGING STATION TRANSECT

	RESIDENTIAL CHARGING	COMMUNITY CHARGING	COMMERCIAL DESTINATION	WORKPLACE DESTINATION	DISTANCE DESTINATION	DEPOT CHARGING
PRIMARY LAND USES	Primarily single-family homes, caninclude shared private charging in multifamily buildings	Public streets with on-street parking, prioritizing locations near existing or planned multifamily development	Retail, shopping, schools, transit stops, restaurants, grocery stores, etc.; prioritizing Justice40 trip destinations	Commercial, offices and mixed-use commercial/office	Highway exits and rest stops	Centralized depot facilities
PRIMARY VEHICLE TYPES	Privately owned vehicles charging at home	Privately owned vehicles without home charging access	Privately owned vehicles charging at destinations	Privately owned vehicles charging at semi-public or private locations	Publicly and privately owned vehicles needing a rapid charge	Public transit and other fleets
STATION TYPES	Driveway/garage, dedicated parking, shared private	Parking lot, utility pole-mounted, curbside	Level 2 parking hub	Level 2 parking lots	DC fast charging hub	DC fast charging hub
TYPICAL CHARGING CONFIGURATION	Level 1 or Level 2	Utility pole drop-down or pedestals in sidewalk or furnishing zone, prioritizing locations with excess grid capacity	Clusters of Level 2 chargers in parking lots and select DCFCs where dwell times are short	Clusters of Level 2 chargers in parking lots and select DCFCs where dwell times are short	Clusters of DCFCs enabling long-distance travel, likely paired with services like a typical fueling station	Clusters of Level 2 chargers and/or DCFCs depending on operating needs
TYPICAL DWELL TIME	Up to 16 hours overnight	2-12 hours	Varies from <1 hour up to 8-10 hours	Varies from <1 hour up to 8-10 hours	Short en-route stops of 20-30 minutes	Varies but typically >12 hours overnight
ACCESS TYPE	Private	Public	Public	Private / semi-Public	Public	Private
POWER REQUIREMENT	Low	Low	Medium	Medium	High	High
LEVEL OF FINANCIAL INVESTMENT	$1,500–5,000 per Level 2 port; Level 1 charging equipment typically included with EV purchase	$5,000–$15,000 per port	$3,000-$15,000 per Level 2 port (6.6-19.2 kW) or $1,250-1,750 per kW (typically 50-350 kW per port)	$3,000-$15,000 per Level 2 charger or $75,000-$200,000 per DCFC	$1,250-1,750 per kW (typically 50 to 350 kW)	$5,000-$20,000 per Level 2 port (6.6-19.2 kW) or $1,500-2,000 per kW (typically 50-350kW per port)

Figure 20: EV Charging Station Transect

7. Stakeholder Engagement

Engaging stakeholders is a critical component of the Study, as it allows Metro COG to gain valuable insights into the unique needs and concerns of the greater community. By fostering open dialogue with a diverse array of stakeholders, the Study aims to develop comprehensive strategies and recommendations that can be referenced as the region prepares for growth in EV usage. Through a collaborative approach with stakeholders, Metro COG seeks to cultivate a shared vision for the future of transportation in the Fargo-Moorhead area.

Working Group

Metro COG convened a Working Group comprising diverse stakeholders, including utilities, state and local government officials, non-profits, and businesses interested in EVs. These meetings facilitated discussions about the Fargo-Moorhead region's characteristics, future EV infrastructure needs, and how EVs will work best for the community and businesses. The Working Group includes representatives from the following agencies and member jurisdictions:

- University of Minnesota
- Cass County
- City of Dilworth
- Moorhead Public Service
- Metro COG
- Clay County
- Cass County Electric Cooperative
- NDDOT
- Local EV owner
- City of Moorhead
- City of Fargo
- City of West Fargo

The Working Group continued to meet throughout the duration of the Study to provide insight into developing EV readiness strategies and recommendations.

Public Engagement

Throughout April 2024, an online survey was available for the public to provide feedback on EV awareness for the Fargo-Moorhead area. The survey began with

questions on the respondents travel patterns then lead into familiarity with EVs, including an open-ended question asking respondents' thoughts about EVs. Respondents that owned/leased an EV were directed to an additional set of questions and non-EV owners were led to the final questions, including additional information on current and future EV models.

On April 17th, 2024, an in-person open house was held in the City of Fargo to give community members the opportunity to engage with Metro COG and learn more about the EV Readiness Study. In addition to learning about the Study, attendees were informed on:

- NEVI in North Dakota and Minnesota
- EV charging infrastructure
- EV benefits
- The current and projected use of EVs

Draft strategies and recommendations (based on survey results and Working Group feedback) were presented to the public through an online meeting, active from September 12th to October 11th, 2024. The online meeting enabled the public to review these drafted strategies and submit feedback on study recommendations, Working Group meeting summaries, and important EV strategies for the Fargo-Moorhead area, allowing respondents to help shape the vision for EVs in the region.[60] The feedback from the public engagement was used to revise recommendations to be tailored to the community.

This section is still under development and will be updated after the online meeting concludes on October 11th and feedback is received.

[60] Metro COG EV Readiness Study (2024): https://fmmetrocog.org

8. Recommended Strategies

Strategies were developed by the Study Working Group and placed into two categories: High Priority and Longer-Term Priority. A stakeholder champion is identified for each strategy.

- **High-Priority**: Immediate actions or initiatives that necessitate a prompter response and are generally expected to yield faster results.
- **Longer-Term Priority**: Actions or initiatives that focus on growth and development over an extended period, often require more investment and time to implement.

High Priority Strategies

As the Fargo-Moorhead region aims to adopt more robust EV readiness practices, the following recommended high-priority strategies can be considered as the EV planning process evolves. **Table 10** outlines key initiatives designed to support the adoption of EVs and the installation of EV charging infrastructure. By prioritizing these actions, a robust framework that encourages EV usage and encourages a seamless charging experience for users can be developed. A detailed description of the high priority strategies and their desired outcome is provided in **Attachment C: Recommended Strategies**.

Table 10: High Priority Strategies

Strategy	Stakeholder Assigned
Update Zoning Codes/Permitted Use Tables to Include EVSE	***Public Agencies (Cities)***
Update zoning codes to include definitions of EVSE by charging level and include EVSE in permitted use tables.	
Develop Building Code Requirements and Update Parking Minimums	***Public Agencies (Cities)***
Develop building code requirements for EV Capable parking at new single-family and multi-family construction and renovations; *update parking minimums to clarify EV parking requirements.*	
Develop EV 101 Education Materials for the Community	***Public Agencies (MPO specifically)***
Develop materials for potential EV users to inform of benefits, incentives, charging availability and provide overall EV education. These resources can include the latest industry information as well as voluntary testimonies of EV owners in the FMCOG region who are willing to share their ownership experiences, such as their driving habits and associated savings as well as their charging experiences and cold weather range performance.	
Track EV Registrations and EVSE installations	***Public Agencies (DOTs specifically)***
Work with MnDOT and NDDOT to receive recurring (at least annually) updates on the number of EVs registered within the FMCOG region and share this data publicly. Additionally, work with residents and charger providers to track charger installations within the FMCOG region. This also includes	

Strategy	Stakeholder Assigned
tracking the EV market on a regional and national scale to follow what changes might affect local EV adoption.	
Define Required Uptime and Reliability Standards for Charging Stations	***Public Agencies (Cities)***
Define required uptime and reliability standards for charging stations.	
Develop Charging Site Standards and Share them with Charging Providers	***Public Agencies (Cities)***
Develop site design standards for EV parking that address lighting, cables, and security concerns. These standards can include guidelines on lighting, safety, and accessibility while integrating with and emphasizing existing building, fire, and electrical codes.	
Create a Density Bonus to Multifamily Developers Adding Charging Stations to Parking	***Public Agencies (Cities)***
Create a density bonus to multifamily property developers who add charging stations to parking.	
Coordinate with Utilities on Ideal Charging Site Locations	***Charging Providers***
Coordinate with utilities on ideal charging site locations.	

Longer-Term Priority Strategies

To advance the sustainable growth of EV infrastructure, it is important to implement long-term priority strategies that support ongoing development and innovation. **Table 11** presents recommended strategies aimed to support the adoption of EVs and the installation of EV charging infrastructure. By prioritizing these actions, a robust framework that encourages EV usage and prompts a seamless charging experience for users can be developed. A detailed description of the longer-term priority strategies is provided in **Attachment C: Recommended Strategies**.

Table 11: Longer-Term Priority Strategies

Strategy	Stakeholder Assigned
Develop a Net Metering Program	***Utilities***
Share EV Information with Customers	***Utilities***
Encourage Utility-Provided Charging Rate Enrollment	***EV Users***
Require EV Battery Fire Training for Emergency Responders	***Public Agencies (Cities)***
Develop a Municipal Fleet Transition Strategy	***Public Agencies (Cities)***
Develop Enforcement Mechanisms for ICEVs Parked in EV Spaces	***Public Agencies (Cities)***
Develop Charging Accessibility Progress Measures	***Charging Providers***

Strategy	Stakeholder Assigned
Develop an Expedited Permitting Process for EVSE	***Public Agencies (Cities)***
Define Required Uptime/Reliability Standards for Charging Stations	***Charging Providers***
Develop a Charging Policy and Ownership/Cost Structure	***Charging Providers***
Promote Charging Opportunities to Employees	***Charging Providers***
Convert Streetlights to LEDs to Divert Excess Electrical Capacity	***Public Agencies (Cities)***

9. Next Steps

Potential Funding Sources

Metro COG's agency partners and member jurisdictions maintain a comprehensive list of projects vying for funding. They may consider strategically leveraging potential funding opportunities to effectively integrate the needs of EV adoption into future planning efforts. Relying solely on grant programs to enhance EV readiness in the area will limit progress; community engagement and support from elected officials is essential.

Until awareness and demand for EV infrastructure increase, efforts to install EV charging stations may largely depend on the private sector. As the market for EVs evolves, Metro COG should consider navigating emerging projects through the solicitation process and collaborate closely with NDDOT and MnDOT. Additionally, Metro COG aims to incorporate EV infrastructure as a future planning need in the next MTP update, focusing on projects that advance EV adoption in the region.

These funding considerations are not unique to the Fargo-Moorhead area; other regions across the U.S. have similarly depended on private sector initiatives for EV infrastructure. While funding opportunities exist for alternative fuels and advanced technologies, it is important to note that grant programs are subject to fluctuations, eligibility criteria, and competitive selection processes.

State Funding

Actively monitoring the evolving funding opportunities presented by state departments is an important action for Fargo-Moorhead. By staying informed, the region can strategically leverage funding to support electrification initiatives.

Carbon Reduction Program: Established under the BIL, this program allocates $6.4 billion over five years for states to develop carbon reduction strategies aimed at decreasing transportation emissions, including alternative fuel projects. The Carbon Reduction Program is a formula program, meaning that federal funding is apportioned among the states and states have broad discretion over how they spend the funds.[61] It is strongly encouraged MPO's/ATPS coordinate this effort with DOTs.

- Estimated Funding for Minnesota: $106.71 million
- Estimated Funding for North Dakota: $40.89 million

[61] U.S. Department of Transportation BIL, 5-Year Carbon Reduction Program: https://www.fhwa.dot.gov

Federal Funding

Proactively tracking the shifting funding landscape presented by federal agencies is a critical action for Metro COG. By remaining vigilant about emerging opportunities, the region can position itself to capitalize on significant federal funding that advance EV electrification initiatives and related infrastructure. Key federal programs of interest for the Fargo-Moorhead region may include those focused on regional transportation planning, EV charging deployment, and intelligent transportation systems.

Charging and Fueling Infrastructure (CFI): Provides funding to strategically deploy publicly accessible electric vehicle charging infrastructure and other alternative fueling infrastructure in communities or alternative fuel corridors.

- Available Funding: Estimated $1.32 billion (FY 2022-2026)
- Timeline: Annual funding cycles

Surface Transportation Block Grant (STBG): Offers formula funding for the installation of EV charging infrastructure and vehicle-to-grid infrastructure for states and localities.

- Available Funding: $72 billion (FY 2022-2026)
- Timeline: Annually apportioned based on formula

Transportation Infrastructure Finance and Innovation Act (TIFIA): Provides federal credit assistance to finance surface transportation projects of national and regional significance, including intelligent transportation systems and rural infrastructure projects.

- Available Funding: $15 million for Intelligent Transportation System Projects
- Timeline: Rolling application basis

Recommended Studies

To pursue effective EV readiness planning and implementation of EV infrastructure, it is recommended to continue exploring studies that promote EV adoption. The following studies are recommended for continued EV readiness efforts:

- Conduct a Phase 2 EV Readiness Study focusing on optimal locations for EV infrastructure within 3-5 years.
- Develop a comprehensive approach for integrating EV infrastructure into utility master planning for major site developments and redevelopments.

- Facilitate studies at the agency partner and member jurisdiction level to address localized needs.

Agency Next Steps

To advance the goals outlined in the EV Readiness Study, Metro COG is encouraged to take several key steps. It is recommended that Metro COG plan for an update to the study within 3-5 years to adapt to evolving regional conditions, funding opportunities, and market dynamics. Metro COG should also prioritize the implementation of high-priority strategies outlined in the Study to make tangible progress. Metro COG may also consider incorporating discussions on EV infrastructure into existing Transportation Technical Committee meetings, which could help facilitate ongoing collaboration and strategic planning. Metro COG is encouraged to explore further options for enhancing EV readiness, such as collaborating with private sector partners or seeking out innovative funding sources.

In addition, it is recommended that Metro COG continue the Working Group and meet annually, navigating opportunities to pursue Metro COG committee status and formalize the group's commitment to EV readiness. The Working Group meetings may focus on EV infrastructure developments in efforts to align community goals and assess progress towards EV adoption in the region. By taking these proactive steps and leveraging the insights of the Working Group, the Fargo-Moorhead region can well-position itself for advancing EV readiness in the area.

Agency Next Steps Overview:

- Plan for an update to the study within 3-5 years.
- Continue engagement with the Working Group and consider pursuing Metro COG committee status.
- Hold annual Working Group Meetings focused on EV infrastructure development.
- Incorporate discussions on EV readiness into existing Transportation Technical Committee meetings to facilitate continued planning and collaboration.
- Prioritize implementing high-priority strategies in the short term.
- Explore additional options for enhancing EV readiness.