



ELECTRIC VEHICLE INFRASTRUCTURE NEEDS ASSESSMENT 2025

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1 EXECUTIVE SUMMARY

The Minnesota Department of Transportation (MnDOT) initiated the Minnesota Electric Vehicle Infrastructure Needs Assessment (EVINA) to guide comprehensive electric vehicle (EV) charging efforts across the state. EV adoption plays an important role in making progress toward statewide greenhouse gas emissions reduction targets and building a statewide EV charging network. EVINA calculated projected statewide charging needs based on an expected increase in EV adoption and the need to add a variety of charging stations (e.g., DC fast charging [DCFC], Level 2).

1.1 EV ADOPTION AND CHARGING NEEDS FORECAST

An analysis of 2024 EV sales and registrations, as well as future projected sales, revealed Minnesota can expect 717,000 registered EVs on the road by 2030, assuming 60% of all new vehicle sales are EVs. To accommodate this number, Minnesota would need:

- 40,000 Level 2 shared private ports (e.g., at multi-family and workplace; charging powered with alternative current [AC] electricity takes 4 to 10 hours to recharge from 20% to 80% battery)
- 48,000 public Level 2 ports (e.g., at retail, libraries, community centers and other recreation areas) (e.g., charging stations powered with alternative current [AC] electricity; charging takes 4 to 10 hours from 20-80% battery)
- 4,000 public DCFC ports (e.g., at retail and fueling stations, charging powered with direct current [DC]; takes 20 minutes to 1 hour to recharge from 20% to 80% battery)

In this scenario, EVs represent roughly 10% of all vehicle registrations by 2030. This is notably lower than the state performance target of 20% of vehicles on the road to be EVs by 2030. However, the EVINA adoption forecast did not consider potential policy changes (e.g., a Clean Transportation Standard) that could accelerate EV adoption in the state.

1.2 EV CHARGING STATION GUIDELINES

To guide development of future charging stations, EV Charging Stations Guidelines were created for EVINA for three charging station types: Long-Distance Hubs, Destination Charging Hubs and Amenity Charging Hubs. The EV Charging Station Guidelines will support consistent service expectations and provide guidance on:

- Appropriate locations and land use types
- Power level per station type
- Number of charging ports per station type
- Amenities and services per station type

Using the anticipated number of charging stations needed by 2030 and the EV Charging Station Guidelines, a comprehensive analysis was completed to assess statewide infrastructure needs for both long-distance and community charging.



1.3 LONG-DISTANCE INFRASTRUCTURE NEEDS

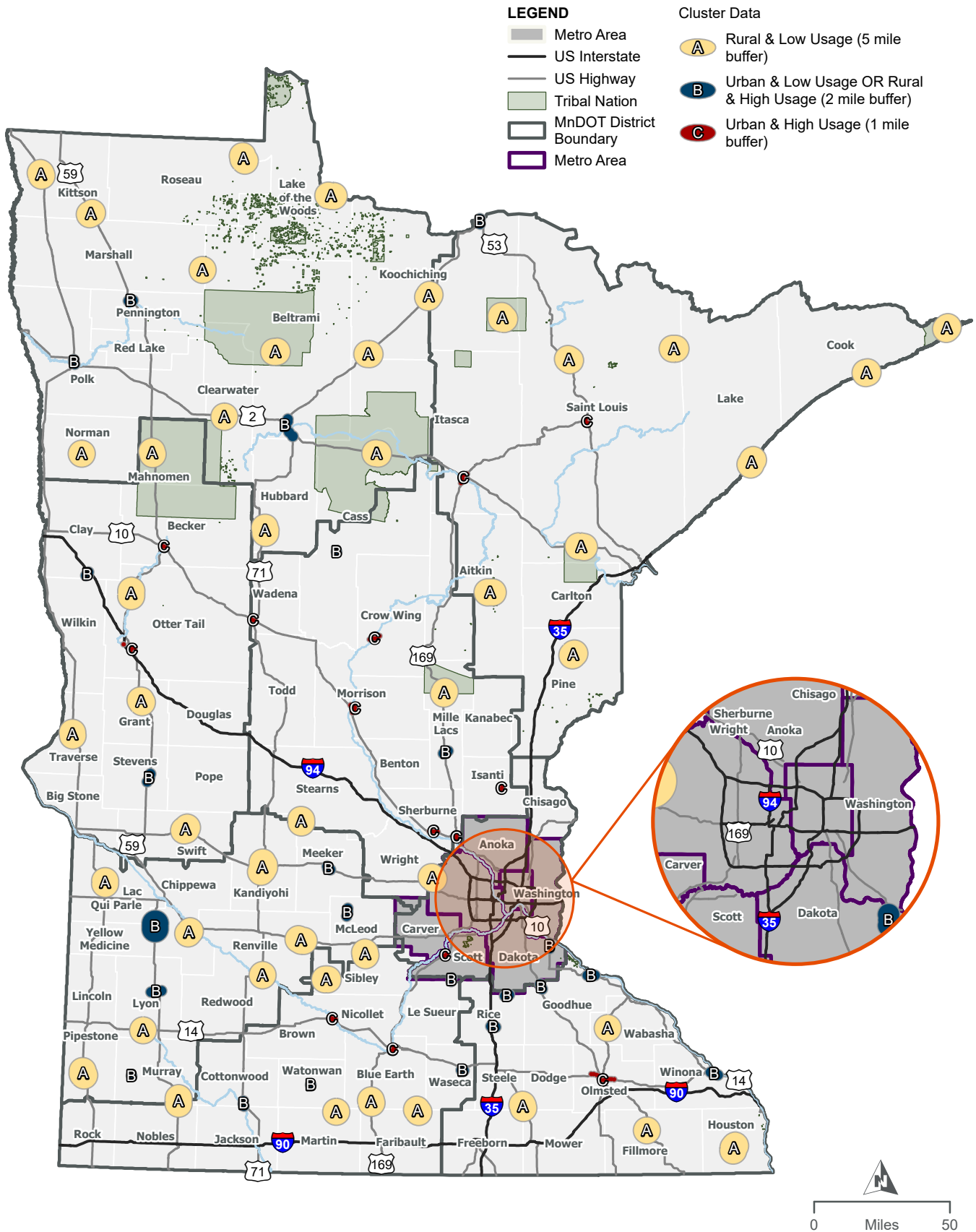
To evaluate the need for long-distance charging, existing charging stations across the state were reviewed and supported the development of the coverage map, shown in **ES Figure 1**. It highlights all areas of Minnesota where EV charging is needed to complete the long-distance charging network according to EV Charging Station Guidelines. Locations along Minnesota interstates and principal arterials identified for long-distance charging stations are referred to as “clusters” in the analysis.

As the next step in the analysis, two scenarios were identified as priorities to consider in EVINA. In these two priority scenarios, End Range Anxiety and Accelerate Adoption, the areas of greatest need according to individual scenario objectives were identified. End Range Anxiety prioritizes rural locations where existing infrastructure is lacking. Accelerate Adoption prioritizes locations with high volumes of long-distance trips.

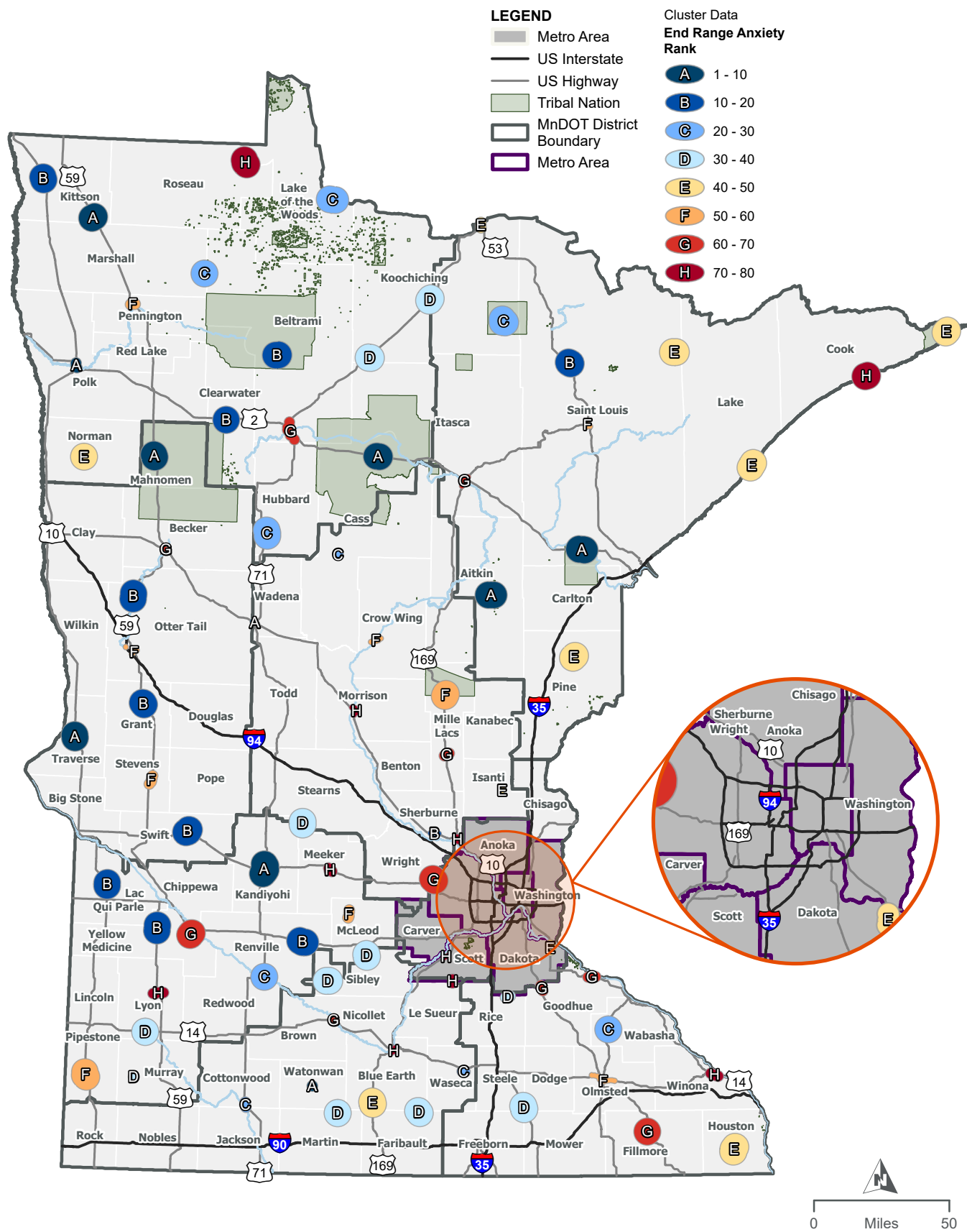
Under the End Range Anxiety scenario, corridors US-2, US-59 and US-71 were revealed as the highest priority corridors. These three corridors had the greatest number of top-ranking clusters. As shown in **ES Figure 2**, clusters located in northern and western Minnesota typically ranked highest in this scenario with low numbers (1, 2, 3) representing a higher rank.

Under the Accelerate Adoption scenario, corridors US-10, US-71, US-169 and US-210 were revealed as the highest priority corridors. These four corridors had the greatest number of top-ranking clusters as shown in **ES Figure 3** with low numbers representing a higher rank.

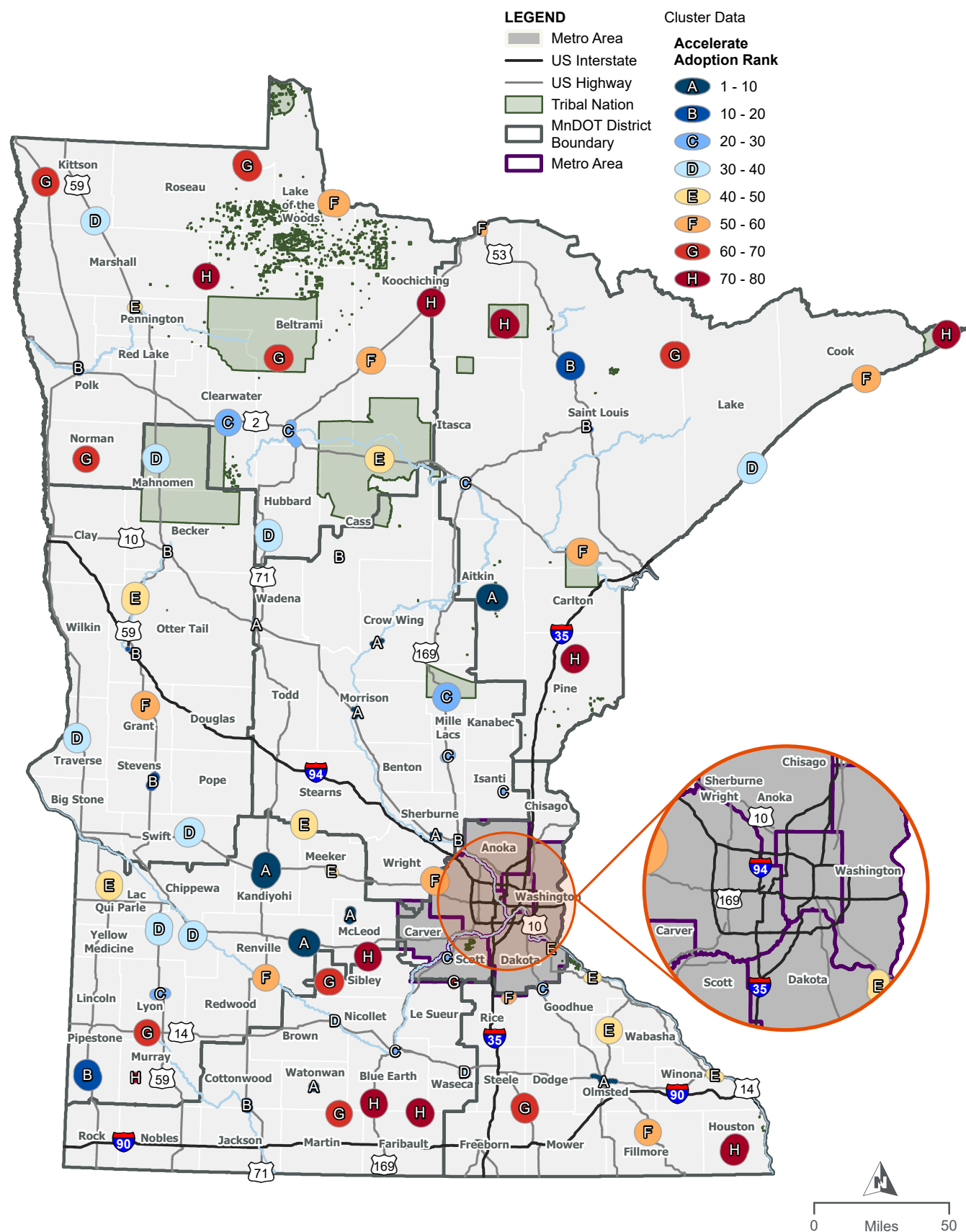
ES Figure 1: Long-Distance Charging Base Coverage Needs



ES Figure 2: End Range Anxiety Long-Distance Charging Prioritization



ES Figure 3: Accelerate Adoption Long-Distance Charging Prioritization



1.4 COMMUNITY CHARGING INFRASTRUCTURE NEEDS

Community charging needs for Minnesota's metropolitan and micropolitan statistical areas (as defined by the US Census Bureau) were projected using EVI-Pro Lite. EVI-Pro Lite uses the projected number of EVs in an area and historical trends in EV charging patterns to calculate how many charging ports will be needed across four categories: single-family, shared private, public Level 2 charging and public DC fast charging.

ES Table 1 details the projected community charging need for Minnesota's metropolitan statistical areas (areas with at least one urban area of 50,000 or more inhabitants), while ES Table 2 details the projected community charging need for Minnesota's micropolitan statistical areas (areas with at least one urban area of at least 10,000 but less than 50,000 population). The highest number of ports will be needed in the Minneapolis-St. Paul-Bloomington metro area, followed by Duluth, Fargo (North Dakota) and Rochester. Most of Minnesota's micropolitan statistical areas require less than 5,000 ports, with the exception of Brainerd and Faribault-Northfield.

ES Table 1: Metropolitan Area Community Charging Port Need

METRO AREA	SINGLE FAMILY	SHARED PRIVATE	PUBLIC L2	PUBLIC DCFC	ALL PORTS
Duluth	23,895	1,958	2,484	189	28,526
Fargo-Moorhead (ND-MN)	23,921	627	914	71	25,533
Grand Forks - East Grand Forks (ND-MN)	7,713	577	785	57	9,132
La Crosse-Onalaska	10,557	634	801	67	12,059
Mankato	7,354	574	744	67	8,739
Minneapolis-St. Paul-Bloomington	264,312	27,283	30,667	1,950	324,212
Rochester	18,050	1,424	1,840	151	21,465
St. Cloud	15,803	1,245	1,651	132	18,831

ES Table 2: Micropolitan Area Community Charging Port Need

MICRO AREA	SINGLE FAMILY	SHARED PRIVATE	PUBLIC L2	PUBLIC DCFC	ALL PORTS
Albert Lea	1,796	148	197	21	2,162
Alexandria	2,618	215	300	32	3,165
Austin	2,378	197	266	30	2,871
Bemidji	2,904	198	296	32	3,430
Brainerd	6,632	509	691	69	7,901
Fairmont	1,009	80	115	18	1,222
Faribault-Northfield	5,067	399	530	56	6,052
Fergus Falls	4,109	273	386	36	4,804
Grand Rapids	2,932	259	334	39	3,564
Hutchinson	2,155	161	220	25	2,561
Marshall	1,304	108	149	24	1,585
New Ulm	1,617	120	160	17	1,914
Owatonna	2,577	212	292	32	3,113



MICRO AREA	SINGLE FAMILY	SHARED PRIVATE	PUBLIC L2	PUBLIC DCFC	ALL PORTS
Red Wing	3,790	299	396	39	4,524
Wahpeton, ND-MN	353	22	34	4	412
Willmar	2,887	235	326	34	3,482
Winona	4,137	327	432	45	4,941
Worthington	955	76	108	17	1,156

1.5 PUBLIC ENGAGEMENT

Throughout the project, MnDOT engaged stakeholders to solicit feedback on diverse project components of EVINA, guided by a Partner and Public Engagement Plan. Engagement opportunities included:

- Monthly meetings with the MnDOT Project Management Team
- Two rounds of focus groups
 - Round 1 - to solicit feedback on the Vision Statement and draft EV Charging Guidelines from state agencies, utilities and Tribal Nations
 - Round 2 - to solicit feedback on the revised EV Charging Guidelines and siting prioritization approach from state agencies, utilities, EVSE vendors and Tribal Nations
- A community survey requesting input on benefits and barriers to driving an EV (June 4 - Aug. 16, 2024)
- Community engagement to solicit feedback on the proposed priority locations for DCFC and Level 2 stations from Minnesota residents
- An interview with HOURCAR, a non-profit carshare organization, to gain insight into the impact of EV infrastructure in their operations
- Online information and community input forum in February 2025 to solicit feedback on the proposed priority locations for DCFC and Level 2 stations from Minnesota residents

Engagement also included outreach with Community-Based Organizations (CBOs). The organizations that partnered with MnDOT to reach out to their communities included:

- Native Sun Community Power Development is a Native-led nonprofit dedicated to advancing energy efficiency, renewable energy and an equitable energy transition
- African Immigrants Community Services (AICS) is a nonprofit organization in Minneapolis that serves refugees and immigrants from the East African community
- Communities Organizing Latine Power and Action (COPAL) is a member-based organization established in 2018 to improve the quality of life of Latine families

Through their agreement with MnDOT, these organizations were able to develop specific outreach plans and feedback opportunities to engage community members in comfortable, familiar ways. The goal of this engagement was to gather input on EV charging infrastructure needs throughout Minnesota and perceived EV benefits and barriers from community members.



1.6 IMPLEMENTATION RECOMMENDATIONS

Multiple partners need to coordinate to achieve full build-out of the statewide charging network by 2030. These partners are expected to include MnDOT, state agencies, utilities, Tribal Nations, metropolitan planning organizations (MPOs), regional development organizations (RDOs), local municipalities (e.g., cities, counties) and private partners.

In addition to the infrastructure recommendations, there are complementary policy, program, collaboration and outreach recommendations identified to advance both EV infrastructure development and EV adoption in Minnesota.

POLICY/PROGRAMS

- Offer rebates on EV and charger purchases
- Create income-based car swap programs to take back older vehicles
- Identify non-federal funding sources for EV charging
- Provide additional grant funding for EV carsharing, especially in low-income neighborhoods
- Implement a Clean Transportation Standard

COLLABORATION

- Offer advisory support to key partners
- Expand coordination with utilities to inform long-term planning
- Develop partnerships with trade schools and colleges to develop a clean transportation workforce
- Coordinate with neighboring states to promote a convenient and user-friendly charging experience between states
- Establish interagency working group to advance collaboration between state agencies

OUTREACH

- Provide educational resources to city planning staff, planning commissions and city councils on zoning and building code updates to support EVs
- Develop marketing campaign to improve consumer understanding of EVs
- Involve Black, Indigenous, and People of Color (BIPOC) and low-income communities in EV plans and policies



1.7 EVINA STRUCTURE

EVINA chapters contain the following information, with additional detail provided in referenced appendices:

- **Chapter 1 Introduction:** Highlights the vision that guided development of the assessment process and recommendations, explains the different facets of EV charging needed to create a comprehensive network.
- **Chapter 2 Existing Conditions:** Key highlights from the existing conditions that set the framework for the assessment.
- **Chapter 3 EV Charging Station Guidelines:** Explains what should be considered when planning for and designing a charging station and the relationship of three types of charging stations to different corridors.
- **Chapter 4 Charging Network:** Outlines two primary types of charging needs to support EV adoption. Two subsections provide long-distance and community charging needs in Minnesota.
- **Chapter 5 Engagement and Feedback:** Key highlights from the stakeholder and public engagement process.
- **Chapter 6 Recommendations:** Infrastructure and non-infrastructure recommendations developed as an outcome of this Assessment.

Chapter 1





1 INTRODUCTION

Transportation is the largest contributor to greenhouse gas (GHG) emissions in Minnesota. One practice to reduce GHGs from transportation is to transition away from internal combustion engine (ICE) vehicles to electric vehicles (EVs). Minnesota has been preparing for the shift to EVs to meet statewide carbon reduction and electric and zero-emission vehicle targets as identified in the [2022 Statewide Multimodal Transportation Plan \(SMTP\)](#) and the [2022 Climate Action Framework](#).

The Minnesota Department of Transportation (MnDOT) launched the EV Infrastructure Needs Assessment (EVINA) to guide how and where to select and prioritize EV charging infrastructure investments across the state. EVINA outlines the methodology, engagement efforts, analysis and recommendations for a reliable charging network across the state's urban and rural corridors. EVINA takes the next step from previous planning efforts toward developing a reliable Zero Emissions Vehicle (ZEV) fueling and charging network across the state's urban, rural and major corridor roadways for light-duty vehicles¹ and associated EV charging infrastructure, also known as electric vehicle supply equipment (EVSE).

EVINA provides guidance to MnDOT, Minnesota state agencies, Tribal Nations and other public and private partners wishing to advance EV infrastructure throughout the state. Recommendations help to inform build-out of the EV charging infrastructure network in Minnesota from both an infrastructure and non-infrastructure perspective. Infrastructure recommendations include details on high priority locations to add long-distance charging throughout Minnesota, which was identified as a top concern through public engagement. Ultimately, EVINA guidance will provide more consistency in the charging experience for EV drivers in Minnesota by offering a predictable framework to guide future EV infrastructure development, including station locations, port count and station amenities. Non-infrastructure recommendations include suggested policy/program, outreach and collaboration actions which MnDOT and other stakeholders can advance to promote EV adoption and remove barriers to charging station development.

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- **Chapter 5 Engagement and Feedback:** Key highlights from the stakeholder and public engagement process.
- **Chapter 6 Recommendations:** Infrastructure and non-infrastructure recommendations developed as an outcome of this Assessment.

¹ Light-duty vehicles as generally defined as those weighing between 8,500-10,000 pounds. For more information, visit the [Alternative Fuels Data Center: Vehicle Weight Classes & Categories](#).

1.1 VISION

The State of Minnesota has been a leader in transportation electrification with wide-ranging efforts from across state government. Examples of key efforts include Minnesota's adoption of a Clean Car Standard, including both a Low and Zero-Emission Vehicle Standard, as well as development of the Climate Action Framework in 2022. The Climate Action Framework identified the expansion of regional charging as a priority action and included a target to reach 20% EVs on Minnesota roads by 2030. The Minnesota Pollution Control Agency has also distributed two rounds of grants for EV charging infrastructure using Volkswagen Settlement funds. For more information on past and current state agency transportation electrification and sustainability efforts, see **Appendix A: Existing Infrastructure Conditions Summary Memo**.

Inspired by these previous efforts, MnDOT developed a Vision Statement in collaboration with other state agencies to guide progress towards Minnesota's transportation electrification and climate action targets. The Vision Statement is not intended to be a departure from what exists in Minnesota's planning documents but a synthesis of existing guidance.

The Vision Statement for the Minnesota Electric Vehicle Infrastructure Needs Assessment (EVINA) is:

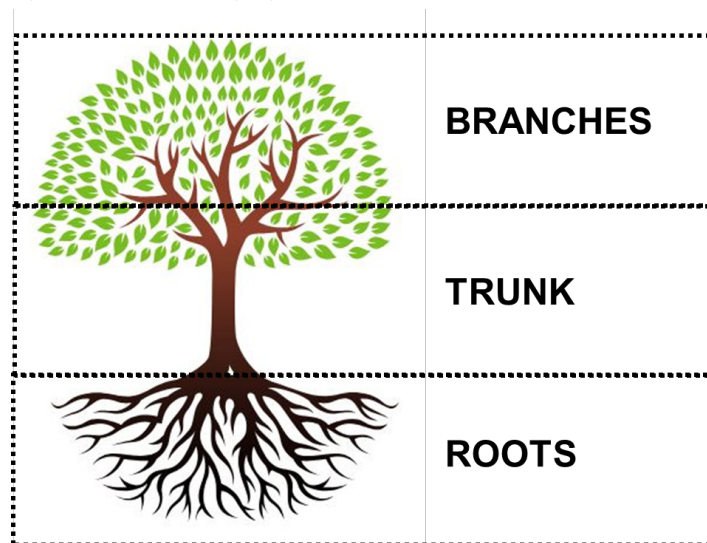
Minnesota will invest in an equitable network of public charging stations serving multiple transportation modes to support electric vehicles statewide. This will drive economic opportunity, promote tourism and enhance quality of life for all Minnesotans, while also making progress towards greenhouse gas reduction targets.

1.2 BUILDING OUT THE EV CHARGING NETWORK

As described in the **EVINA Vision**, the assessment considered plans to support electric vehicles statewide, looking at the gaps in the network from privately-owned and semi-public charging stations and identifying the potential locations or priority needs to locate publicly accessible charging stations. Building out this network will remove a typical barrier to EV adoption – range anxiety. According to a [survey conducted by the American Automobile Association](#) in April 2024, range anxiety continues to be a top concern for potential EV buyers, alongside cost and the lack of widespread charging opportunities.

In [Building the 2030 Charging Network](#), the National Renewable Energy Laboratory (NREL) compares a tree to a complete charging network (illustrated in **Figure 1**).

Figure 1: Tree/Charging Network Components, MnDOT, 2025



Within this tree are three distinct parts:

1. **Roots** represent the private charging network, which is widespread and made up of single-family, multi-family and workplace charging. According to NREL projections, the private charging network will account for roughly 50% of total charging investments and make up the largest number of charging ports.
2. The **trunk** represents public DCFC. These chargers are in publicly accessible locations both along corridors and in communities. They typically have fewer ports than other charging types but their placement throughout Minnesota is necessary to connect EV drivers from their home to more distant locations and improve the perceived availability of charging stations. While the number of public DCFC stations is fewer than other station types, these stations are the most expensive to construct and are anticipated to make up 40% of the total investment cost.
3. The **branches** represent public destination charging, and while at public destinations, they are typically privately owned. These stations are more ubiquitous than public DCFC and are spread across more diverse locations, such as grocery stores and shopping centers. Public destination charging is projected to account for only a small portion of the required investment, roughly 10% but a large portion of charging ports.

All three components are needed for a healthy and robust charging network, but how they are used is expected to be very different. The private charging network represents where the bulk of charging will occur for most EV owners. Charging at home or work is typically the most convenient and lowest cost method of recharging an EV. Public DCFC allows EV owners to have confidence that they can travel longer distances in an EV and be able to recharge quickly and conveniently along the way, whereas public destination charging allows charging opportunities in the day-to-day travel pattern of an EV. This type of charging location can make EV ownership more feasible for those who do not have the ability to charge at home.

All three components of the charging network work together to make widespread adoption of EVs possible. Recognition of each component and their role were considered in the analysis process and ultimate recommendations of EVINA.

Chapter 2



2 EXISTING CONDITIONS AND FORECASTS

To understand the future need for EV infrastructure in Minnesota, EVINA included a comprehensive review of the existing EV and charging landscape throughout the state.

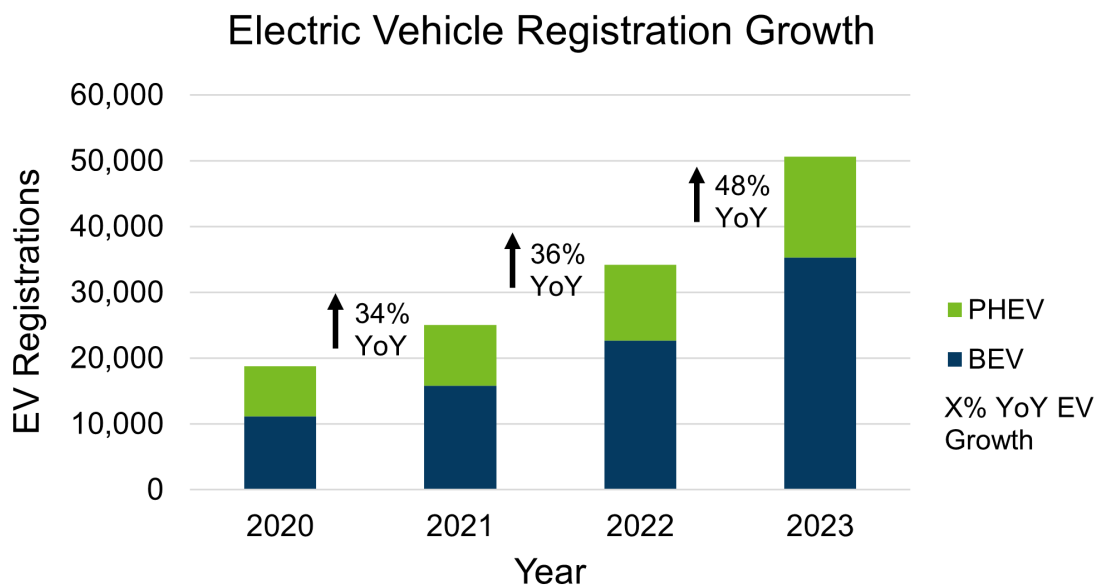
2.1 EVS REGISTERED IN MINNESOTA

As of November 2024, there were 65,679 EVs registered in Minnesota according to data obtained from [Atlas Public Policy](#).² In total, EVs make up less than 1% of the 7.3 million vehicles registered in Minnesota.

- 46,111 were battery electric vehicles (BEVs), which use only an electric motor
- 19,568 were plug-in hybrid electric vehicles (PHEVs), which use both an electric motor and a gasoline engine

EVs accounted for 4% of new light-duty vehicle registrations in Minnesota in 2023, up from 3% in 2022. EV registration growth has increased each year over the past three years, driven largely by growth in BEV registrations, as shown in **Figure 2**.

Figure 2: Electric Vehicles in Minnesota (Year-end Data), Atlas Public Policy, December 2020-2023



² The Atlas data undergoes periodic updates to improve accuracy, with typical variations of less than 1%, which can occasionally cause dashboards to update with new data.

2.2 EV CHARGING STATIONS IN MINNESOTA

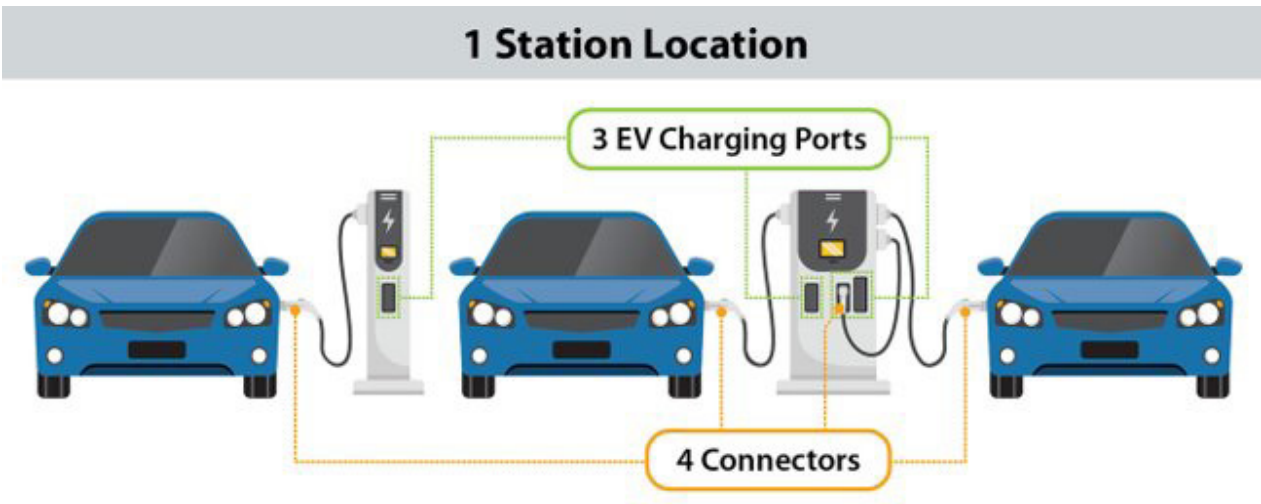
The EV charging infrastructure industry uses the terms “station”, “charger”, “port” and “connector” to refer to elements of EV charging equipment. **Table 1** introduces these terms and defines them.

Table 1: Common Charging Terminology

Term	Also known as	Definition
Station	EV charging station, charging station	Location where charging infrastructure is installed. Stations can include gas stations, retail, employer, recreation and other host sites.
Charger	Electric vehicle supply equipment (EVSE), electric vehicle charging infrastructure (EVCI)	Broadly refers to equipment that provides electric power to a vehicle to recharge the vehicle’s battery.
Port	-	Provides power to charge only one vehicle at a time. EVSE can be single-port, dual-port or multi-port.
Connector	Charging standard or plug	The device that attaches an EV to a charging port in order to transfer electricity.

Figure 3 below outlines the different components of an EV charging station location with three charging ports.

Figure 3: EV Charging Station Components, Alternative Fuels Data Center



As of May 2024, Minnesota has 880 EV charging stations as identified by the [Alternative Fuels Data Center \(AFDC\) Station Locator](#).

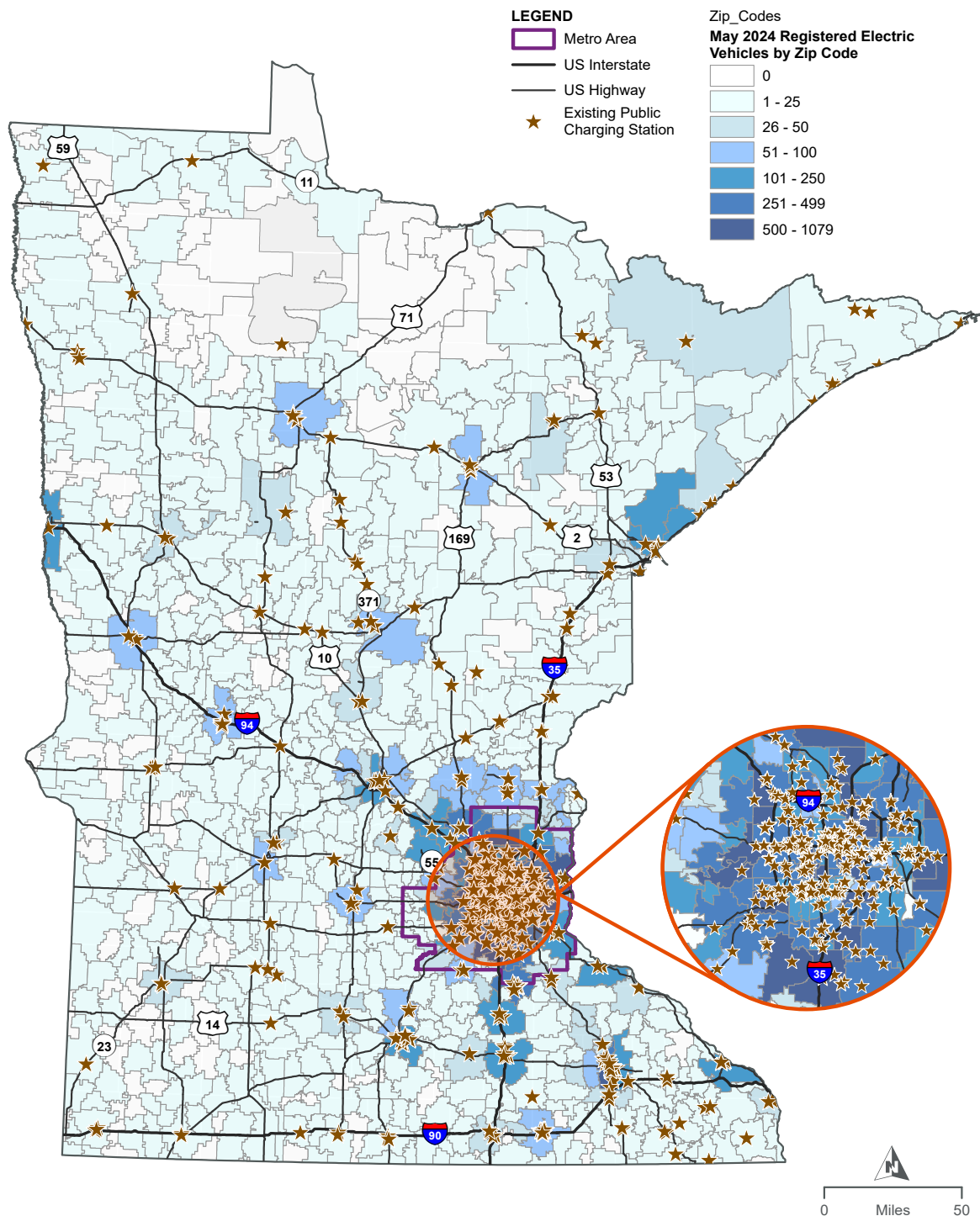
- 704 EV charging stations offering Level 2 charging
- 176 EV charging stations offering DCFC

There are 322 EV charging stations distributed throughout Greater Minnesota, typically located along U.S. highways or interstates.

2.3 EV TO CHARGER RATIO

The seven-county Twin Cities metro area has the highest proportion of EVs to public charging stations. The majority of zip codes outside of the Twin Cities metro area have at least one registered EV, but no public charging stations. Some areas of the state, particularly in northern Minnesota, have no registered EVs and no charging stations. **Figure 4** shows the concentration of registered EVs per public charging station by zip code throughout the state as of May 2024.

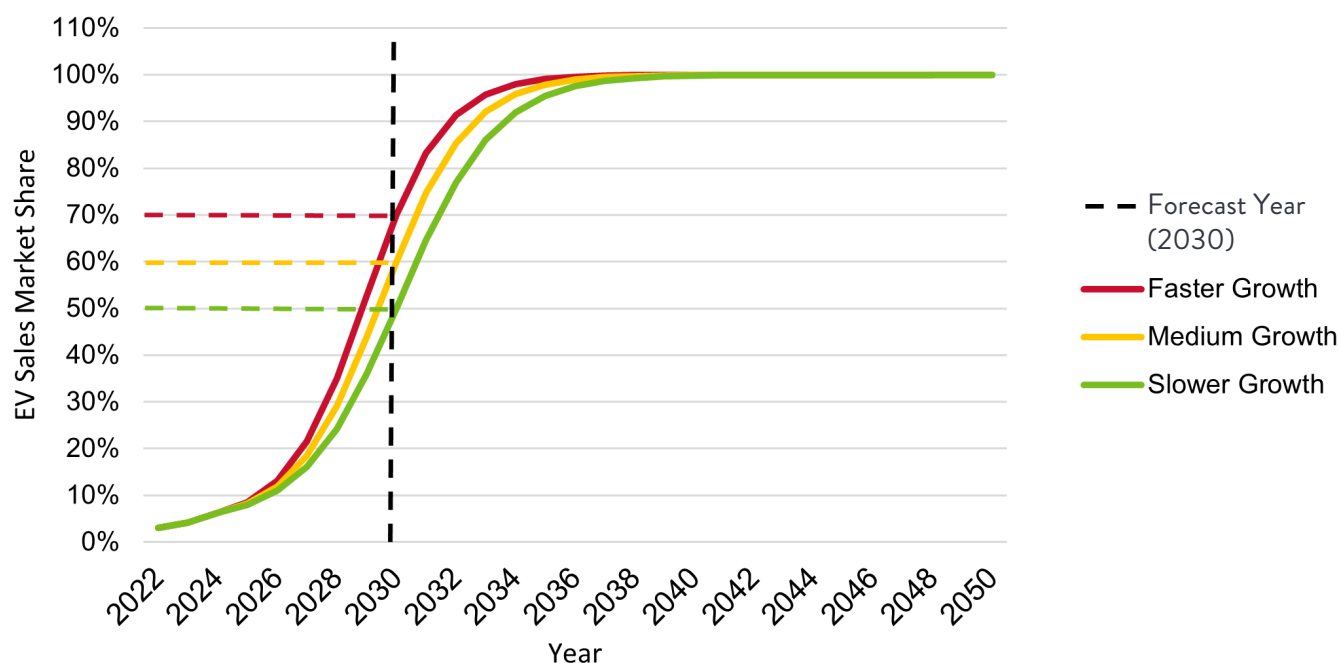
Figure 4: Registered EVs in Minnesota per Public Charging Station by Zip Code, Atlas Public Policy, May 2024



2.4 ADOPTION FORECAST

Throughout EVINA, EV adoption refers to purchasing or leasing an EV. Building from May 2024 EV adoption levels in Minnesota, an adoption forecast was created which displays three unique 2030 sales scenarios. The adoption forecast in **Figure 5** uses the Minnesota target of 60% as the baseline or “medium” growth scenario. This target was set in the 2022 Statewide Multimodal Transportation Plan (SMTP). A 50% “slower growth” and 70% “faster growth” scenario were included as well to account for other growth possibilities. If growth continues in an S-curve pattern, 100% of new car sales are forecasted to be electric around 2040 based on current sales conditions and assumed 60% (medium growth) EV sales in 2030.

Figure 5: EV Sales Market Share Projections, MnDOT, July 2024



Each of the sales growth scenarios (slow/medium/fast) would result in a total number of registered EVs well under the statewide EV registration performance target, as shown in **Table 2** and **Table 3**. These forecasted scenarios all fall short of Minnesota’s performance target for EVs on the road. If growth continues according to the historic trend data, present-day and future performance targets will not be met.

The Minnesota targets for total number of EVs registered were established by multiplying EV registration targets from the SMTP (e.g., 5% by 2025) with the total number of forecasted future light-duty vehicle registrations. Future registration forecasts were developed by applying a .31% compound annual growth rate (equivalent to estimated Minnesota population growth) to the annual vehicle registration data.



Table 2: EV Population Forecast (Number), MnDOT, July 2024

EV Population of Light-Duty Vehicles (Total Number of EVs Registered)				
Forecast Years	Slower	Medium	Faster	MN Performance Targets
2025	104,000	105,000	106,000	368,000
2030	610,000	717,000	822,000	1,496,000
2035	2,051,000	2,249,000	2,402,000	3,418,000
2040	3,470,000	3,633,000	3,753,000	5,015,000
2045	4,601,000	4,726,000	4,818,000	N/A
2050	5,497,000	5,592,000	5,662,000	N/A

Table 3: EV Population Forecast (Percentage), MnDOT, July 2024

EV Population of Light-Duty Vehicles (Total Percent of EVs Registered)				
Forecast Years	Slower	Medium	Faster	MN Performance Targets
2025	1%	1%	1%	5%
2030	8%	10%	11%	20%
2035	27%	30%	32%	45%
2040	45%	47%	49%	65%
2045	59%	60%	61%	N/A
2050	69%	70%	71%	N/A

The number of EVs projected for metropolitan statistical areas is shown in **Table 4**. The number of EVs projected for micropolitan statistical areas is shown in **Table 5**.

Table 4: Projected EVs in Minnesota Metropolitan Statistical Areas by 2030

Metropolitan Statistical Area	Projected EVs by 2030
Duluth	38,960
Grand Forks	12,561
Fargo	29,374
St. Cloud	25,603
Minneapolis-St. Paul-Bloomington	438,269
Mankato	11,960
Rochester	29,344
La Crosse-Onalaska	17,219



Table 5: Projected EVs in Minnesota Micropolitan Statistical Areas by 2030

Micropolitan Statistical Area	Projected EVs by 2030
Albert Lea	2,653
Alexandria	3,854
Austin	3,513
Bemidji	4,383
Brainerd	9,966
Fairmont	1,491
Faribault-Northfield	7,635
Fergus Falls	6,213
Grand Rapids	4,349
Hutchinson	3,253
Marshall	1,929
New Ulm	2,439
Owatonna	3,805
Red Wing	5,711
Wahpeton, ND-MN	520
Willmar	4,249
Winona	6,233
Worthington	1,414

2.5 PROJECTED CHARGING NEED

[EVI-Pro Lite](#) is a tool developed by the National Renewable Energy Lab (NREL), which uses the projected number of EVs in an area (either statewide or at the metropolitan level) and historical trends in EV charging patterns to calculate how many charging ports will be needed across four categories: single-family, shared private, public Level 2 and public DCFC. This tool was used to calculate the projected Minnesota charging need used in EVINA.

According to projections from EVI-Pro Lite, when all charging types are considered together, Minnesota is projected to need between 76,000-193,000 total charging ports to support EVs statewide depending on the growth scenario. In a medium-growth scenario, which assumes that EVs would make up roughly 10% of all registered vehicles by 2030, Minnesota would need the following number of ports to meet the projected demand:

- 40,000 shared private charging ports
- 48,000 public Level 2 charging ports
- 4,000 public DCFC ports

Additional details on the projected statewide charging need, both for long-distance and community charging, can be found in **Chapter 4**. The following chapters offer an infrastructure and implementation framework to guide the location of various charging station types, and the selection of charging station elements and amenities.

Chapter 3





3 EV CHARGING STATION GUIDELINES

EV charging station guidelines (Guidelines) were developed to facilitate consistent progress towards a complete statewide network that can provide a dependable and worry-free public charging experience, especially for long-distance travel. Additional details on this process can be found in **Appendix C: EV Charging Guidelines Technical Memo**. These guidelines are not requirements, but provide a framework to guide and evaluate the development of DCFC and Level 2 charging stations, including private and public funded charging stations.

The Guidelines can be used to inform the development of scoring criteria for future funding opportunities, as well as understand the potential utility impacts and infrastructure costs of various charging station types. It's anticipated that these Guidelines will continue to evolve as both EVs and charging technology continue to advance.

Note that this guidance is not intended to supersede requirements of any funding opportunities. Refer to each funding opportunity for their specific requirements and expectations.

The Guidelines provide counsel on:

- Appropriate locations and land use types
- Power level per station type
- Number of charging ports per station type
- Amenities and services per station type

These are outlined for each of three charging station hub typologies (e.g., long-distance, destination charging, amenity charging) and summarized in tables in the following sections.

3.1 LONG-DISTANCE CHARGING STATION GUIDELINES

Long-Distance Charging supports drivers needing to charge quickly for long-distance travel. Stations function similar to a gas station, allowing travelers access to quick refueling. The number of ports and amenities may vary depending on the location. Larger hubs are likely to be found along multi-state travel routes, such as interstates and U.S. highways. Station sizes may vary depending on usage level as shown in **Figure 6** and **Figure 7**.

Figure 6: Example of Low Potential Usage Long-Distance Charging Hub, HDR, 2025



Figure 7: Example of High Potential Usage Long-Distance Charging Hub, HDR, 2025



The Long-Distance Charging Guidelines classify locations according to whether they are in an urban or rural area, and whether they are expected to have high or low potential usage.

Locations analyzed for EVINA were classified as urban or rural based on U.S. Census delineations, which classify an area as urban if it contains at least 2,000 housing units or has a population of at least 5,000. Locations were classified as high or low potential usage based on the number of long-distance trips on the adjacent roadway as measured through Replica data. [Replica](#) is a data platform that uses third-party data sources, such as mobile phone applications, to provide travel insights. Traffic on an average weekday was modeled to determine the number of long-distance trips. Trips longer than 150 miles with more than 50 miles remaining at the location of interest were considered long-distance trips. Locations with the highest number of long-distance trips (75th percentile or higher) were considered high potential usage and the remaining locations were considered low potential usage. Locations in the 75th percentile had at least 2,500 long-distance trips on the adjacent roadway. The methodology for selecting the locations is provided in [Chapter 4](#).

Table 6 details the guidance developed for Long-Distance Charging hubs. In northern Minnesota (e.g., north of US-2) additional roadway classifications (e.g., federally functionally classified major collector roadways) may need to be included to provide complete coverage for EVs. Additional roadways may be identified in the future based on further analysis considering vehicle traffic and roadway suitability (i.e., level of nearby urban development).

Pull-through parking was prioritized for high potential usage stations in rural areas, where campers or boats are more likely to be towed but are optional for other station types because this configuration may be more difficult or costly to implement.

Table 6: Long-Distance EV Charging Guidelines, MnDOT, 2025

Element	Urban		Rural	
	High Potential Usage	Low Potential Usage	High Potential Usage	Low Potential Usage
Location	Every 50 miles along interstates and principal arterials	Every 50 miles along interstates and principal arterials	Every 50-75 miles along interstates and principal arterials	Every 50-75 miles along interstates and principal arterials
Distance	Max 1-mile drive distance from roadway	Max 2-mile drive distance from roadway	Max 2-mile drive distance from roadway	Max 5-mile drive distance from roadway
Minimum Power Level per Port	150 kW	150 kW	150 kW	150 kW
Power Level per Station	600 kW-1.2 MW	600-900 kW	1.2-1.8 MW	300-600 kW
Charging Ports	4-8 ports	4-6 ports	8-12 ports	2-4 ports
Charging Connectors	CCS, J3400	CCS, J3400	CCS, J3400	CCS, J3400
Safety	Emergency call button, lighting	Emergency call button, lighting	Emergency call button, lighting	Emergency call button, lighting
Standard Amenities	Restroom, food & drink, shaded area, WiFi	Restroom, food & drink, shaded area, WiFi	Restroom, food & drink, shaded area, WiFi	Restroom, water fountain, shaded area, WiFi
Additional Amenities	Pet area	Pet area	Playground, pet area, walking path	Playground, pet area, walking path
Parking configuration	Traditional stall or pull-through parking	Traditional stall or pull-through parking	Pull-through	Traditional stall or pull-through parking
Payment	Multiple payment options, including prepaid debit card and toll-free number			

3.2 DESTINATION CHARGING STATION GUIDELINES

Destination Charging is a cluster of charging stations that are located in retail, workplace, public and recreational parking areas (**Figure 8**). Often these are Level 2 charging stations but may include DCFC charging stations as well. In these locations, people will typically be parked for more than two hours. Destination charging may or may not be accessible to the public. In instances such as employer-based parking, use of these chargers will likely be limited to employees or visitors of the company.

Figure 8: Example of Level 2 Destination Charging



Destination Charging typically features several Level 2 stations at one site. This typically requires substantial electrical infrastructure that may include transformers or upgrades to utility service. In general, when the cumulative load of the chargers exceeds what the existing building panel or transformer can provide, it will fall into the destination charging classification. Destination Charging may also include DCFC stations.

Table 7 outlines the Destination Charging Guidance.

Community and Recreation Hubs offer EV charging at libraries, community centers, parks and other popular indoor/outdoor recreation areas. Hubs could be sited in areas where the private market may lag in development and support EV charging for disadvantaged communities.

Workplace Hubs are ideal locations for Level 2 charging due to a vehicle's extended time on site, which is often eight or more hours.

Retail Hubs offer charging opportunities that fit into the day-to-day travel pattern of EV owners running errands or shopping.

Mobility Hubs support electrified transportation for a variety of modes, including personal EVs, rideshare EVs, transit, e-bikes and e-scooters. They offer multiple levels of charging, including DCFC for rideshare EVs (which need to recharge quickly while in service), slower Level 2 charging for commuters making use of transit and low-power Level 1 charging, which utilizes a standard 120V outlet, for e-bikes and e-scooters.

Destination Hubs can be sized as small, medium or large hubs to account for variation in the sizes of supporting businesses, workplaces and community centers, as well as variation in the popularity of retail and recreational locations. For example, a 50-person workplace may only offer four charging ports for employees, while a larger 500-person workplace may offer 30 or more ports. Destination hubs would offer both J1772 and J3400 connectors to support Level 2 charging for a wider variety of EVs. For Tesla vehicles, the J3400 connector supports both Level 2 and DCFC charging, while most other EVs need to make use of J1772 for Level 2 charging and CCS1 for DCFC.

Table 7: Destination Charging Guidelines

Element	Community and Recreation	Workplace	Retail	Mobility Hub
Location	Libraries, parks, community centers and other indoor/outdoor recreation areas	At individual workplace or central area supporting several workplaces	Shopping, dining and commercial areas	Co-located with transit, active transportation and rideshare
Power Level per Port	3.6-19 kW	3.6-19 kW	3.6-19 kW	Level 1: 1-3 kW Level 2: 3.6-19 kW DCFC: 50-100 kW
Charging Connectors	J1772, J3400	J1772, J3400	J1772, J3400	J1772, CCS, J3400
Safety	Lighting, emergency call button	Lighting, emergency call button	Lighting, emergency call button	Lighting, emergency call button
Standard Amenities	Located nearby basic amenities	Workplace amenities accessible to employees	Amenities offered by businesses	Restroom, water fountain, shaded area, WiFi
Payment	Private: determined by business Public: multiple options, including prepaid debit card and toll-free number	Determined by workplace	Private: determined by business Public: multiple options, including prepaid debit card and toll-free number	Multiple options, including prepaid debit card and toll-free number

3.3 AMENITY CHARGING STATION GUIDELINES

Amenity Charging refers to small installations of Level 2 charging in public or private lots, curbside (**Figure 9**) or pole-mounted (**Figure 10**), where minimal electrical upgrades are needed. These small-scale implementations of publicly available charging infrastructure can integrate into existing parking areas and typically can tap into spare or excess electrical capacity in an existing electrical system without upgrades to the building service or transformer.

Figure 9: Example of Curbside Charging



Figure 10: Example of Utility Pole-Mounted Charging



These chargers are important neighborhood amenities, allowing people without access to at-home charging an opportunity to charge an EV throughout their daily routine. Curbside and pole-mounted stations on residential streets can mimic at-home charging by allowing EV owners to charge their vehicles while parked overnight. HOURCAR, an EV carsharing program located in the Twin Cities metro area, makes use of this charging type.

Table 8 details the guidance developed for Amenity Charging.

Table 8: Amenity Charging Guidelines

Element	Curbside or Pole-Mounted	Commercial Lot	Residential Lot
Location	In city right-of-way (ROW), coordinated with other street upgrades	Private businesses, including retail and lodging	Multi-family housing
Power Level per Port	3.6-19 kW	3.6-19 kW	3.6-19 kW
Charging Connectors	J1772, J3400	J1772, J3400	J1772, J3400
Amenities	Typically located nearby private businesses	Provided by host business	No amenities: stations typically for resident or guest use only
Safety	Lighting	Lighting	Lighting
Payment	Determined by charging provider	Determined by business	Varies, may be wired directly to residential unit's electric meter or determined by charging provider

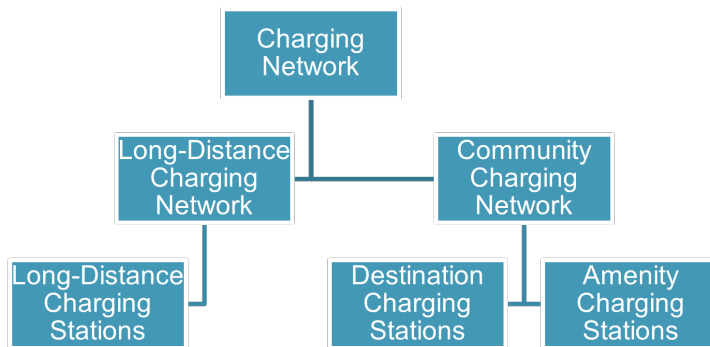
Chapter 4



4 CHARGING NETWORK

The proposed overall EV charging network for Minnesota takes into consideration charging that serves two main purposes: long-distance travel and community travel (**Figure 11**). Both of these networks include the different charging station types as discussed in the previous chapter.

Figure 11: Charging Network Organization Chart



4.1 LONG-DISTANCE CHARGING NETWORK

The following summarizes the analysis of Minnesota’s existing long-distance charging network and development of a statewide map illustrating gaps in coverage. The purpose of this analysis is to inform the identification of recommended priority locations for charging stations as MnDOT, and other partners pursue the development of Minnesota’s statewide network.

ANALYSIS OF EXISTING NETWORK

A site analysis was performed to evaluate the existing coverage of DCFC stations across Minnesota and whether existing charging is able to meet traveler needs according to the EV Charging Station Guidelines detailed in **Chapter 3**. The results from this analysis helped to inform where there are critical gaps in the existing charging network after considering where stations will be built with National Electric Vehicle Infrastructure (NEVI) funding along I-35, I-90 and I-94.

Existing DCFC stations as of September 2024 were identified through the AFDC. Chargers were reviewed to determine if they meet guidelines for Long Distance Charging.

- No existing DCFC stations could meet all long-distance guidelines.
- Only one DCFC station offered both CCS1 and J3400 connectors.
- Stations typically had fewer ports and a lower power level per port than recommended with most stations only offering two ports at maximum power of 50 kW or less.
- The simultaneous kW rating per port was estimated using the number of ports and kW rating per charger. For example, dual-port chargers were assumed to split power if both ports are used simultaneously. Tesla stations were assumed to provide 100 kW per port when charging occurs simultaneously based on previous trends of Tesla installations.

Full details on existing DCFC stations in Minnesota and whether stations meet Long-Distance Charging Guidelines are included in the [Long-Distance Dashboard](#).

SUMMARY OF METHODOLOGY

The Long-Distance Dashboard has three maps which describe 1) Base Coverage needs, 2) End Range Anxiety prioritization scenario rankings and 3) Accelerate Adoption prioritization scenario rankings. The following resources were used to develop the dashboard:

- [Replica](#)
- [USA Census Urban Areas](#)
- [Highway Reference Posts in Minnesota](#) (MnDOT)
- [Federal Functional Class in Minnesota](#) (MnDOT)

BASE-COVERAGE

Included Corridors

All U.S. and state highway corridors that have a portion of roadway designated as a principal arterial and are longer than 100 miles in length were included in the analysis. Interstates exceeding 100 miles in length (e.g., I-35, I-90 and I-94) were excluded due to their planned coverage under Minnesota's NEVI program.

Siting

Clusters were sited based on spacing requirements found in the EV Charging Guidelines and nearby availability of amenities. According to the Guidelines, urban clusters are located at a maximum spacing of 50 miles along included corridors, while rural clusters are located up to 75 miles along corridors. If either end of the corridor is rural, the spacing requirement increases to a maximum of 75 miles. For corridors that begin and/or end at a land-based state border, required spacing is 25 miles. If spacing guidelines could not be met to reach a nearby location with amenities that could support charging, spacing went above the guidelines.

Overlapping Clusters

Clusters were added to each corridor independently, but due to intersecting corridors, sometimes two clusters are sited in the same location. This created the potential for double counting for a location that could serve two corridors with one site. To remedy this, clusters are merged into one site where an overlap occurs.

The two clusters were assigned either as the primary or secondary cluster to keep the record of a cluster needed for each corridor. For example, cluster US 71-4 is a secondary cluster to US 10-2. By keeping the record of US 71-4, the corridor can be analyzed to show that a site is serving the corridor in that location, with US 71-3 and US 71-5 adjacent to US 71-4.

Urban/Rural Designation

Clusters were deemed urban or rural based on data from the 2020 U.S. Census. The U.S. Census designates an area as urban if it has at least 2,000 housing units or a population of at least 5,000 residents.

High Potential Usage/Low Potential Usage Designation

Using data from Replica, clusters were deemed high or low potential usage based on the number of long-distance trips passing through. Traffic on an average weekday was modeled to determine the number of trips taken throughout the state on each corridor. Trips longer than 150 miles with more than 50 miles remaining at the point it passed through the cluster were considered long-distance trips. These two trip qualifiers were the base metrics for a long-distance trip that has the potential for needing a fast charge, a trips-per-mile metric created using Replica data. Clusters with the highest number of long-distance trips (75th percentile or higher) were considered high potential usage and the remaining locations were considered low potential usage. Clusters in the 75th percentile had at least 2,500 long-distance trips on the adjacent roadway.

Cost

Costs were estimated based on the number of ports and a cluster’s designation as urban or rural. Costs were estimated as \$1,100 per kW for each site based on typical costs from the Minnesota NEVI round 1 grant awards made in April 2024. These costs include operations and maintenance (O&M) costs for five years.

Figure 12 illustrates the base coverage network (using clusters) that would be required to meet the Long-Distance EV Charging Guidelines developed in EVINA.

PRIORITIZATION SCENARIOS

The Long-Distance Base Coverage Map (**Figure 12**) provides a statewide illustration of all locations where DCFC stations would be needed to meet guidelines, while two prioritization scenarios (e.g., End Range Anxiety, Accelerate Adoption) identify the areas of greatest need within each scenario.

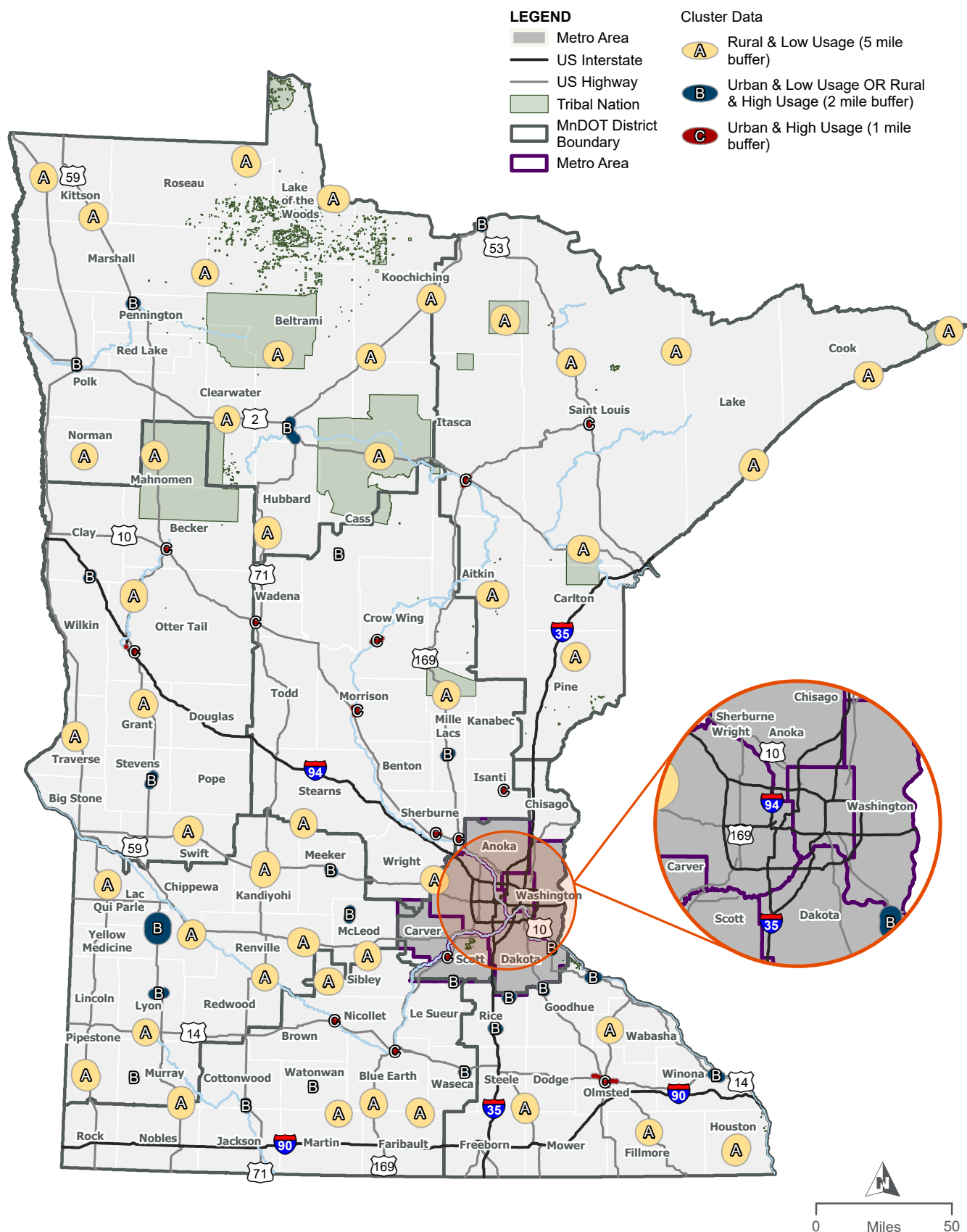
- End Range Anxiety prioritizes rural locations where existing infrastructure is lacking.
- Accelerate Adoption scenario prioritizes locations with high volumes of long-distance trips.

Table 9 details the metrics used to evaluate and rank clusters within each scenario. Rankings for each prioritization scenario are determined by the number of total points awarded for each scenario metric. For most metrics, points are awarded on a comparative basis with a cluster receiving points based on its percentile ranking. For example, if a cluster is in the 75th percentile for trips greater than 150 miles, the cluster would receive three points for that category (0.75×4 points). For both the Rural Area and Disadvantaged Community metrics, the cluster is awarded points if it is in a rural area or disadvantaged community and zero points if it is not.

Table 9: Scenario Ranking Metrics, MnDOT, March 2025

Metric	End Range Anxiety	Accelerate Adoption
Cluster Located in a Rural Area	3	-
High Average Station Spacing	1	-
Low Number of Existing Chargers	4	-
Serves More than One Analyzed Corridor Cluster	1	3
Cluster Located in a Disadvantaged Community	1	1
High Number of Trips > 150 Miles and > 50 Miles Remaining	-	6
Total Points Available	10	10

Figure 12: Long-Distance Charging Needs Base Coverage, MnDOT, April 2025



END RANGE ANXIETY AND ACCELERATE ADOPTION ANALYSIS

Figure 13 illustrates the cluster prioritization under the End Range Anxiety scenario. Clusters with a lower rank (i.e. 1, 2, 3) indicate a higher priority. Full details on cluster rankings can be found in **Table 10**.

Figure 13: End Range Anxiety Cluster Results, MnDOT, April 2025

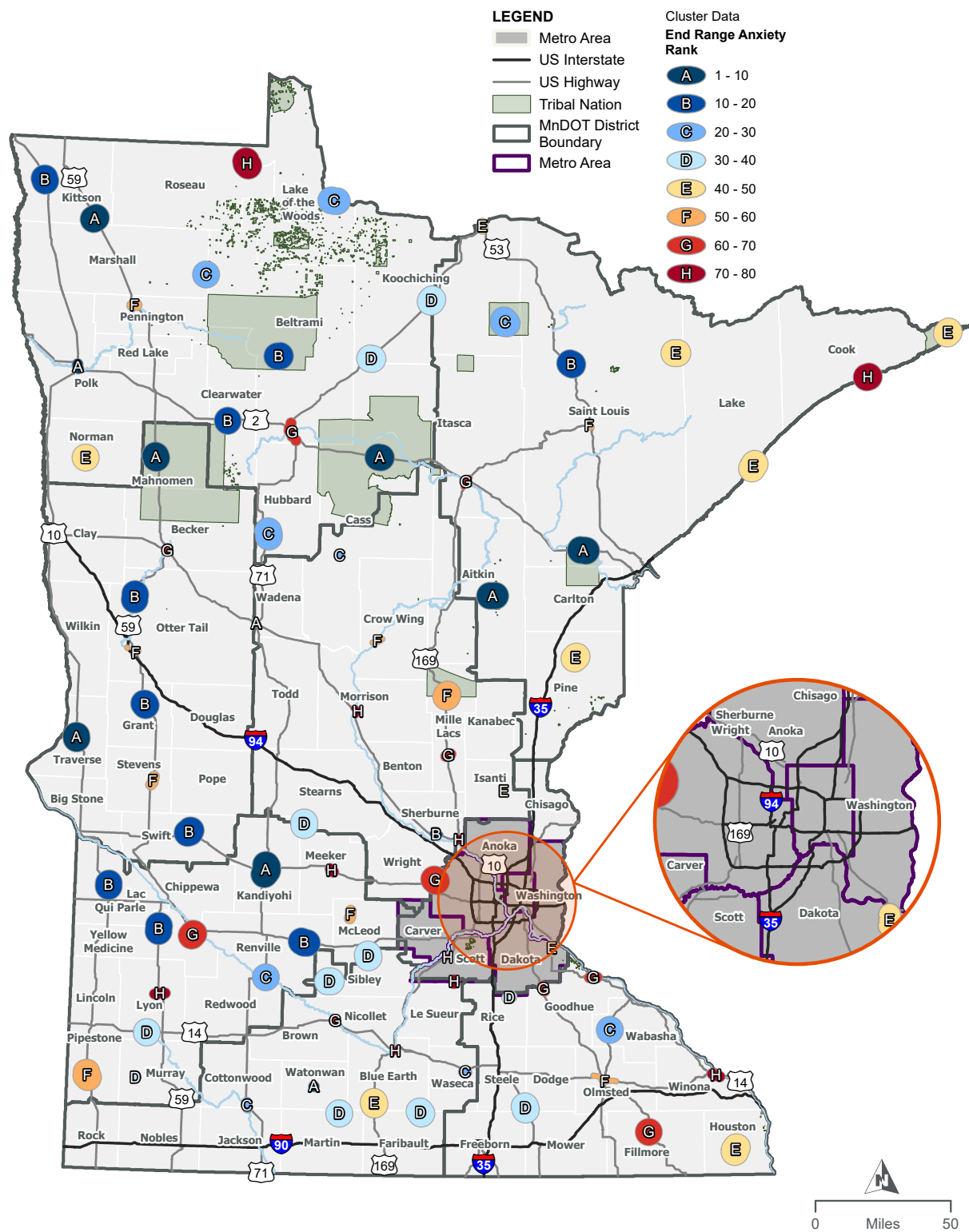


Table 10: End Range Anxiety Cluster Rankings

Rank	Cluster Name	Location	Urban vs. Rural	High vs. Low Potential Usage	Number of Ports	Cost			
						\$330K - 660K	\$660K - 990K	\$660K - 1.32M	\$1.32M - 1.98M
1	US 59-6	Karlstad	Rural	Low	2-4	X			
2	US 2-1	Crookston	Urban	Low	4-6		X		
3	US 10-2	Wadena	Urban	High	4-8			X	
4	MN 210-3	McGregor	Rural	Low	2-4	X			
5	US 71-3	Wilmar	Rural	Low	2-4	X			
6	US 59-5	Mahnomen	Rural	Low	2-4	X			
7	US 2-3	Bena	Rural	Low	2-4	X			
7	US 2-4	Grand Lake	Rural	Low	2-4	X			
9	MN 30-2	St. James	Rural	High	8-12				X
10	US 75-3	Graceville	Rural	Low	2-4	X			
11	US 59-4	Pelican Rapids	Rural	Low	2-4	X			
12	US 75-2	Madison	Rural	Low	2-4	X			
13	MN 1-2	Red Lake	Rural	Low	2-4	X			
13	US 75-5	Hallock	Rural	Low	2-4	X			
15	US 212-2	Hector	Rural	Low	2-4	X			
16	MN 55-1	Elbow Lake	Rural	Low	2-4	X			
16	US 53-2	Cook	Rural	Low	2-4	X			
16	US 59-2	Montevideo	Urban	Low	4-6		X		
19	US 12-1	Benson	Rural	Low	2-4	X			
20	US 10-4	Big Lake	Urban	High	4-8			X	
20	US 2-2	Bagley	Rural	Low	2-4	X			
22	US 14-3	Waseca	Urban	Low	4-6		X		
23	US 71-5	Park Rapids	Rural	Low	2-4	X			
24	US 71-2	Morton	Rural	Low	2-4	X			
25	US 71-1	Windom	Rural	High	8-12				X
26	MN 11-3	Baudette	Rural	Low	2-4	X			
27	US 63-2	Zumbro Falls	Rural	Low	2-4	X			
28	MN 371-1	Backus	Rural	High	8-12				X
28	MN 89-1	Grygla	Rural	Low	2-4	X			
30	MN 65-3	Nett Lake	Rural	Low	2-4	X			
31	MN 30-3	Blooming Prairie	Rural	Low	2-4	X			
32	MN 1-3	Northome	Rural	Low	2-4	X			
33	MN 15-1	Truman	Rural	Low	2-4	X			
34	MN 30-1	Lake Wilson	Urban	Low	4-6		X		
35	US 71-7	Big Falls	Rural	Low	2-4	X			
36	MN 19-2	Gibbon	Rural	Low	2-4	X			



Rank	Cluster Name	Location	Urban vs. Rural	High vs. Low Potential Usage	Number of Ports	Cost			
						\$330K - 660K	\$660K - 990K	\$660K - 1.32M	\$1.32M - 1.98M
36	MN 19-3	Northfield	Urban	Low	4-6		X		
38	MN 23-3	Paynesville	Rural	Low	2-4	X			
38	US 14-1	Balaton	Rural	Low	2-4	X			
40	MN 22-1	Minnesota Lake	Rural	Low	2-4	X			
40	MN 22-2	New Auburn	Rural	Low	2-4	X			
42	US 169-1	Amboy	Rural	Low	2-4	X			
42	US 53-3	International Falls	Urban	Low	4-6		X		
44	MN 23-5	Bruno	Rural	Low	2-4	X			
45	MN 61-1	Silver Bay	Rural	Low	2-4	X			
46	MN 65-1	Cambridge	Urban	High	4-8			X	
47	MN 1-5	Ely	Rural	Low	2-4	X			
48	MN 9-3	Ada	Rural	Low	2-4	X			
49	MN 61-3	Grand Portage	Rural	Low	2-4	X			
50	MN 44-1	Caledonia	Rural	Low	2-4	X			
50	US 61-3	Hastings	Urban	Low	4-6		X		
52	US 59-3	Morris	Urban	Low	4-6		X		
53	US 75-1	Pipestone	Rural	Low	2-4	X			
54	MN 1-1	Thief River	Urban	Low	4-6		X		
55	MN 15-2	Hutchinson	Urban	Low	4-6		X		
56	MN 210-2	Brainerd	Urban	High	4-8			X	
57	US 169-4	Onamia	Rural	High	8-12				X
58	US 53-1	Virginia	Urban	High	4-8			X	
59	US 14-4	Rochester	Urban	High	4-8			X	
60	MN 210-1	Fergus Falls	Urban	High	4-8			X	
61	US 71-6	Bemidji	Urban	Low	4-6		X		
62	MN 23-2	Minnesota Falls	Rural	Low	2-4	X			
62	US 14-2	New Ulm	Urban	High	4-8			X	
62	US 52-1	Fountain	Rural	Low	2-4	X			
62	US 52-2	Cannon Falls	Rural	High	8-12				X
66	US 61-2	Red Wing	Urban	Low	4-6		X		
67	MN 55-3	Rockford	Rural	Low	2-4	X			
68	US 169-5	Grand Rapids	Urban	High	4-8			X	
69	MN 23-4	Milaca	Rural	High	8-12				X
70	US 10-1	Detroit Lakes	Urban	High	4-8			X	
71	MN 11-2	Warroad	Rural	Low	2-4	X			
72	MN 19-1	Marshall	Urban	Low	4-6		X		



Rank	Cluster Name	Location	Urban vs. Rural	High vs. Low Potential Usage	Number of Ports	Cost			
						\$330K - 660K	\$660K - 990K	\$660K - 1.32M	\$1.32M - 1.98M
73	US 10-3	Little Falls	Urban	High	4-8			X	
74	MN 61-2	Grand Marais	Rural	Low	2-4	X			
75	MN 13-1	New Prague	Urban	Low	4-6		X		
76	MN 60-2	Mankato	Urban	High	4-8			X	
77	US 61-1	Winona	Urban	Low	4-6		X		
78	US 169-2	Jordan	Urban	High	4-8			X	
79	US 12-2	Litchfield	Urban	Low	4-6		X		
80	US 169-3	Otsego	Urban	High	4-8			X	
N/A	MN 60-3	Faribault	Urban	Low	4-6		X		
N/A	MN 9-2	Barnesville	Rural	High	8-12				X
N/A	US 59-1	Fulda	Rural	Low	2-4	X			

Figure 14 illustrates the cluster prioritization under the Accelerate Adoption scenario. Full details on cluster rankings can be found in **Table 11**.

Figure 14: Accelerate Adoption Prioritization Cluster Results, MnDOT, April 2025

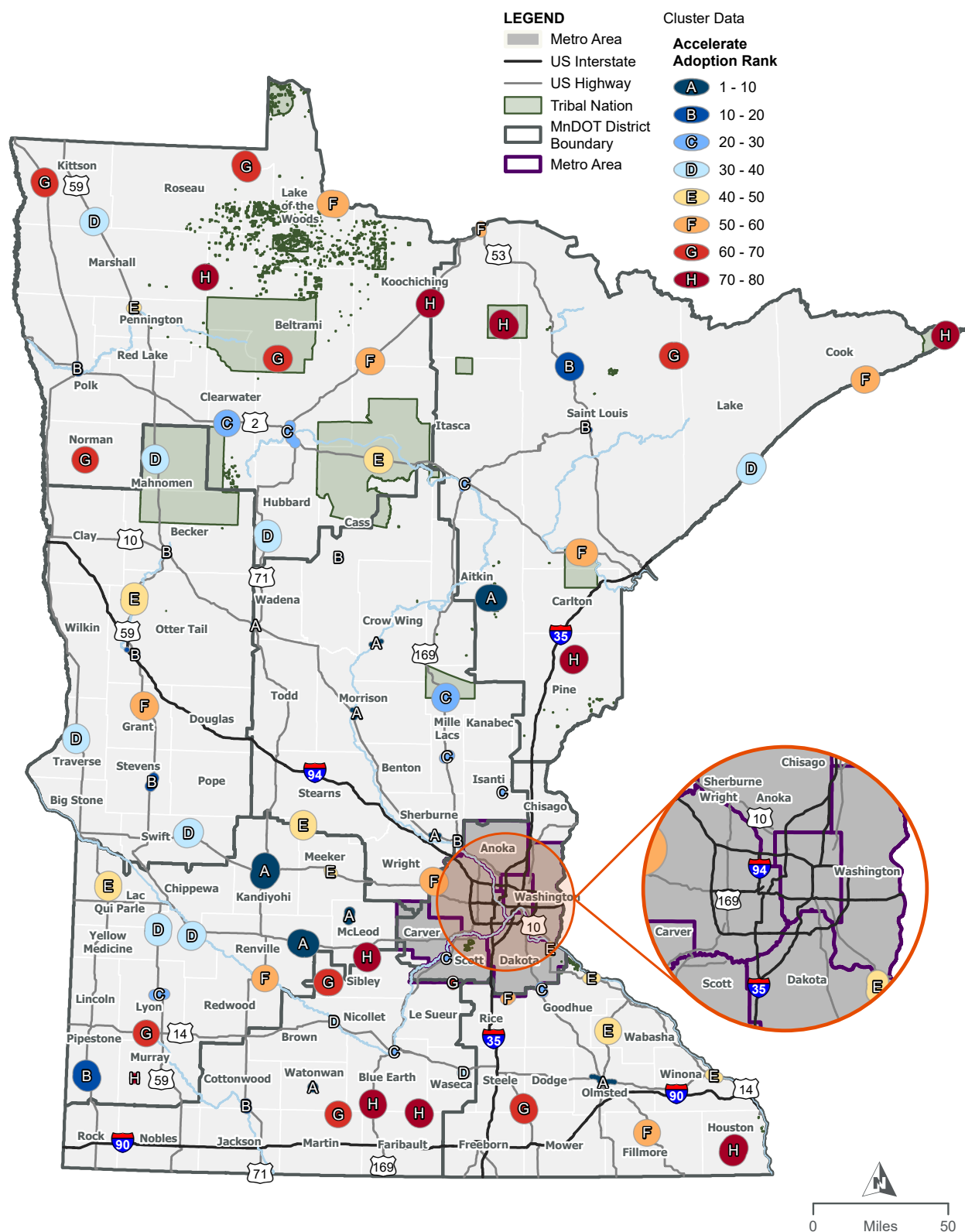


Table 11: Accelerate Adoption Cluster Rankings

Rank	Cluster Name	Location	Urban vs. Rural	High vs. Low Potential Usage	Number of Ports	Cost			
						\$330K - 660K	\$660K - 990K	\$660K - 1.32M	\$1.32M - 1.98M
1	US 14-4	Rochester	Urban	High	4-8			X	
2	US 10-2	Wadena	Urban	High	4-8			X	
3	US 10-4	Big Lake	Urban	High	4-8			X	
4	MN 30-2	St. James	Rural	High	8-12				X
5	US 71-3	Wilmar	Rural	Low	2-4	X			
6	MN 210-3	McGregor	Rural	Low	2-4	X			
7	MN 15-2	Hutchinson	Urban	Low	4-6		X		
8	US 10-3	Little Falls	Urban	High	4-8			X	
9	US 212-2	Hector	Rural	Low	2-4	X			
10	MN 210-2	Brainerd	Urban	High	4-8			X	
11	MN 210-1	Fergus Falls	Urban	High	4-8			X	
12	US 2-1	Crookston	Urban	Low	4-6		X		
13	US 71-1	Windom	Rural	High	8-12				X
14	US 53-2	Cook	Rural	Low	2-4	X			
15	MN 371-1	Backus	Rural	High	8-12				X
16	US 75-1	Pipestone	Rural	Low	2-4	X			
16	US 169-3	Ostego	Urban	High	4-8			X	
18	US 53-1	Virginia	Urban	High	4-8			X	
19	US 59-3	Morris	Urban	Low	4-6		X		
20	US 10-1	Detroit Lakes	Urban	High	4-8			X	
21	MN 60-2	Mankato	Urban	High	4-8			X	
22	US 169-4	Onamia	Rural	High	8-12				X
23	MN 65-1	Cambridge	Urban	High	4-8			X	
24	MN 19-1	Marshall	Urban	Low	4-6		X		
25	US 52-2	Cannon Falls	Rural	High	8-12				X
26	US 71-6	Bemidji	Urban	Low	4-6		X		
27	MN 23-4	Milaca	Rural	High	8-12				X
28	US 169-2	Jordan	Urban	High	4-8			X	
29	US 169-5	Grand Rapids	Urban	High	4-8			X	
30	US 2-2	Bagley	Rural	Low	2-4	X			
31	US 14-2	New Ulm	Urban	High	4-8			X	
32	US 14-3	Waseca	Urban	Low	4-6		X		
33	US 59-5	Mahnomen	Rural	Low	2-4	X			
34	MN 61-1	Silver Bay	Rural	Low	2-4	X			
35	US 12-1	Benson	Rural	Low	2-4	X			



ELECTRIC VEHICLE INFRASTRUCTURE NEEDS ASSESSMENT

Rank	Cluster Name	Location	Urban vs. Rural	High vs. Low Potential Usage	Number of Ports	Cost			
						\$330K - 660K	\$660K - 990K	\$660K - 1.32M	\$1.32M - 1.98M
36	MN 23-2	Minnesota Falls	Rural	Low	2-4	X			
37	US 59-2	Montevideo	Urban	Low	4-6		X		
38	US 75-3	Graceville	Rural	Low	2-4	X			
39	US 59-6	Karlstad	Rural	Low	2-4	X			
39	US 71-5	Park Rapids	Rural	Low	2-4	X			
41	US 61-2	Red Wing	Urban	Low	4-6		X		
42	US 75-2	Madison	Rural	Low	2-4	X			
43	US 61-1	Winona	Urban	Low	4-6		X		
44	MN 1-1	Thief River	Urban	Low	4-6		X		
45	US 2-3	Bena	Rural	Low	2-4	X			
46	US 59-4	Pelican Rapids	Rural	Low	2-4	X			
47	US 63-2	Zumbro Falls	Rural	Low	2-4	X			
48	US 61-3	Hastings	Urban	Low	4-6		X		
49	US 12-2	Litchfield	Urban	Low	4-6		X		
50	MN 23-3	Paynesville	Rural	Low	2-4	X			
51	US 2-4	Grand Lake	Rural	Low	2-4	X			
52	US 52-1	Fountain	Rural	Low	2-4	X			
53	US 71-2	Morton	Rural	Low	2-4	X			
54	MN 19-3	Northfield	Urban	Low	4-6		X		
55	MN 55-1	Elbow Lake	Rural	Low	2-4	X			
56	US 53-3	International Falls	Urban	Low	4-6		X		
57	MN 11-3	Baudette	Rural	Low	2-4	X			
58	MN 1-3	Northome	Rural	Low	2-4	X			
59	MN 61-2	Grand Marais	Rural	Low	2-4	X			
60	MN 55-3	Rockford	Rural	Low	2-4	X			
61	MN 15-1	Truman	Rural	Low	2-4	X			
62	US 14-1	Balaton	Rural	Low	2-4	X			
63	MN 30-3	Blooming Prairie	Rural	Low	2-4	X			
64	MN 1-5	Ely	Rural	Low	2-4	X			
65	MN 19-2	Gibbon	Rural	Low	2-4	X			
66	MN 11-2	Warroad	Rural	Low	2-4	X			
67	MN 13-1	New Prague	Urban	Low	4-6		X		
68	US 75-5	Hallock	Rural	Low	2-4	X			
69	MN 9-3	Ada	Rural	Low	2-4	X			
70	MN 1-2	Red Lake	Rural	Low	2-4	X			
71	MN 89-1	Grygla	Rural	Low	2-4	X			



Rank	Cluster Name	Location	Urban vs. Rural	High vs. Low Potential Usage	Number of Ports	Cost			
						\$330K - 660K	\$660K - 990K	\$660K - 1.32M	\$1.32M - 1.98M
72	US 169-1	Amboy	Rural	Low	2-4	X			
73	MN 44-1	Caledonia	Rural	Low	2-4	X			
74	US 71-7	Big Falls	Rural	Low	2-4	X			
75	MN 22-1	Minnesota Lake	Rural	Low	2-4	X			
76	MN 30-1	Lake Wilson	Urban	Low	4-6		X		
77	MN 65-3	Nett Lake	Rural	Low	2-4	X			
78	MN 22-2	New Auburn	Rural	Low	2-4	X			
79	MN 61-3	Grand Portage	Rural	Low	2-4	X			
80	MN 23-5	Bruno	Rural	Low	2-4	X			
N/A	MN 60-3	Faribault	Urban	Low	4-6		X		
N/A	MN 9-2	Barnesville	Rural	High	8-12				X
N/A	US 59-1	Fulda	Rural	Low	2-4	X			

COMBINED SCENARIO RANKINGS

To determine which clusters rank highly in both scenarios, cluster rankings were combined to create an additive score which shows each cluster's overall rank. Details on each cluster's combined rank are shown in **Table 12**.

Table 12: Combined Cluster Rankings

Rank	Cluster Name	Location	Urban vs. Rural	High vs. Low Potential Usage	Number of Ports	Cost			
						\$330K - 660K	\$660K - 990K	\$660K - 1.32M	\$1.32M - 1.98M
3	US 10-2	Wadena	Urban	High	4-8			X	
5	MN 210-3	McGregor	Rural	Low	2-4	X			
5	US 71-3	Wilmar	Rural	Low	2-4	X			
7	US 2-1	Crookston	Urban	Low	4-6		X		
7	MN 30-2	St. James	Rural	High	8-12				X
12	US 212-2	Hector	Rural	Low	2-4	X			
12	US 10-4	Big Lake	Urban	High	4-8			X	
15	US 53-2	Cook	Rural	Low	2-4	X			



ELECTRIC VEHICLE INFRASTRUCTURE NEEDS ASSESSMENT

Rank	Cluster Name	Location	Urban vs. Rural	High vs. Low Potential Usage	Number of Ports	Cost			
						\$330K - 660K	\$660K - 990K	\$660K - 1.32M	\$1.32M - 1.98M
19	US 71-1	Windom	Rural	High	8-12				X
20	US 59-6	Karlstad	Rural	Low	2-4	X			
20	US 59-5	Mahnomen	Rural	Low	2-4	X			
22	MN 371-1	Backus	Rural	High	8-12				X
24	US 75-3	Graceville	Rural	Low	2-4	X			
25	US 2-2	Bagley	Rural	Low	2-4	X			
26	US 2-3	Bena	Rural	Low	2-4	X			
27	US 75-2	Madison	Rural	Low	2-4	X			
27	US 59-2	Montevideo	Urban	Low	4-6		X		
27	US 12-1	Benson	Rural	Low	2-4	X			
27	US 14-3	Waseca	Urban	Low	4-6		X		
29	US 2-4	Grand Lake	Rural	Low	2-4	X			
29	US 59-4	Pelican Rapids	Rural	Low	2-4	X			
30	US 14-4	Rochester	Urban	High	4-8			X	
31	US 71-5	Park Rapids	Rural	Low	2-4	X			
31	MN 15-2	Hutchinson	Urban	Low	4-6		X		
33	MN 210-2	Brainerd	Urban	High	4-8			X	
35	MN 65-1	Cambridge	Urban	High	4-8			X	
35	US 75-1	Pipestone	Rural	Low	2-4	X			
36	MN 55-1	Elbow Lake	Rural	Low	2-4	X			
36	US 59-3	Morris	Urban	Low	4-6		X		
36	MN 210-1	Fergus Falls	Urban	High	4-8			X	
37	US 63-2	Zumbro Falls	Rural	Low	2-4	X			
38	US 53-1	Virginia	Urban	High	4-8			X	
39	US 71-2	Morton	Rural	Low	2-4	X			
40	MN 61-1	Silver Bay	Rural	Low	2-4	X			
40	US 169-4	Onamia	Rural	High	8-12				X
41	US 75-5	Hallock	Rural	Low	2-4	X			
41	US 10-3	Little Falls	Urban	High	4-8			X	
42	MN 1-2	Red Lake	Rural	Low	2-4	X			
42	MN 11-3	Baudette	Rural	Low	2-4	X			
44	MN 23-3	Paynesville	Rural	Low	2-4	X			
44	US 71-6	Bemidji	Urban	Low	4-6		X		
44	US 52-2	Cannon Falls	Rural	High	8-12				X
45	MN 1-3	Northome	Rural	Low	2-4	X			



ELECTRIC VEHICLE INFRASTRUCTURE NEEDS ASSESSMENT

Rank	Cluster Name	Location	Urban vs. Rural	High vs. Low Potential Usage	Number of Ports	Cost			
						\$330K - 660K	\$660K - 990K	\$660K - 1.32M	\$1.32M - 1.98M
45	MN 19-3	Northfield	Urban	Low	4-6		X		
45	US 10-1	Detroit Lakes	Urban	High	4-8			X	
47	MN 30-3	Blooming Prairie	Rural	Low	2-4	X			
47	MN 15-1	Truman	Rural	Low	2-4	X			
47	US 14-2	New Ulm	Urban	High	4-8			X	
48	MN 23-4	Milaca	Rural	High	8-12				X
48	MN 19-1	Marshall	Urban	Low	4-6		X		
48	US 169-3	Ostego	Urban	High	4-8			X	
49	US 53-3	International Falls	Urban	Low	4-6		X		
49	US 61-3	Hastings	Urban	Low	4-6		X		
49	MN 1-1	Thief River	Urban	Low	4-6		X		
49	MN 23-2	Minnesota Falls	Rural	Low	2-4	X			
49	US 169-5	Grand Rapids	Urban	High	4-8			X	
49	MN 60-2	Mankato	Urban	High	4-8			X	
50	MN 89-1	Grygla	Rural	Low	2-4	X			
50	US 14-1	Balaton	Rural	Low	2-4	X			
51	MN 19-2	Gibbon	Rural	Low	2-4	X			
53	US 169-2	Jordan	Urban	High	4-8			X	
54	MN 65-3	Nett Lake	Rural	Low	2-4	X			
54	US 61-2	Red Wing	Urban	Low	4-6		X		
55	MN 30-1	Lake Wilson	Urban	Low	4-6		X		
55	US 71-7	Big Falls	Rural	Low	2-4	X			
56	MN 1-5	Ely	Rural	Low	2-4	X			
57	US 169-1	Amboy	Rural	Low	2-4	X			
57	US 52-1	Fountain	Rural	Low	2-4	X			
58	MN 22-1	Minnesota Lake	Rural	Low	2-4	X			
59	MN 22-2	New Auburn	Rural	Low	2-4	X			
59	MN 9-3	Ada	Rural	Low	2-4	X			
60	US 61-1	Winona	Urban	Low	4-6		X		
62	MN 23-5	Bruno	Rural	Low	2-4	X			
62	MN 44-1	Caledonia	Rural	Low	2-4	X			
64	MN 61-3	Grand Portage	Rural	Low	2-4	X			
64	MN 55-3	Rockford	Rural	Low	2-4	X			
64	US 12-2	Litchfield	Urban	Low	4-6		X		

Rank	Cluster Name	Location	Urban vs. Rural	High vs. Low Potential Usage	Number of Ports	Cost			
						\$330K - 660K	\$660K - 990K	\$660K - 1.32M	\$1.32M - 1.98M
67	MN 61-2	Grand Marais	Rural	Low	2-4	X			
69	MN 11-2	Warroad	Rural	Low	2-4	X			
71	MN 13-1	New Prague	Urban	Low	4-6		X		
N/A	MN 60-3	Faribault	Urban	Low	4-6		X		
N/A	MN 9-2	Barnesville	Rural	High	8-12				X
N/A	US 59-1	Fulda	Rural	Low	2-4	X			

4.2 COMMUNITY CHARGING NETWORK

The evaluation of community charging is described in the hypothetical as more detailed and community-specific characteristics and feedback should be used to tailor recommendations. For Destination and Amenity Charging, the EV Charging Guidelines can be used to help identify how community charging port projections can be distributed into various charging station types.

SUMMARY OF EXAMPLE METHODOLOGY

EVI-Pro Lite Projections

[EVI-Pro Lite](#) was used to calculate the community charging need across four categories: single-family, shared private, public Level 2 and public DCFC. EVI-Pro Lite uses the projected number of EVs in an area and historical trends in EV charging patterns to calculate how many charging ports will be needed. The projected number of EVs for this analysis was based on a medium growth scenario, as detailed in [2.3 Adoption Forecast](#). Community charging needs for Minnesota's metropolitan and micropolitan statistical areas were projected using EVI-Pro Lite.³ While EVI-Pro Lite does not calculate micropolitan port projections, MnDOT's project team extrapolated micropolitan statistical area charging port projections using a similar calculation method.

³ As defined by the U.S. Census Bureau, metropolitan areas have at least one urban area of 50,000 or more inhabitants and include adjacent counties having a high degree of social and economic integration as measured through commuting ties. Micropolitan areas have at least one urban area of at least 10,000 but less than 50,000 inhabitants and include adjacent counties having a high degree of social and economic integration with the core as measured through commuting ties.



Table 13 details the projected community charging need for Minnesota’s metropolitan statistical areas using EVI-Pro Lite and the medium-growth scenario numbers for Minnesota. As shown in the table, the vast majority of ports will be needed in the Twin Cities metro area, followed by Duluth, Fargo and Rochester.

Table 13: Community Charging Port Need by Metropolitan Statistical Area

Metro Area	Single Family	Shared Private	Public L2	Public DCFC	All Ports
Duluth	23,895	1,958	2,484	189	28,526
Fargo-Moorhead (ND-MN)	23,921	627	914	71	25,533
Grand Forks - East Grand Forks (ND-MN)	7,713	577	785	57	9,132
La Crosse-Onalaska	10,557	634	801	67	12,059
Mankato	7,354	574	744	67	8,739
Minneapolis-St. Paul-Bloomington	264,312	27,283	30,667	1,950	324,212
Rochester	18,050	1,424	1,840	151	21,465
St. Cloud	15,803	1,245	1,651	132	18,831

Table 14 details the projected community charging need for Minnesota’s micropolitan statistical areas using EVI-Pro Lite and the medium-growth scenario numbers for Minnesota. Most of the total charging ports needed for Minnesota’s micropolitan statistical areas are less than 5,000 ports, with the exception of Brainerd and Faribault-Northfield.

Table 14: Community Charging Port Need by Micropolitan Statistical Area

Micropolitan Statistical Area	Single Family	Shared Private	Public L2	Public DCFC	All Ports
Albert Lea	1,796	148	197	21	2,162
Alexandria	2,618	215	300	32	3,165
Austin	2,378	197	266	30	2,871
Bemidji	2,904	198	296	32	3,430
Brainerd	6,632	509	691	69	7,901
Fairmont	1,009	80	115	18	1,222
Faribault-Northfield	5,067	399	530	56	6,052
Fergus Falls	4,109	273	386	36	4,804
Grand Rapids	2,932	259	334	39	3,564
Hutchinson	2,155	161	220	25	2,561
Marshall	1,304	108	149	24	1,585
New Ulm	1,617	120	160	17	1,914
Owatonna	2,577	212	292	32	3,113
Red Wing	3,790	299	396	39	4,524
Wahpeton, ND-MN	353	22	34	4	412
Willmar	2,887	235	326	34	3,482
Winona	4,137	327	432	45	4,941
Worthington	955	76	108	17	1,156

CHARGER TO LAND USE RELATIONSHIP

Within each of the four general EVI-Pro Lite categories (e.g., single-family, shared private, public Level 2 charging and public DCFC), charging stations could be in a variety of land use types. It’s important to understand that the breakdown of charging ports into more specific locations will look different in each community based upon its land use pattern and other community characteristics (i.e., housing tenure, commuting patterns).

Single-family and multi-family residential will generally make up the greatest number of ports needed in a community. Typically, charging at these land use types will use Level 2 charging but some EV owners will choose to use Level 1 charging through 120V household outlets.

Together with private workplace charging, multi-family charging falls into the shared private category. Charging at these land use types allow an EV to charge for several hours daily and replenish most of its battery capacity. For this reason, shared private charging ports are critical to support broad EV adoption for those without the ability to install a charger at home.



Public Level 2 charging stations can be found in a variety of land use types, including but not limited to:

- Retail
- Community centers
- Parks
- Education facilities
- Healthcare facilities
- Neighborhood curbside charging

Public Level 2 charging stations allow “opportunity charging” or the ability to replenish a small portion of an EV’s battery capacity as part of a driver’s normal routine. This could be while shopping at a grocery store or visiting a library or park. Generally, EV owners do not typically use public Level 2 charging as their sole method of charging, but the visibility of these public chargers instills confidence in potential EV adopters that there are ample opportunities to recharge their vehicle.

Public DCFC stations are typically located at retail locations in a community setting. Retailers who add public EV charging may see a significant uptick in revenue from increased customer traffic. Retail locations which host DCFC stations will need to have a high vehicle turnover to support the investment in DCFC, which costs significantly more to install than Level 2 charging stations. For example, large retailers, such as Target and WalMart, have partnered with charging network providers to add DCFC to their sites.

EXAMPLE OF PLANNING-LEVEL METHODOLOGY

The following planning-level methodology is provided as an illustrative example of what development of a community charging strategy may involve.

1. Evaluate the state of the EV charging network within the community
 - Identify the existing chargers and registered EVs within the community
 - Examine existing charging network
2. Analyze the projected need and demand
 - Calculate the projected adoption and associated charging demand in the community
 - Use EVI-Pro Lite to project the EV Charging demand
 - Identify gaps within the charging network based on projected community charging need
3. Analyze potential priority areas within the community
 - Highlight activity areas within the jurisdiction and identify land use
 - Analyze key community characteristics, such as housing tenure, commuting patterns and disadvantaged community designation
 - Find areas where gaps are adjacent or nearby high activity areas
 - Evaluate the land use within the priority areas to determine what barriers there are to EV charging



4. Outreach

- Coordinate with local electric utility to inform of projected charging need in high demand areas
- Engage with local leaders, stakeholders and community members to understand public needs and targets for EV charging

5. Develop recommendations

- Develop course of action for public and/or public-private partnership for EV charger installation

4.3 COMMUNITY CHARGING PRIORITIZATION

Each community will have unique demographic and land use characteristics that should be considered when developing a community charging strategy. For example, a community with many employers and commuters may prioritize support for workplace charging. Communities which have a large number of renters and multi-family apartments could choose to prioritize multi-family installations and curbside charging.

PRIORITIZATION SCENARIOS

Similar to the Long-Distance Charging analysis, different prioritization scenarios represent potential strategies for prioritizing community charging investments.

- **Bring Home Charging to All:** This approach prioritizes Level 2 charging at multi-family properties and curbside on residential streets. At-home charging is the preferred charging method of EV owners due to its convenience and low cost. Increasing access to home charging could persuade more internal combustion engine vehicle drivers to make the switch to an EV.
- **Fill in the Gap:** This approach would focus on adding charging stations where the private market will likely lag in development, such as chargers supporting disadvantaged communities and rural Minnesota. Locations could include libraries and community centers, which already provide basic amenities such as internet access to residents. Owning an EV would become more feasible for residents, who would benefit from lower fueling and maintenance costs, as well as reduced tailpipe emissions in their communities.
- **Promote Multimodal Transportation:** This approach would focus on encouraging transit ridership and active transportation by locating charging stations alongside other transportation modes. This strategy has the potential to shift trips made in a personal vehicle to transit or micromobility.
- **Integrate Charging into Daily Travel:** This approach would focus on adding EV charging to workplaces and key commercial areas which fit the day-to-day travel pattern of residents, which would allow EV owners to charge without a major change in habit.

These scenarios should not be considered exhaustive of all potential approaches and do not need to be considered as mutually exclusive. A multi-faceted approach can be tailored uniquely to each community. To maximize utilization of chargers, locations should be considered which can accommodate different users throughout the day. For example, a cluster of chargers can be shared between office users during business hours and still serve neighboring residential or recreational users during non-business hours.



Additionally, there are many different parties that have the potential to play a strong role in each of the different scenarios as indicated in the following non-exhaustive list:

- **End Range Anxiety:** MnDOT, Minnesota Pollution Control Agency (MPCA), Tribal Nations
- **Integrate Charging into Daily Travel:** Regional Planning Organizations, Tribal Nations, Private Development, Other State Agencies
- **Promote Multimodal Transportation:** MnDOT, Local Transit Agencies, Regional Planning Organizations
- **Bring Home Charging to All:** Utilities, Private Development, other State Agencies
- **Accelerate Adoption:** MnDOT, MPCA, Regional Planning Organizations
- **Fill in the Gap:** MnDOT, Local governments/municipalities, Private Development, Tribal Nations

RESOURCES FOR COMMUNITY PLANNING

The following resources can also be used to support development of a community charging strategy.

- [Joint Office of Energy & Transportation Public EV Charging Infrastructure Playbook](#)
- American Planning Association (APA) resources on community electrification
 - [Preparing for the Electric Vehicle Surge](#)
 - [Planning for On-Street EV Charging Infrastructure](#)
 - [How to Design Electric Vehicle Charging Facilities](#)
- [Great Plains Institute – Summary of Best Practices in EV Ordinances](#)
- [Argonne National Laboratory Geospatial Energy Mapper](#)
- [Minnesota Local Road Research Board, Best Practices for Electric Vehicle Charging Stations](#), estimated completion date February 2026
- [Drive Electric Minnesota, Finding The Best Charging Option For Your Community](#)

Chapter 5





5 ENGAGEMENT AND FEEDBACK

5.1 SUMMARY OF ENGAGEMENT

Throughout the entire project, regular engagement opportunities were held with multiple stakeholders to solicit feedback on diverse project components of EVINA, guided by a Partner and Public Engagement Plan. These engagement opportunities included:

- Monthly meetings with the MnDOT Project Management Team
- Two rounds of focus groups
 - Round 1 - to solicit feedback on the Vision Statement and draft EV Charging Guidelines from state agencies, utilities and Tribal Nations
 - Round 2 - to solicit feedback on the revised EV Charging Guidelines and siting prioritization approach from state agencies, utilities, EVSE vendors Tribal Nations
- A community survey requesting input on benefits and barriers to driving an EV (June 4 – August 16, 2024)
- Community engagement to solicit feedback on the proposed priority locations for DCFC and Level 2 stations from Minnesota residents
- An interview with HOURCAR, a non-profit carshare organization, to gain insight into the impact of EV infrastructure in their operations
- Online information and community input forum in February 2025 to solicit feedback on the proposed priority locations for DCFC and Level 2 stations from Minnesota residents
- Community-based organization case studies

The following provides a brief summary of each of these engagement efforts with more detailed information found in **Appendix B: Community Engagement Summary**.

5.2 FOCUS GROUPS (ROUND 1)

In July 2024, three webinars were held with Minnesota state agencies to seek feedback on the draft EVINA Vision Statement and Vision for State Agency Collaboration. Participants from 12 state agencies (including MnDOT, Department of Administration, Department of Natural Resources, MPCA, Department of Commerce, Department of Employment and Economic Development, Department of Health, Department of Tourism/Explore Minnesota, Minnesota State Council on Disability, Public Utilities Commission, Minnesota State Colleges and Universities and University of Minnesota) attended webinars and provided feedback at meetings, which were held on July 2, July 9 and July 18, 2024. Engagement with state agencies during these sessions revealed the following key feedback on the draft Vision Statement:

- Ensuring transportation electrification targets, emission reductions and other benefits (e.g., reduction in noise pollution) are achieved in underserved communities
- Interest in highlighting significant economic opportunity from transportation electrification, potential for an improved quality of life for residents through economic development and tourism from charging investments



Simultaneously, webinars were also held in July 2024 to seek feedback from state agencies, utilities and Tribal Nations on the draft EV Charging Guidelines developed for Long-Distance Charging, Destination Charging and Amenity Charging. State agency sessions were held on July 2, July 9 and July 18, 2024. Utility sessions were held on July 15 and 17. A Tribal Nations session was held on July 23, 2024.

Engagement during these sessions revealed the following key feedback on the draft guidelines:

- Stations should be built with future expansion of charging in mind
- Participants were interested in identifying sites that could eventually help meet needs of medium- and heavy-duty (MHD) vehicles
- Rural stations will need to plan for tourism and identify locations which receive an influx of visitors during certain seasons

5.3 FOCUS GROUPS (ROUND 2)

In Fall 2024, MnDOT and its project team organized a second round of focus groups with key stakeholders including state agencies, utilities, EVSE vendors and Tribal Nations. The purpose of this round of focus groups was to seek input on the final draft of the EV Charging Guidelines and consider several scenarios to help guide investment prioritization. In addition to these topics, State Agency participants also discussed previously developed avenues for interagency collaboration. Key feedback received from stakeholders is noted below.

STATE AGENCIES

- Guidelines should include a note mentioning that station build-outs should match/meet available funding options.
- Participants wanted to include guidelines on uptime requirements and temperature operational requirements for charging stations.
- Future guidelines should consider appropriate distance distribution for locations accommodating MHDs.
- Several participants provided input into how specific state agency targets could be coordinated with charging station development.
 - MnDOT Aeronautics is looking for opportunities to improve last-mile and first-mile connectivity to Minnesota's 133 public-use airports and providing charging for air travel parking.
 - The Department of Natural Resources (DNR) may have opportunities to add charging and fill in rural areas with state parks or other destinations where charging may not already exist.
 - MnDOT Office of Sustainability and Public Health (OSPH) is interested in collaboration regarding MHD and freight-related electrification needs and installation strategies.
 - Department of Employment and Economic Development (DEED) could assist with workforce projects.

UTILITIES

- Participants stressed the need to have a high number of ports at key stations on high-traffic corridors leading into or through urban areas.
- Another focus should be right sizing the number of ports at rural locations.
- Utilities noted that the ideal partnership between state and utility is filling gaps and pushing out the edges of the charging network.

EVSE VENDORS

- Participants noted the need to consider a broader type of amenities than would be typically found at gas stations, such as shopping malls and restaurants.
- Participants expressed a preference towards installing DCFC stations where possible, even outside of long-distance hubs. Customers visiting grocery stores/retail centers typically have dwell times consistent with DCFC speeds.

TRIBAL NATIONS

- There is a need to think about future-proofing and advance planning for stations to avoid having to rip up asphalt twice. Locations should also consider potential expansions to handicap stations.
- Participants noted that a 50-75-mile gap in service is likely too much in rural areas.
- Tribal Nations expect to be integral to this project. Casinos can play a large role because they have the needed infrastructure (lighting, food) and can provide safety.

ONLINE INFORMATION AND COMMUNITY INPUT FORUM

Throughout February 2025, public engagement was conducted through a virtual community forum. This interactive forum provided participants with an overview of EVINA, the project vision and project targets along with basic information on EVs, charging stations and national and state trends in EV adoption. This website (www.mnevina.com) was translated into Spanish, Somali and Hmong.

The forum asked for feedback on EVINA's six prioritization scenarios (**Table 15**) and requested participants to place pins where they would like to see charging stations added throughout Minnesota. Participants were asked to rank their top three prioritization scenarios considering both long-distance and community charging scenarios collectively. In total, 155 participants provided responses.

Table 15: EVINA Prioritization Scenario Types

Long Distance Charging	Community Charging
■ End Range Anxiety ■ Accelerate Adoption	■ Bring Home Charging to All ■ Integrate Charging into Daily Travel ■ Support Multimodal Transportation ■ Fill in the Gap



After a scenario was ranked as a priority, it could not be chosen again. **Table 16** displays the percentage of responses that ranked each scenario as the first, second and third priority. The majority of participants (77%) ranked the long-distance scenario “End Range Anxiety” as their top priority.

Table 16: Priority Scenario Ranking Results

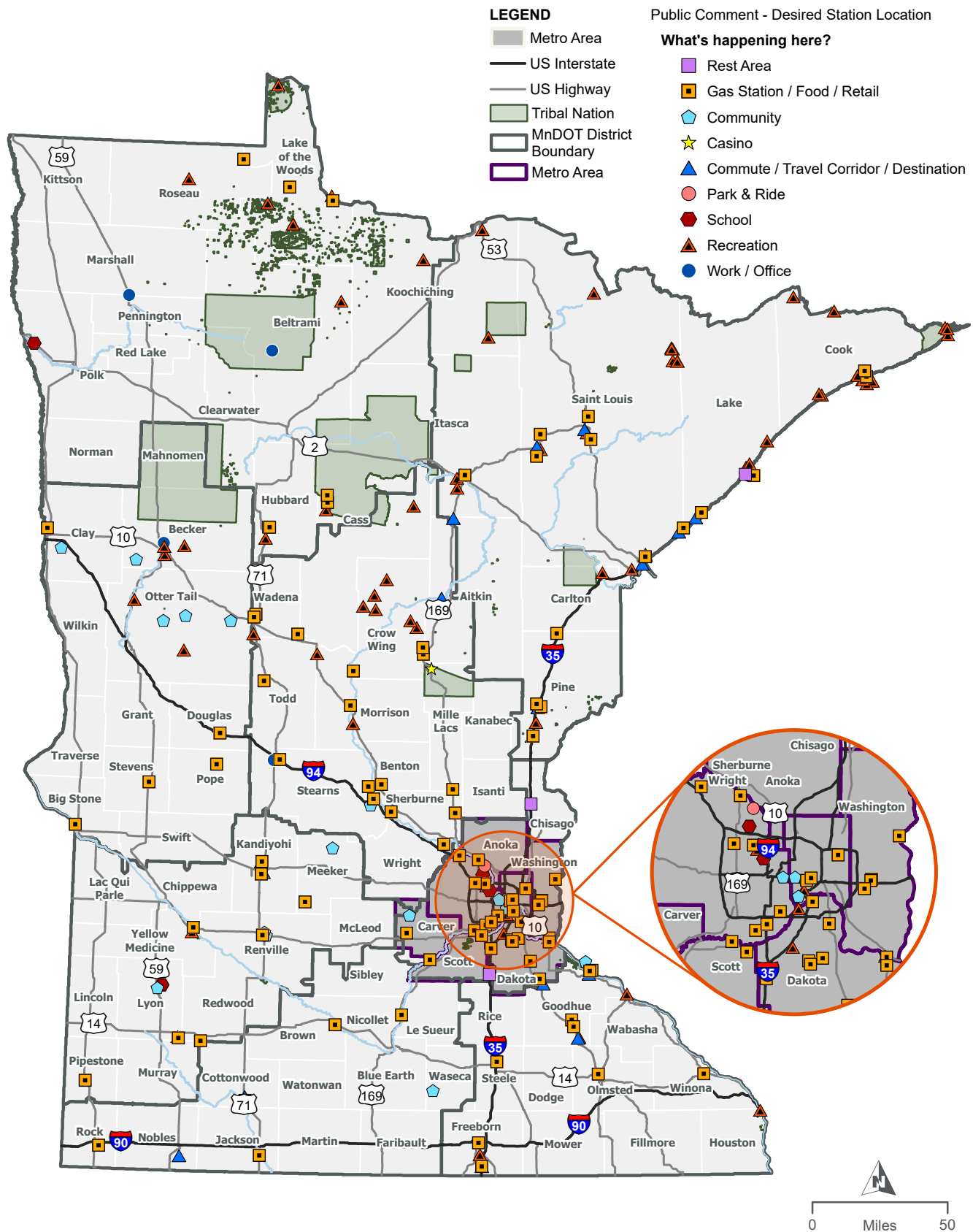
Scenario	Priority #1	Priority #2	Priority #3
End Range Anxiety	77 %	0 %	0 %
Bring Home Charging to all	14 %	26 %	0 %
Integrate Charging into Daily Travel	5 %	17 %	3 %
Accelerate Adoption	3 %	31 %	8 %
Promote Multimodal Transportation	1 %	22 %	26 %
Fill in the Gap	0 %	4 %	63 %

Table 17 and **Figure 15** illustrate the locations where participants would like to see EV charging added across Minnesota. Participants were asked to provide detail on the location type (i.e. gas station or recreation) and the typical number of hours spent at each location. The most pins were dropped in the gas station/food/retail location category, suggesting that these types of hubs are the most desired by the public.

Table 17: Community Feedback for Desired Charging Locations

Category	0-1 hour	2-4 hours	4+ hours	Grand Total
Rest Area	3	1		4
Gas Station	4			4
Shopping / Retail	69	14	4	87
Community Center	6	1		7
Casino			1	1
Commute / Travel Corridor / Destination	18	3	3	24
Park & Ride			1	1
School		1	4	5
Recreation	27	31	23	81
Work / Office			5	5
Grand Total	127	51	41	219

Figure 15: Online Forum Feedback on Desired Publicly Accessible Charging Location



Forum participants also provided general feedback on EV charging priorities related to charging station location, reliability, power level, resiliency and site design.

Location

- Drivers would like to be able to find DCFC
 - Near exits on major corridors without having to navigate into urban areas
 - At state-owned rest areas
 - At the intersection of major corridors
- Participants noted the need to add chargers to popular recreational areas in northern Minnesota, such as Highway 61 and the Iron Range
- Drivers would like to see Level 2 charging widely available so drivers can top off while running errands or working

Reliability

- Reliability of chargers is considered paramount to promoting further adoption
 - Many participants noted frustration when finding chargers non-functional and will only choose certain charging networks

Power Level

- Drivers would like DCFC to offer at least 150 kW
 - Slower charging (50 kW) at DCFC stations is frustrating for drivers and slows EV adoption progress

Resiliency

- Many drivers noted that vehicle range decreases significantly with wind or cold weather, so more charging stations are needed to combat this

Site Design

- Some participants have noted that EV spaces are frequently occupied by non-EVs if they are placed in the most convenient spaces in a parking lot, such as near the building entrance, and would prefer spaces farther away from entrances if it means the space will be available
- Other participants suggested adding an idle fee to EV spaces to deter other EVs from spending longer than necessary in charging spaces

5.4 CBO CASE STUDIES

To reach historically underrepresented communities, MnDOT partnered with three Community-Based Organizations (CBOs) as part of the EVINA project to create intentional opportunities for meaningful engagement through trusted leaders. Three CBOs were contracted to represent a tribal community, a Black, Indigenous and People of Color (BIPOC) organization, and a multilingual community outside of the Twin Cities metro area.

The organizations that partnered with MnDOT to reach out to their communities included:

- **Native Sun Community Power Development** is a Native-led nonprofit dedicated to advancing energy efficiency, renewable energy and an equitable energy transition.
- **African Immigrants Community Services (AICS)** is a nonprofit organization in Minneapolis that serves refugees and immigrants from the East African community.
- **Communities Organizing Latine Power and Action (COPAL)** is a member-based organization established in 2018 to improve the quality of life of Latine families.

Through their agreement with MnDOT, these organizations were able to develop specific outreach plans and feedback opportunities to engage community members in comfortable, familiar ways. The goal of this engagement was to gather input on EV charging infrastructure needs throughout Minnesota and perceived EV benefits and barriers from community members.

5.5 HOURCAR INTERVIEW

In the interview with Paul Schroeder, President and CEO of [HOURCAR](#), he discussed the need for improved EV infrastructure to address range anxiety and encourage widespread adoption. Schroeder emphasized the importance of corridor charging, particularly in disadvantaged communities, and highlighted operational challenges of keeping chargers consistently available. He discussed the potential of expanding car sharing in rural areas and the need for a fleet card for EV charging. The discussion also explored user experience and fleet management of car sharing services and provided insights on usage patterns, including most trips being for work or medical appointments. The dedicated charging networks and seasonal usage patterns of EV charging infrastructure in Minneapolis and St Paul was also a major point of discussion.

5.6 INCORPORATION OF FEEDBACK

The feedback received from the public and stakeholders in its various formats throughout the project was referenced at key points in the development of recommendations. Community response and insights were critical to observing the human behaviors that are not necessarily apparent in technical data. Understanding resident and stakeholder priorities for EV chargers (i.e., general locations and amenities) helped refine recommendations for priority clusters, the EV Charging Station Guidelines and the non-infrastructure recommendations.

The feedback we received regarding priority scenarios - with “End Range Anxiety” as the highest priority – was used to develop recommendations for policy and programs, collaboration and outreach initiatives for MnDOT and partner agencies to consider championing.

EVINA also utilized engagement activities as an opportunity to provide educational material to the public regarding EVs and charging stations as well as to communicate MnDOT’s vision for the future of electrified transportation in Minnesota. This targeted engagement and increased EV awareness contributes to MnDOT’s priority of promoting EV adoption and engaging with previously underrepresented communities throughout the state.

Chapter 6



6 RECOMMENDATIONS

This chapter discusses recommendations for EV charging infrastructure as well as non-infrastructure recommendations for associated elements such as policy, collaboration with other entities and EV-related outreach.

6.1 INFRASTRUCTURE

EVINA's primary objective is to help guide future EV charging station development throughout the state of Minnesota both along corridors and within communities. Infrastructure recommendations are provided for long-distance charging in the form of priority clusters with planning-level considerations provided for community charging (not site-specific). Additionally, the Long-Distance Charging Dashboard online tool is discussed. This dashboard illustrates where DCFC stations are needed to offer EV drivers a complete network spanning the entire state. EVINA also provides high-level community charging needs for metropolitan and micropolitan statistical areas throughout the state, which can serve as a baseline from which communities can develop an individualized community charging strategy.

LONG-DISTANCE CHARGING

The EVINA Long-Distance Charging Dashboard was developed in January 2025 to help visualize where DCFC is needed statewide. Through the dashboard, gaps in EV charging infrastructure are identified and prioritized into corridors for improvement and implementation for light-duty vehicles. Full details on how to use the Dashboard are included on the [Dashboard Use & Instructions](#) tab on the webpage.

The purpose of the Long-Distance Charging Dashboard is to support planning level decision-making as MnDOT, state agencies and partners continue to build Minnesota's complete charging network. It is not illustrative of where MnDOT or any other public or private partners have committed to future charging investments.

Prioritization Rankings

Two prioritization scenarios, End Range Anxiety and Accelerate Adoption, were developed to rank clusters and guide investment priorities. The following sections detail which clusters and corridors were revealed as high-priority investment areas following the analysis process described in **Chapter 4** and through consideration of feedback gathered during stakeholder and public engagement.

End Range Anxiety Prioritization

Under the End Range Anxiety prioritization scenario (which prioritizes rural locations where existing infrastructure is lacking), corridors US-2, US-59 and US-71 were revealed as the highest priority corridors. These three corridors had the greatest number of top-ranking clusters under the End Range Anxiety prioritization scenario. Top ranked clusters are those with a lower rank (i.e. 1, 2, 3).

As shown in **Figure 16**, clusters located in northern and western Minnesota typically ranked highest in this scenario. **Table 18** provides additional details on the recommended cluster prioritization within the End Range Anxiety scenario.

Figure 16: End Range Anxiety Prioritization Cluster Results

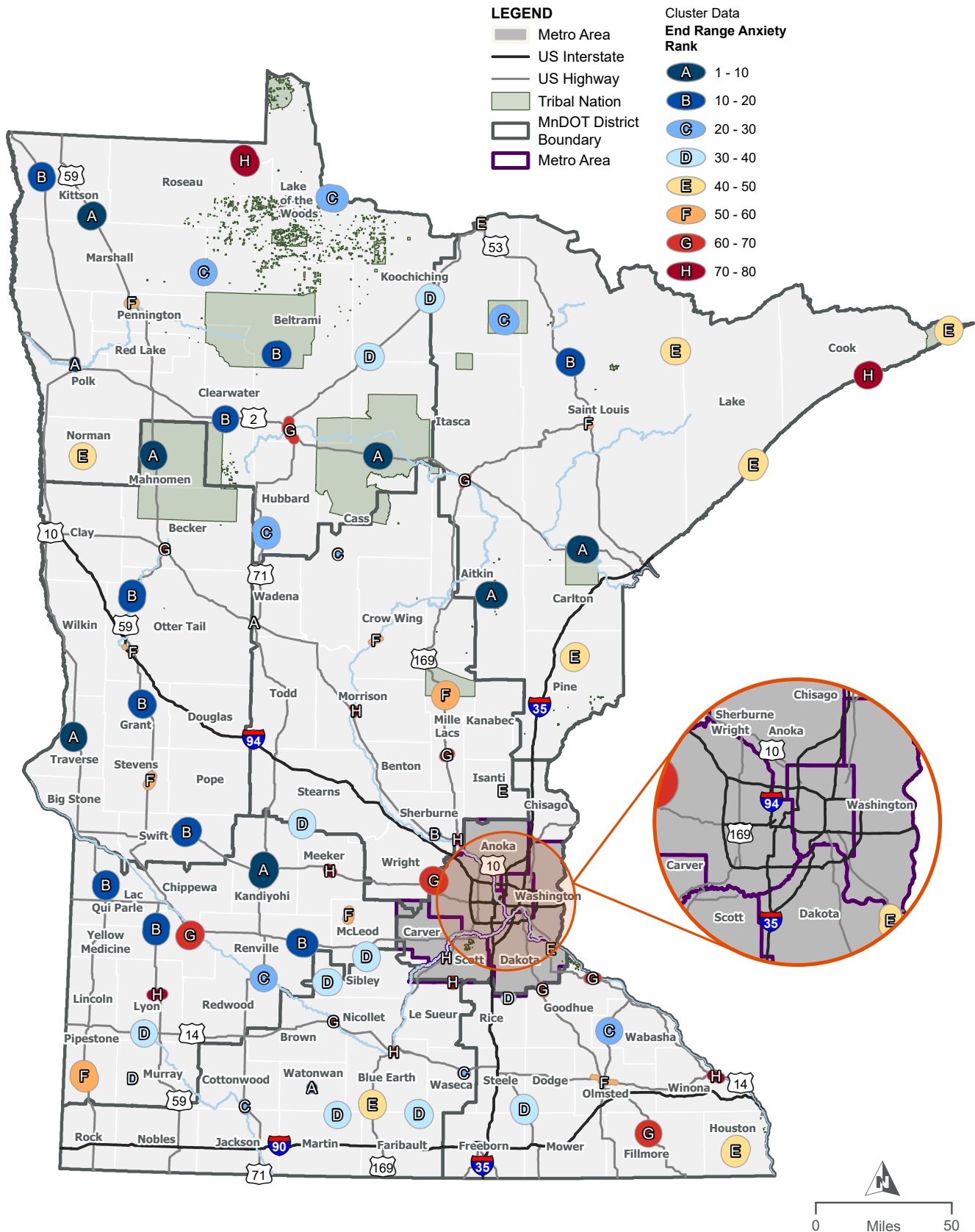


Table 18: End Range Anxiety Top Ten Cluster Rankings

Rank	Cluster Name	Location	MnDOT District	Urban vs. Rural	High vs. Low Potential Usage	Number of Ports (150 kW)	Cost Estimate			
							\$330K - 660K	\$660K - 990K	\$660K - 1.32M	\$1.32M - 1.98M
1	US 59-6	Karlstad	2	Rural	Low	2-4	X			
2	US 2-1	Crookston	2	Urban	Low	4-6		X		
3	US 10-2	Wadena	3	Urban	High	4-8			X	
4	MN 210-3	McGregor	3	Rural	Low	2-4	X			
5	US 71-3	Wilmar	8	Rural	Low	2-4	X			
6	US 59-5	Mahnomen	4	Rural	Low	2-4	X			
7	US 2-3	Bena	2	Rural	Low	2-4	X			
7	US 2-4	Grand Lake	1	Rural	Low	2-4	X			
9	MN 30-2	St. James	7	Rural	High	8-12				X
10	US 75-3	Graceville	4	Rural	Low	2-4	X			

As shown in **Table 19**, none of the top ten clusters in the End Range Anxiety prioritization scenario had existing charging stations within the nearest urbanized area, and all clusters, with the exception of MN 30-2 and 75-3, were located in a disadvantaged community.⁴ Most of the top ten clusters are also able to serve more than one corridor, except for US 59-5, US 2-4 and US 2-3, which only serve one corridor. Most of these clusters are also located at significant distances from the next available cluster.

Table 19: End Range Anxiety Top Ten Cluster Methodology Additional Details

Rank	Cluster Name	Location	MnDOT District	Existing Charging Stations Nearby	Maximum Distance to Next Cluster	Number of Corridors Served	Disadvantaged Community
1	US 59-6	Karlstad	2	0	96	2	Yes
2	US 2-1	Crookston	2	0	63	2	Yes
3	US 10-2	Wadena	3	0	58	2	Yes
4	MN 210-3	McGregor	3	0	55	2	Yes
5	US 71-3	Wilmar	8	0	51	2	Yes
6	US 59-5	Mahnomen	4	0	96	1	Yes
7	US 2-3	Bena	2	0	90	1	Yes
7	US 2-4	Grand Lake	1	0	90	1	Yes
9	MN 30-2	St. James	7	0	88	2	No
10	US 75-3	Graceville	4	0	78	2	No

⁴ Disadvantaged communities were identified using the Justice40 criteria developed during the Biden administration. Disadvantaged communities can be defined as people and areas that are economically disadvantaged and overburdened by pollution and underinvestment in the built environment. These communities are often disproportionately affected by environmental pollution and lack access to clean energy and transportation options.

Accelerate Adoption Prioritization

Under the Accelerate Adoption prioritization scenario, which prioritizes locations with high volumes of long-distance trips, corridors US-10, US-71, US-169 and US-210 were revealed as the highest priority corridors. These three corridors had the greatest number of top-ranking clusters related to station investments under this approach. **Figure 17** and **Table 20** provide additional details on the recommended cluster prioritization within the Accelerate Adoption scenario.

Figure 17: Accelerate Adoption Prioritization Cluster Results

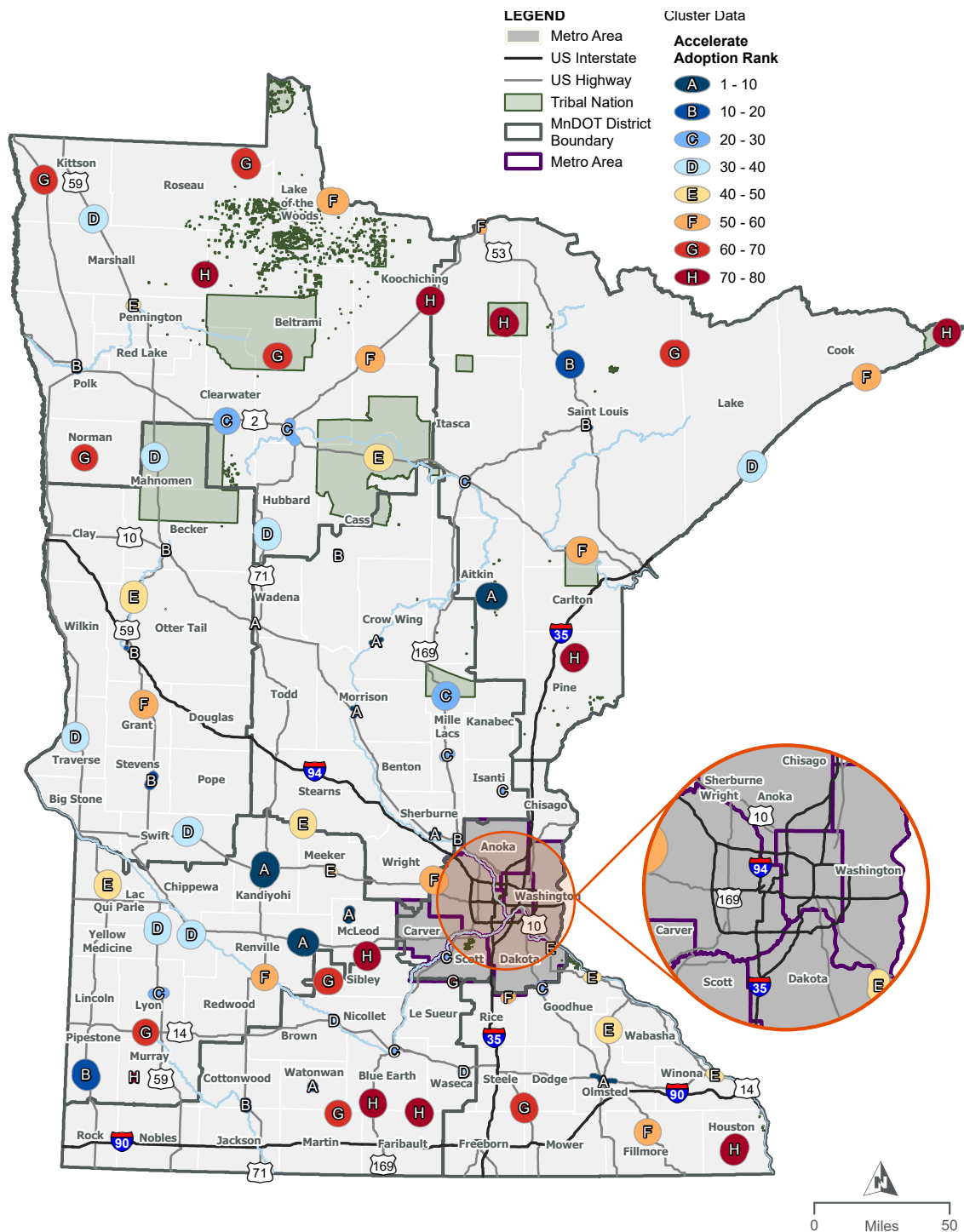


Table 20: Accelerate Adoption Top 10 Cluster Rankings

Rank	Cluster Name	Location	MnDOT District	Urban vs. Rural	High vs. Low Potential Usage	Number of Ports (150 kW)	Cost Estimate			
							\$330K - 660K	\$660K - 990K	\$660K - 1.32M	\$1.32M - 1.98M
1	US 14-4	Rochester	6	Urban	High	4-8			X	
2	US 10-2	Wadena	3	Urban	High	4-8			X	
3	US 10-4	Big Lake	3	Urban	High	4-8			X	
4	MN 30-2	St. James	7	Rural	High	8-12				X
5	US 71-3	Wilmar	8	Rural	Low	2-4	X			
6	MN 210-3	McGregor	3	Rural	Low	2-4	X			
7	MN 15-2	Hutchinson	8	Urban	Low	4-6		X		
8	US 10-3	Little Falls	3	Urban	High	4-8			X	
9	US 212-2	Hector	8	Rural	Low	2-4	X			
10	MN 210-2	Brainerd	3	Urban	High	4-8			X	

In the Accelerate Adoption Scenario, the primary driver of cluster rankings is the percentage of long-distance trips passing through a cluster. A long-distance trip is one longer than 150 miles in total length with more than 50 miles remaining at the point it passes through the cluster.

In four clusters (US 14-4, US 10-4, US 10-3 and US 212-2), more than 90% of trips passing through are considered long-distance trips. Most clusters, except for US 10-3 and US 212-2, also serve more than one corridor (see **Table 21**).

Table 21: Accelerate Adoption Top Ten Cluster Methodology Details

Rank	Cluster Name	Location	MnDOT District	% of Total Trips as Long-Distance Trips	Number of Corridors Served	Disadvantaged Community
1	US 14-4	Rochester	6	94%	2	Yes
2	US 10-2	Wadena	3	82%	2	Yes
3	US 10-4	Big Lake	3	96%	2	No
4	MN 30-2	St. James	7	87%	2	No
5	US 71-3	Wilmar	8	63%	2	Yes
6	MN 210-3	McGregor	3	68%	2	No
7	MN 15-2	Hutchinson	8	65%	2	No
8	US 10-3	Little Falls	3	100%	1	Yes
9	US 212-2	Hector	8	95%	1	Yes
10	MN 210-2	Brainerd	3	40%	2	Yes

IMPLEMENTATION OF LONG-DISTANCE CHARGING DASHBOARD

A recommendation from this assessment is to continue to leverage the online Long-Distance Charging Dashboard for planning future infrastructure investments. The Long-Distance Charging Dashboard will contain the results discussed in the previous chapter.

Through the development of these prioritization scenarios and through extensive stakeholder engagement, these infrastructure recommendations and outcomes will help guide:

- Minnesota's long-distance network
- Comprehensive statewide map
- Priority locations according to scenarios
- Locations which meet partner objectives

The intent of the Long-Distance Charging Dashboard is to help shape future MnDOT work, as well as inform and guide investment by other partners, such as Tribal Nations, MPOs, RPOs, other state agencies and the private sector. The following describes how the Dashboard could be used by various stakeholders to guide investment decisions.

MnDOT: In 2022, MnDOT and other state DOTs began the build out of a fast-charging network along Alternative Fuel Corridors for EV charging using the [NEVI Plan](#) and the formula funds allocated to states through the 2021 Bipartisan Infrastructure Law. In February 2025, FHWA suspended the state NEVI plans and guidance while they assessed the program. MnDOT has 12 locations under contract to build DCFC stations and is in the process of establishing contracts for 12 additional locations in 2025 through a mix of federal and state funds along I-94, I-90 and I-35. These locations were considered during development of the long-distance charging locations in EVINA and were excluded from the analysis. MnDOT is continuing to explore options for building out this network.

State Agencies: The Long-Distance Charging Dashboard developed through EVINA can be used by other state agencies to identify areas of the state where EV charging stations could help support agency targets, as well as the build-out of a complete EV charging network. The Minnesota Pollution Control Agency (MPCA) is planning to use this assessment to inform the final round of EVSE grants through the VW Settlement.

Another example is the Minnesota Department of Natural Resources (DNR), which has expressed interest in using the Long-Distance Charging Dashboard to identify ideal locations to add charging infrastructure to support visitors at Minnesota state parks and the number of ports needed. Other state agencies, such as the MPCA and Department of Health, may use the Dashboard to identify where agency targets, such as the reduction of air pollutant emissions, coincide with long-distance charging clusters.

Private Partners: For private entities interested in developing charging stations, profitability and a return on investment are often the largest determinants of where charging stations can be added and how many ports should be installed. The analysis underpinning the Accelerate Adoption scenario for Long-Distance Charging highlights areas in the state where charging stations are projected to see the highest utilization and could provide insights to private partners on where stations will likely generate higher revenue.

Tribal Nations: Particularly in northern and rural Minnesota, Tribal Nations have shown a keen interest in renewable technologies and are expected to be key partners in build-out of the state network. For example, casinos operated by Tribal Nations already have the existing amenities and underlying electrical



infrastructure needed to support DCFC stations. Tribal Nations could make use of both the base coverage map and End Range Anxiety prioritization scenario to identify where clusters overlap with tribal territory.

Utilities: Utilities are perhaps best positioned to help support build-out of the complete charging network in areas of the state more difficult to electrify, such as Minnesota's northern/rural communities and areas of very high-demand. Because utilities have existing relationships with their customer base, they can carefully right-size the number of ports needed both at high potential usage locations and low potential usage locations using the Long-Distance Dashboard and EV Charging Station Guidelines.

Some utilities have already begun similar efforts, such as Minnesota Power and Otter Tail Power Company. Beginning in 2024, Minnesota Power has been installing sixteen DC fast chargers in its service territory in northeastern Minnesota. Locations of DC fast chargers will include both rural and urban communities along major travel corridors. Otter Tail Power Company has also begun a similar program to install 11 DCFC stations and ten Level 2 charging stations. According to Otter Tail Power Company, 97% of its customers will be within 30 miles of a charging station and 100% will be within 60 miles of a charging station when all stations are completed.

COMMUNITY CHARGING

The scenarios for community charging were presented to Minnesota residents and key stakeholders through virtual engagement held in February 2025. Participants were asked to provide feedback on where charging stations should be added in their community and which prioritization scenario resonated best with community needs.

Public feedback provided through a prioritization activity indicated that respondents considered the End Range Anxiety scenario as their top priority (as shown in **Table 22**). Many agencies have the potential to be critical partners in building out the rural charging infrastructure network. MnDOT, for example, can have a big impact on prioritizing this scenario, especially when paired with efforts from other partners building toward the recommendations identified for priority clusters in this assessment. The second highest rank priority was Accelerate Adoption. Both End Range Anxiety and Accelerate Adoption relate to long-distance charging and could be championed by MnDOT and other state and regional partners, such as MPCA, Tribal Nations and Regional Planning Organizations (RPOs).

The third highest priority as ranked through this exercise was Fill in the Gap. This scenario is focused on local community charging needs and could be a priority for all levels of government and private entities, but with stronger champions expected in the form of local government/municipalities. Since this scenario is expected to be primarily led at the local level, it's recommended that MnDOT and other state agencies consider how to best support the local development of charging infrastructure in areas of highest need.

Although two of the top priorities highlighted focus on the statewide network, it's important to recognize that all charging station infrastructure siting plays a role in developing the overall network and reducing barriers to EV adoption across the state.

Table 22: Community Input Scenario Priority Rankings

Scenario	Priority #1	Priority #2	Priority #3
End Range Anxiety	77 %	0 %	0 %
Bring Home Charging to All	14 %	26 %	0 %
Integrate Charging into Daily Travel	5 %	17 %	3 %
Accelerate Adoption	3 %	31 %	8 %
Promote Multimodal Transportation	1 %	22 %	26 %
Fill in the Gap	0 %	4 %	63 %

6.2 NON-INFRASTRUCTURE

In addition to the infrastructure recommendations that were developed through the long-distance and community charging analysis, there are also complementary policy, program, collaboration and outreach recommendations that were identified to further both EV infrastructure development and EV adoption in Minnesota. These recommendations were developed through a review of prior Minnesota efforts relating to climate action and transportation electrification and through consideration of similar efforts happening in other states.

The recommendations detailed in each section include:

Policy and Programs

- Offer rebates on EV and charger purchases
- Create income-based car swap programs to take back older vehicles
- Identify non-federal funding sources for EV charging
- Provide additional grant funding for EV carsharing, especially in low-income neighborhoods
- Implement a Clean Transportation Standard

Collaboration

- Offer advisory support to key partners
- Expand coordination with utilities to inform long-term planning
- Develop partnerships with trade schools and colleges to develop a clean transportation workforce
- Coordinate with neighboring states to promote a convenient and user-friendly charging experience between states
- Establish interagency working group to advance collaboration between state agencies

Outreach

- Provide educational resources to city planning staff, planning commissions and city councils on zoning and building code updates to support EVs
- Develop marketing campaign to improve consumer understanding of EVs
- Involve BIPOC and low-income communities in EV plans and policies

POLICY AND PROGRAMS

Offer rebates on EV and charger purchases

One of the primary barriers to EV adoption is the cost difference between an EV and an internal combustion engine vehicle, which typically exceeds \$5,000. The Minnesota Department of Commerce (MDC) has previously offered an EV rebate of up to \$2,500 for a new EV and \$600 for a used EV to help bridge this price difference. Between 2023-2024, the Commerce Department distributed 6,662 rebates for EVs. The Clean Vehicle Tax Credit is also available at the federal level, but it's uncertain if this credit will remain in future years, as the Trump Administration has signaled that they are interested in ending the credit. Continuing to offer a state-sponsored rebate could be a critical incentive for potential EV buyers, and additional incentives should be considered, such as an EV charger rebate.

Key actions to support recommendation:

- Consider expanding rebate impact through outreach to EV or charging station businesses who could offer an additional discount on price
- Consider targeted rebates that consider income and commuting distances as qualification criteria

Create income-based car swap programs to take back older vehicles

Encouraging owners of older, less efficient gas-powered cars to swap vehicles for an EV is a critical part of Minnesota reaching its EV adoption targets. [Recent research](#) published in Transportation Research Interdisciplinary Perspectives has shown that low-income households primarily buy used automobiles, either from a dealership or informally, with only 17% of car purchases being new cars from a dealership. The availability of used EVs is still limited, and those that are available are often older models with significantly lower ranges than present-day EVs. Creating an income-based car swap program to help lower-income Minnesotans transition from an older gas-powered vehicle to a new EV could help further EV adoption in the state. This program could take the form of a higher EV rebate offered to participants.

Key actions to support recommendation:

- Outline income limits and eligibility to participate in car swap program
- Identify organizations to take older vehicles for parts recycling

Identify non-federal funding sources for EV charging grant programs

On January 20, 2025, President Trump issued Executive Order 14154, "Unleashing American Energy," which, among other actions, paused the disbursement of funds related to the National Electric Vehicle Infrastructure Formula Program and Charging and Fueling Infrastructure Discretionary Grant Program. When this report published, it's uncertain when funding for these programs may return and if future disbursements will be subject to new restrictions. Due to this, it's recommended that MnDOT and other state agencies involved in the build-out of Minnesota's charging network identify ways to complete this work without relying on federal funds.

Key actions to support recommendation:

- Engage fuel providers, lodging industry and other potential private partners to explore new funding sources for EV charging infrastructure in Minnesota



Provide additional grant funding for EV carsharing, especially in low-income neighborhoods

Ongoing efforts to expand access to EVs as a form of on-demand personal transportation, such as Evie Carshare, have been successful in the Twin Cities metro area. This effort could be expanded both within the Twin Cities metro area and throughout greater Minnesota to introduce residents to the basics and benefits of EVs while providing access to personal transportation.

Key actions to support recommendation:

- Review usage metrics of current Evie Carshare program to identify insights into where program has been most beneficial
- Identify other communities and neighborhoods which could benefit from similar program
- Seek additional funding to support expansion of EV carshare services

Implement a Clean Transportation Standard (CTS)

A Clean Transportation Standard (CTS) is a technology and fuel-neutral market-based policy that requires carbon intensity reductions for transportation fuels including gasoline, diesel biofuels and electricity. The Minnesota Legislature continues to discuss implementing a Clean Transportation Standard because it would help the transportation sector achieve the state's greenhouse gas emission reduction targets, and it would generate unprecedented funding for electrification infrastructure in rural and environmental justice areas across the state. In addition to helping with the transition to electric vehicles, a clean fuels policy would also support the production and use of alternative, lower-carbon fuels such as sustainable aviation fuel (SAF).

Key actions to support recommendation:

- Revisit the 2023-2024 Clean Transportation Standard Workgroup Report prepared for the Minnesota Legislature
- Establish an informal or formal working group to advance the policy discussions and help educate state agency leaders on the policy's value

COLLABORATION

Offer advisory support to key partners

The comprehensive statewide charging network outlined in EVINA provides a convening source for state agencies, municipalities, regional planning organizations, metropolitan planning organizations and private stakeholders to collectively and collaboratively build Minnesota's complete charging network. To achieve full build-out of the comprehensive charging network identified through EVINA, it's expected that all partners will have a role to play.

MnDOT can help to guide development of the complete statewide long-distance charging network by other state agencies, Tribal Nations, MPOs and private partners. MnDOT can serve as an advisory partner and help state agencies and private partners identify areas where charging station development could help to meet state targets.

Key actions to support recommendation:

- Provide how-to guidance on using the online dashboard by offering webinar/online tutorials
- Help partners identify where charging station guidelines can be incorporated into their targets to implement a build-out of the network

Expand coordination with utilities to inform long-term planning

Utility providers Xcel Energy, Minnesota Power and Otter Tail Power Company all submit Transportation Electrification Plans (TEPs) to the Minnesota Public Utilities Commission (PUC) every two years detailing their current and future efforts to prepare for the shift to electric transportation. As utilities continue to update these plans, the statewide long-distance charging network and community charging prioritization identified through EVINA will allow utilities to develop informed long-range plans to meet these needs. The Long-Distance Dashboard allows utilities to view the projected utilization and number of ports required for a complete statewide DCFC network.

Key actions to support recommendation:

- Support for regular updates to Transportation Electrification Plans created by investor-owned utilities, other efforts led by municipal and co-op utilities to plan for EV charging
- Use of dashboard to inform projected utilization and associated number of ports at sites; Accelerate Adoption scenario details which locations are expected to have highest use
- Revisit EV Charging Station Guidelines with technology changes (e.g. kW, ports)

Develop partnerships with trade schools and colleges to develop a clean transportation workforce

Large investments in EV and battery manufacturing are being made both in the public and private sector with a growing need for people trained in both vehicle and charger maintenance. Supporting certifications related to EV and charger maintenance can help prepare residents for future work in the industry and develop a skilled local workforce. Additionally, if mechanics are not available locally to service EVs, this makes it more difficult for drivers to make the switch to an EV. Many EV workforce development programs also provide participants with valuable transferable job skills, which can be beneficial for future civil construction or electrical careers.

Key actions to support recommendation:

- Identify key partners, such as other state agencies, educational institutions and businesses, to support program development
- Implement a plan to rollout programs statewide, including rural and northern Minnesota, through technical colleges or satellite continuing education centers

Coordinate with neighboring states to promote a seamless charging experience across state lines

EVINA focuses on what is needed to achieve build-out of a complete charging network in Minnesota. However, there is still a need to think about ensuring there is an adequate long-distance charging network available for EV drivers who are travelling through Minnesota enroute to another destination. While past efforts began this initiative, including the Midwestern Clean Fuels Policy Initiative, DRIVE Midwest Proposal and Regional Electric Vehicle Midwest Coalition (REV Midwest), efforts have not yet made it past the ideation stage.

Key actions to support recommendation:

- Review past regional transportation electrification efforts and identify core targets
- Establish informal or formal working group to advance build-out of charging stations along high-traffic interstate corridors in the Midwest

Establish interagency working group to advance collaboration between state agencies

As part of the development of EVINA, MnDOT and other state agencies provided input on collaborative actions beyond infrastructure development that they and other interested partners could pursue to facilitate development of the comprehensive charging network and support EV adoption in Minnesota. **Table 23** details key actions which MnDOT and other state agencies highlighted as essential to support electrified transportation throughout Minnesota.

Many of the actions mirror strategies developed in the [2021 Minnesota Electric Vehicle Assessment](#), and it's recommended that Minnesota state agencies collaborate to refine details and begin to implement the actions. Future collaboration could include additional details on strategies, timelines, specific agency responsibilities and a proposed process to track successful implementation. To address delays in implementing strategies from the 2021 Minnesota EV Assessment, a standing interagency meeting is recommended to collaborate on putting these actions into practice.

Table 23: Key Actions and State Agencies Supporting Transportation Electrification in Minnesota

Key Actions	State Agencies
Thought Leadership	
Leverage existing collaborative efforts and/or establish new efforts to guide policy and thought leadership on transportation electrification	■ MPCA ■ MnDOT
Coordinate with partners to complete public charging network as described in EVINA	■ MnDOT
Participate in existing forums to engage EV industry stakeholders (e.g., Drive Electric MN)	■ Department of Commerce ■ DEED ■ MnDOT ■ Department of Labor and Industry (DLI) ■ PUC
EV Education and Fleet Transition Resources	
Promote awareness of existing EV educational resources and work with community partners to expand marketing materials to improve consumer understanding of EVs	■ MnDOT ■ MPCA ■ Minnesota State Colleges & Universities
Develop EV fleet transition guidance	■ Department of Administration, Office of Enterprise Sustainability (OES) ■ MnDOT ■ DNR ■ Department of Public Safety (DPS)
Develop EV safety and emergency response guidance	■ MnDOT ■ Department of Health ■ DPS

Key Actions	State Agencies
Workforce and Economic Development	
Identify EV, clean energy and related industry economic development opportunities	■ Department of Commerce ■ DLI ■ DEED
Promote EV industry career pathways	■ DEED ■ DLI ■ Minnesota State Colleges & Universities
Public Charging Development Resources	
Provide funding for EVSE and EVs	■ MnDOT ■ MPCA ■ Department of Commerce
Develop guidance and prioritization framework to help cities and utilities direct public charging investments	■ MnDOT ■ MPCA ■ PUC
Identify priority charging station types, locations for public-led charging investment and priority charging station types, locations for private-led charging investment	■ MnDOT ■ MPCA
Identify charging sites that could support multiple transportation modes, such as electrified transit, freight and micromobility	■ MnDOT ■ MPCA ■ PUC
Develop standards for equitable payment methods, charging fee structure	■ OES ■ MnDOT ■ Minnesota Council on Disability

OUTREACH

Provide educational resources to city planning staff, planning commissions and city councils on zoning and building code updates to support EVs

Local municipalities who typically control the zoning and land use code which inform where charging stations can be developed, also play an important role in the development of Minnesota's comprehensive charging network. To facilitate a frictionless development process for charging stations, most zoning codes will require updates to distinguish EV charging from conventional gasoline refueling. MnDOT can develop template language to support EV-friendly zoning and building code amendments which cities can adapt to best fit their local political context.

Key actions to support recommendation:

- Potential zoning codes updates to distinguish EV charging from gas refueling
 - Define EV charging separately from gas station
 - Add EV charging to permitted use tables
 - Clarify parking minimums (i.e. whether EV spaces count towards minimum requirements)



- Potential building code updates
 - Define EV-ready/capable parking requirements
 - Updates to match International Building Code (IBC) guidance for EVs

Develop marketing campaign to improve consumer understanding of EVs

Most EV owners today are early adopters with an interest in new technologies. Educating prospective buyers on EV basics can encourage adoption in groups which may be hesitant to make the switch from a gas-powered vehicle to an electric one. Many prospective EV buyers are worried about range anxiety and vehicle operation in extreme cold, but they may not be familiar with the benefits of owning an EV, such as lower maintenance and fuel costs, the ability to recharge at home and even the potential for an EV to serve as a backup power source for a home or auxiliary tools.

Key actions to support recommendation

- Develop EV 101 marketing campaign and partner with diverse agencies for broadcasting support
- Partner with local car dealerships to host EV Ride and Drive events
- Provide financial incentives to BIPOC and low-income community organizers to educate about EVs

Appendix A

Existing Infrastructure Conditions Summary





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1 INTRODUCTION

1.1 PURPOSE

Transportation is the largest contributor to greenhouse gas (GHG) emissions in Minnesota. One practice to reduce GHGs from transportation is to transition away from internal combustion engine (ICE) vehicles to electric vehicles (EVs). Minnesota is preparing for the shift to EVs to meet statewide carbon reduction and electric and zero-emission vehicle targets as identified in the [2022 Statewide Multimodal Transportation Plan \(SMTP\)](#) and the [2022 Climate Action Framework](#).

The Minnesota Department of Transportation (MnDOT) launched the Minnesota Electric Vehicle Infrastructure Needs Assessment (EVINA) project to guide how and where to select and prioritize Electric Vehicle Supply Equipment (EVSE) investments across the state. EVINA takes the next step from previous planning efforts toward developing a reliable Zero Emissions Vehicle (ZEV) fueling and charging network across the state's urban, rural, and major corridor roadways. EVINA focuses on light-duty vehicles (LDVs) and associated EVSE.

EVINA outlines the methodology, engagement efforts, analysis and recommendations for a reliable charging network across the state's urban and rural corridors. Ultimately, EVINA guidance will provide more consistency in the charging experience for EV drivers in Minnesota by offering a predictable framework to guide future EV infrastructure development, including station locations, port count and station amenities.

This document outlines the existing conditions of EVSE in the state of Minnesota. A detailed look at these conditions is necessary to identify gaps in the current infrastructure that will inform the needs assessment by establishing a baseline for Minnesota's existing EVSE.

1.2 GUIDING POLICY

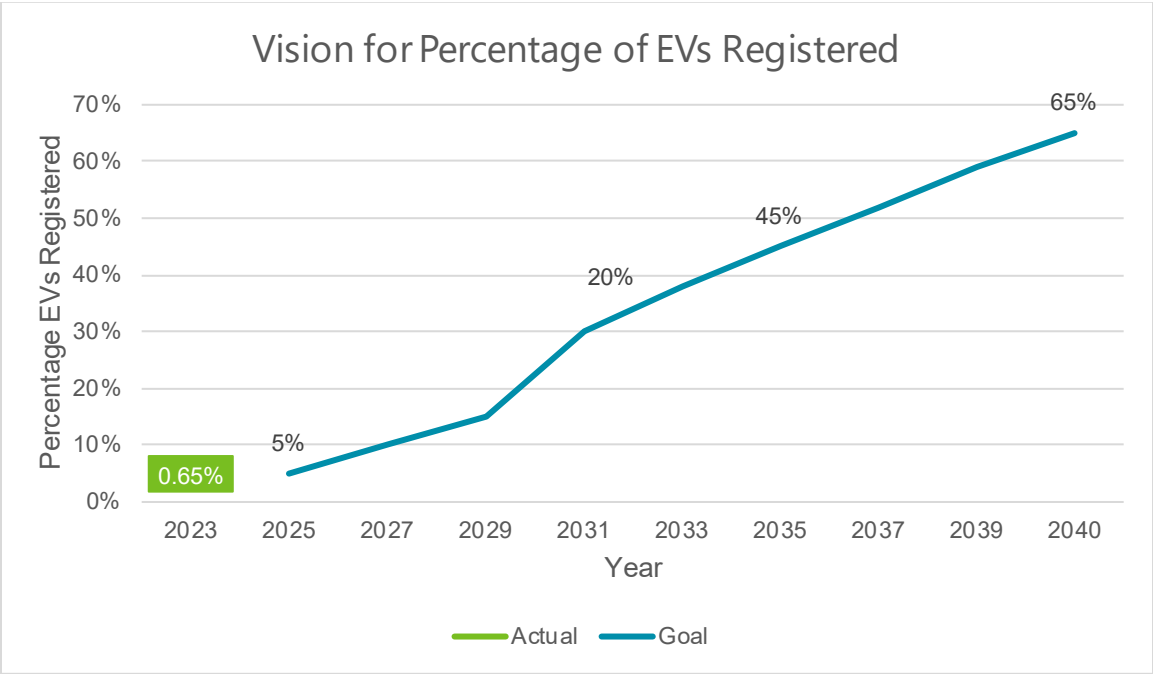
Leaders in Minnesota have been advocating for stricter emissions laws for personal vehicles. The state of Minnesota enacted a "Clean Car" mandate to significantly reduce light-duty emissions in the state. This mandate will require auto manufacturers to sell more low-emission vehicles (LEVs) and zero emission vehicles (ZEVs) in their product lineup. The mandate requires 22% of model year 2025 and later vehicles sold to be zero emission.

MnDOT presented similar targets in their [2023 EV Infrastructure Plan](#), broadly aiming to reduce greenhouse gas (GHG) emissions and advance public adoption of EVs. [MnDOT](#) is aiming for EVs to make up 5% of the state's registered vehicles by 2025, 20% by 2030, 45% by 2035 and 65% by



2040. **Figure 1** represents these targets for each target year, including the current EV registration percentage for 2023.

Figure 1: MnDOT Vision for EV Registration from 2023 to 2040



The Clean Cars rule, along with MnDOT’s infrastructure targets, will significantly increase the number of EVs in the state. This increase will require more public charging infrastructure to allow easier travel. EVINA will provide a clear picture of needs for public charging infrastructure and recommendations for siting the EVSE infrastructure.

1.3 EVINA ORGANIZATION

The remaining content of the EVINA existing conditions describes the balance between EV ownership levels and the corresponding level of supporting EV charging infrastructure. The EVINA existing conditions is organized as follows:

- **Chapter 2:** introduces EVs and associated infrastructure that will be referred to throughout the EVINA project. It also provides an overview of the current EV market.
- **Chapter 3:** describes the Minnesota context for EV ownership by recognizing potential users and populations that may warrant additional focus.
- **Chapter 4:** overviews the current EV ownership within the state and projections for future levels of EV sales and the resulting composition of the vehicle fleet between EVs and non-EVs, which will affect the future level of EV charging needed.



- **Chapter 5:** reviews EV charging already deployed across the state for currently active as well as planned chargers.
- **Chapter 6:** discusses utility infrastructure needs to support EV as well as regulations and policies that affect how EV charging is deployed.
- **Chapter 7:** highlights the current regulations and policies existing at the federal and state levels that impact EV funding, planning and deployment.
- **Chapter 8:** summarizes key takeaways from this phase of EVINA and provides an overview of the next steps of the EVINA project that will build on this review of existing conditions.

2 ELECTRIC VEHICLES 101

EVs are rapidly transforming the transportation landscape, yet many aspects of this technology remain unfamiliar to the public. The following overview, or “EV 101,” provides a comprehensive understanding of EV technology, establishing a foundation for common terminology and a clear grasp of the current state of EVs and their charging infrastructure. This foundation provides the essential knowledge needed to understand the focus and findings of the analysis discussed in later chapters.

2.1 INTRODUCTION TO ELECTRICITY AS A FUEL

EVs differ from traditional gas-powered vehicles, also known as internal combustion engine vehicles, in fundamental ways including the build and operation of the engine, propulsion method and fuel source. When discussing EVs, the fuel source that enables propulsion is generally the differentiating factor identified. There are several different types of EVs shown in [Table 1](#).

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 and/or energy recaptured during braking, also known as regenerative braking.

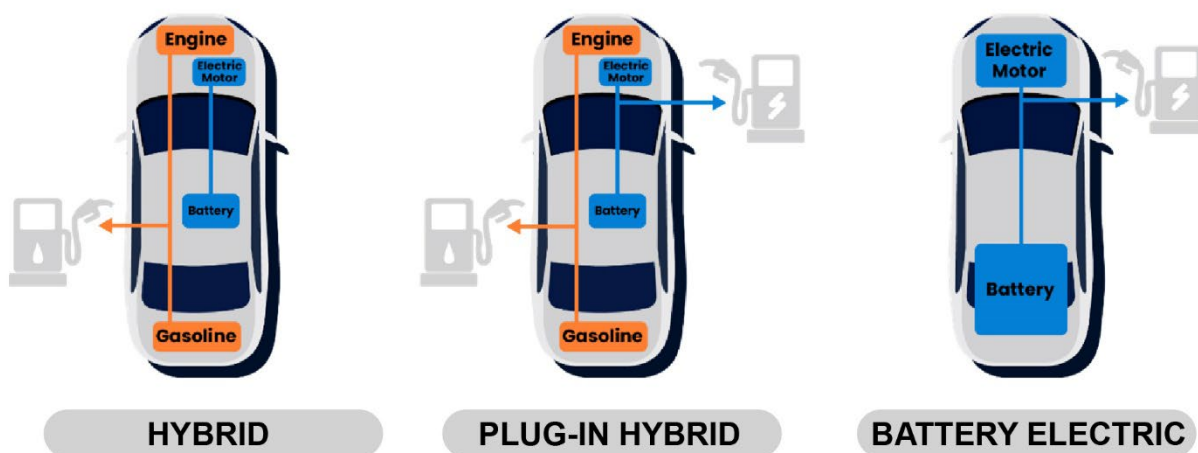
Table 1: EV Terminology

Term	Acronym	Definition
Electric Vehicle or Battery Electric Vehicle	EV or BEV	A vehicle that relies on only electric motors for propulsion and draws its energy exclusively from the vehicle’s battery pack.

Term	Acronym	Definition
Zero-Emissions Vehicle	ZEV	A vehicle that does not produce tailpipe emissions or other pollutants from the onboard source of power.
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.
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.
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.

Figure 2 highlights fueling configurations for hybrid-electric vehicles, plug-in hybrid electric vehicles and battery electric vehicles.

Figure 2: Common Electric Vehicle Fueling Configurations



The range an EV can travel is determined by several factors, including the weight of the vehicle and the size of its battery. Battery sizes are measured in kilowatt hours (kWh) and range from about 40 kWh in a small sedan to about 130 kWh in light-duty trucks and vans. EVs can generally travel about



150 to 300 miles on a single charge, depending on the weight of the vehicle, size of the battery, weather conditions, driver behavior and road conditions. The range can be further limited by extremely cold temperatures and, to a lesser extent, extremely hot temperatures. Aggressive driving (fast stopping and acceleration) will drain an EV's battery faster than driving at consistent speeds. Higher driving speeds reduce range as well as steep inclines and frequent elevation changes.

2.2 CHARGING TECHNOLOGY

CHARGING INFRASTRUCTURE

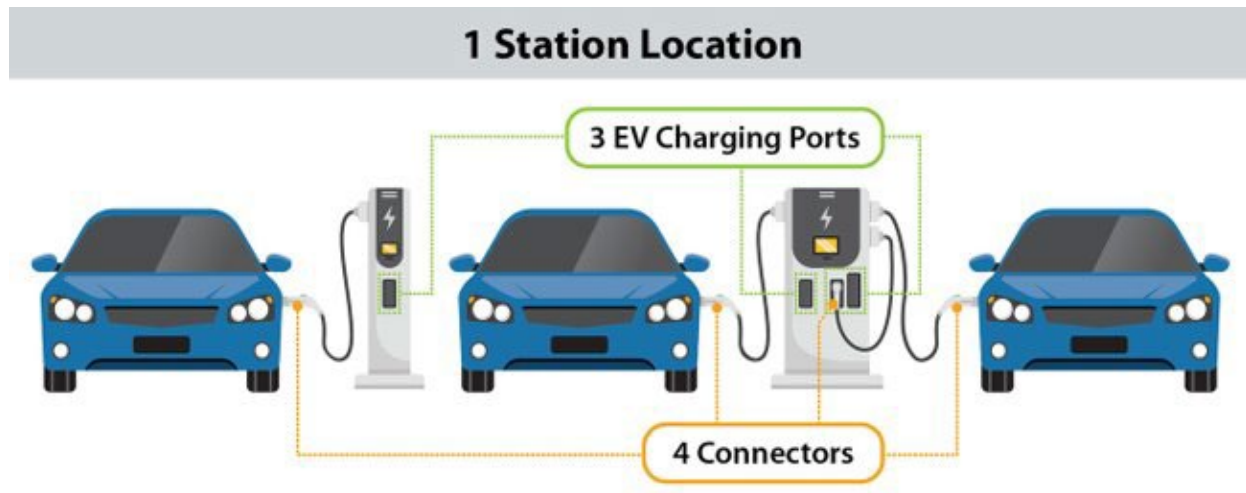
Charging an EV is different from refueling a gas- or diesel-powered vehicle in many respects, including the speed at which the vehicle can be charged, where it can be charged and the types of equipment involved in charging. **Table 2** introduces key terminology used when discussing EV charging equipment.

Table 2: Common Charging Terminology

Term	Also known as	Definition
Station	EV charging station, charging station	Location where charging infrastructure is installed. Stations can include gas stations, retail, employer, recreation and other host sites.
Charger	Electric vehicle supply equipment (EVSE), electric vehicle charging infrastructure (EVCI)	Broadly refers to equipment that provides electric power to a vehicle to recharge the vehicle's battery.
Port	-	Provides power to charge only one vehicle at a time. EVSE can be single-port, dual-port or multi-port.
Connector	Charging standard or plug	The device that attaches an EV to a charging port in order to transfer electricity.

Figure 3 below outlines the different components of an EV charging station location with three charging ports.

Figure 3: EV Charging Station Components



LEVELS OF CHARGING

Charging infrastructure is a critical component of a healthy EV ecosystem. There are three levels of EV charging: Level 1, Level 2 and Direct Current Fast Charging (DCFC). The key difference between each level is the power output delivered. Common electrical terminology used in the EV industry include:

- **Amperage (A):** base unit of electric current in the International System of Units.
- **Voltage (V):** electrical “pressure” that flows across a circuit.
- **Power (measured in watts [W], or kilowatts [kW]):** base unit of power, represented by multiplying amperage (A) by voltage (V).
- **Level 1 Charger:** typically used to charge EVs at residence. Lower voltage that requires longer charging times.
- **Alternating Current (AC) Level 2 Charger:** vehicles are fitted with an onboard charger capable of accepting energy from a single-phase AC electric vehicle supply equipment. AC can be more easily converted to different voltages relatively easily using a transformer.
- **DCFC:** a method that uses dedicated DC supply equipment to provide energy from an appropriate offboard charger to an EV. DC runs continually in a single direction.
- **SoC:** State of Charge of the battery.

Table 3 outlines the characteristics of each charging type.



Table 3: Characteristics of Level 1, Level 2 and DC Fast Chargers

Characteristic Category	Level 1	Level 2	DCFC
Charger Output Voltage	120 V AC	208-240 V AC	400-1000 V DC
Typical Power Output	1.9 kW	3.6-19.2 kW	50-350 kW
Power Equivalent to	Hair dryer	Clothes dryer	About 50 homes (50kW)
Estimated Electric Range per Hour of Charging	2-5 miles	10-20 miles	180-240 miles
Estimated EV Charge Time from Empty (20% to 80% SoC)	40-50 hours	4-10 hours	20 minutes-1 hour

CHARGING STANDARDS (CONNECTORS)

Currently, there are several charging standards, or connectors, used by automakers in North America. The J1772 (used for AC charging), Combined Charging Standard (CCS) (used for DC charging) and Tesla’s North America Charging Standard (NACS), SAE J3400, (used for both AC and DC charging) have been the most widely used by vehicle manufacturers to date.

A lack of standardization across the industry can create confusion for consumers interested in purchasing an EV. Most auto manufacturers have recently announced plans to adopt Tesla’s J3400 connector by 2025 after Tesla began allowing other automakers to use the design. J3400 is the same standard for both AC and DC charging, which is a huge benefit to drivers. By adopting the J3400 standard, EVs from other automakers can use Tesla’s expansive nationwide Supercharger network, the largest in North America, to simplify vehicle and charger interoperability for consumers.

EV CHARGING TYPES FOR LIGHT-DUTY VEHICLES

One significant implication for regional policymakers when considering the integration of EVs into the existing transportation network is the expansion of land uses associated with “refueling” vehicles. Currently, internal combustion engine vehicles are refueled at gas stations largely located along commercial corridors and interstate exits. Understanding the growing EV charging options available is a critical component in the widespread adoption of EVs. Common EV charging station types include at-home charging, amenity charging, destination hubs and DCFC charging hubs.

The following sections describe a variety of common implementation types for chargers that correspond to different contexts, users, use-cases for vehicles and charger types. It is non-exclusive



and may be subject to updates as the industry matures and different charging applications and technologies are developed.

At-Home Charging

Most of a vehicle's charging activity will occur at home, with the National Renewable Energy Laboratory (NREL) estimating approximately 80% of charging happening at home. The reliance on home charging will vary from region to region and even locations within them, depending upon different charging needs and the potential availability to access charging infrastructure or power within an individual's home.

Figure 4: Example of At-Home Charging



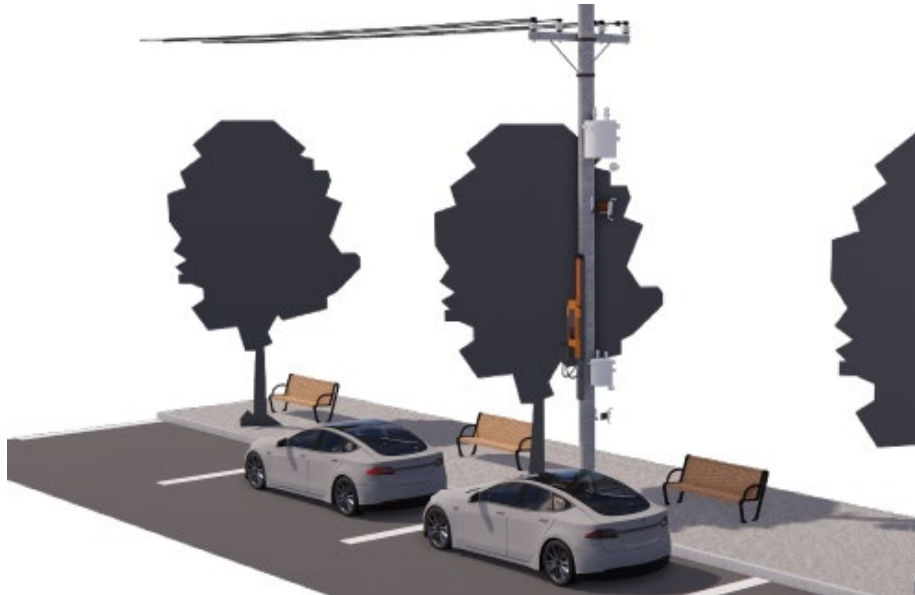
At-home charging will almost always be AC-charging (Level 1 and Level 2). Chargers can take several forms and may include portable chargers that are plugged into a wall or powered bollard (short post), wall-mounted or post-mounted chargers and freestanding pylon-style chargers. Chargers will generally be used during the times that vehicles are parked, most likely overnight. This allows users to tap the inexpensive power available to residents, to charge the vehicle while it is not in use and make the fully charged vehicle available when the day begins.

At-home charging locations typically include driveway/garage or dedicated parking spaces in multifamily developments.



Amenity Charging

Figure 5: Example of Utility Pole-Mounted Charging



This category is generally a smaller-scale implementation of publicly available charging infrastructure that integrates into existing parking areas and taps spare/excess capacity in an existing electrical system without upgrades to the building service or transformer (e.g. [Figure 5](#) and [Figure 6](#)). Unlike at-home charging, the cost per kWh will be determined by the site operator, who is likely to have full control over the cost of energy, the cost of parking and the idling fee for fully charged vehicles.

Figure 6: Example of Curbside Charging





The objective of amenity charging is to provide charging at key destinations without the need for utility or transformer upgrades. These chargers can be important neighborhood amenities, allowing people without access to at-home charging an opportunity to own an EV and charge their vehicle throughout their daily routine.

Locations for these types of chargers include parking lots, mounts on utility poles and curbside infrastructure.

Destination Hubs

Level 2 parking lot hubs can be defined as a cluster of chargers, mostly Level 2, that will require more substantial electrical infrastructure upgrades that may include transformers or upgrades to the utility service. These hubs may be located in surface lots or structured lots and will often be integrated into multifamily residential, public, quasi-public and commercial parking areas. In general, when the cumulative load of the chargers exceeds what the existing building panel or transformer is able to provide, it will fall into this classification. The scale of upgrades outside the chargers themselves will be dependent upon the number and power of the chargers installed, as well as any potential for charging management systems to help manage the load among different users and potentially reducing demand charges. Hubs may also include DCFC chargers, but they will likely be lower power (50kW – 100kW) and limited in number.

Figure 7: Example of Level 2 Destination Charging Hub



These types of hubs may or may not be accessible to the public. In instances such as multifamily residential or employer-based parking, the use of these chargers will likely be limited to the users of the property. Chargers can also be programmed to allow certain users at certain times, which may allow the general public to use during the day, but only trusted users, such as multifamily residents,



allowed to use during the evening. Users of these areas will typically be parked for longer than two hours.

To maximize utilization of the infrastructure, placement of chargers can be identified to accommodate different users throughout the day. For example, a cluster of chargers can be shared between office users during business hours and still service neighboring residential or restaurant users during non-business hours.

DC Fast Charging Hubs

The DCFC Hub (e.g., **Figure 8**) targets users needing to charge quickly within a limited time span. Stations will essentially function like today's fueling stations, allowing travelers access to quick refueling for longer-distance trips. Depending upon the location, the number of ports and the amenities offered may vary. For example, a small commercial area may support a handful of chargers, whereas a large corridor with substantial throughput may support several dozen chargers (see **Figure 9**).

Figure 8: Example of DCFC Station



Using 23 CFR 680 requirements as a guide, smaller stations could have four 150kW ports, although the industry is starting to recognize that higher power chargers are better protection against obsolescence, with some stations offering the maximum for a Combined Charging System (CCS1) of 360kW per port. The key feature of these stations is the maximum load of all the chargers combined will likely be less than 1MW, as the cost becomes higher and access to power becomes more difficult (in general) at that level.

Larger hubs are likely to be found along major travel ways (e.g., Interstates, U.S. Highways) to serve those making long-distance trips (see **Figure 9**).

Figure 9: Example of Large DCFC Hub



Turnover of EVs using chargers could be quite high, ultimately generating higher traffic to and from the site. Similar to the Destination Hubs, the scale of upgrades outside the chargers themselves will be dependent upon the number and power of the chargers installed, as well as any potential for charging management systems to help manage the load among different users and potentially reducing demand charges. These hubs will exceed 1MW, but the maximum load will be dictated by the number of ports, the power of the ports and the power-sharing systems or supplementary batteries that may help offset the peak load.

2.3 BATTERY ELECTRIC VEHICLE MARKET

In the evolving landscape of sustainable transportation, the market for EV vehicles has experienced substantial growth, encompassing various vehicle segments, including sedans, crossovers & SUVs, vans and trucks. The current availability of EV models in the US within each category as of Q4 2023 is provided in [Table 4](#). Within the table, vehicle size is specified, along with associated battery capacity as stated by the manufacturer. Additionally, the [U.S. Department of Energy Alternative Fuels Database](#) regularly updates available EVs across various vehicle categories.

Table 4: Potential BEV Alternatives (2023 Market)

Vehicle Type	Make	Model	Seats	Battery Capacity (kWh)
Pickup	Ford	F150 Lightning 4WD	5	123



Vehicle Type	Make	Model	Seats	Battery Capacity (kWh)
Pickup	Ford	F150 Lightning 4WD Plat/Ext. Range4	5	165
Pickup	Lordstown	Endurance		109
Pickup	Rivian	R1T18	5	144
Pickup	Rivian	R1T Dual Motor19	5	144
Sedan/Wagon	Audi	e-tron GT/RS e- tron GT	5	95
Sedan/Wagon	BMW	i4 eDrive35/40 Gran Coupe2		84
Sedan/Wagon	BMW	i4 M50 Gran Coupe	5	83
Sedan/Wagon	BMW	i7 xDrive60 Sedan3	5	105
Sedan/Wagon	Chevrolet	Bolt EUV	5	75
Sedan/Wagon	Chevrolet	Bolt EV	5	75
Sedan/Wagon	Genesis	Electrified G80		87
Sedan/Wagon	Genesis	GV60 Advance		77
Sedan/Wagon	Genesis	GV60 Performance		77
Sedan/Wagon	Hyundai	Ioniq 6 Long range AWD7		77
Sedan/Wagon	Hyundai	Ioniq 6 Long range RWD7		77
Sedan/Wagon	Hyundai	Ioniq 6 Standard range RWD		53
Sedan/Wagon	Kia	EV6 AWD GT	5	77
Sedan/Wagon	Kia	EV6 Long Range AWD	5	77
Sedan/Wagon	Kia	EV6 Standard/Long Range RWD	5	77
Sedan/Wagon	Kia	Niro Electric	5	64
Sedan/Wagon	Lucid	Air G Touring XR AWD3	5	120
Sedan/Wagon	Lucid	Air GT P AWD8	5	120
Sedan/Wagon	Lucid	Air Pure AWD9	5	120



Vehicle Type	Make	Model	Seats	Battery Capacity (kWh)
Sedan/Wagon	Lucid	Air Touring AWD3	5	120
Sedan/Wagon	Mazda	MX-30		35
Sedan/Wagon	Mercedes- Benz	EQS 450 4MATIC	5	111
Sedan/Wagon	Mini	Cooper SE Hardtop 2 door	4	32
Sedan/Wagon	Nissan	ARIYA ENGAGE e-4ORCE 63kWh	5	65
Sedan/Wagon	Nissan	ARIYA ENGAGE FWD 63kWh		65
Sedan/Wagon	Nissan	ARIYA ENG+/EVO+/PLAT+ e-4ORCE 87kWh10	5	90
Sedan/Wagon	Nissan	ARIYA FWD 87kWh11		90
Sedan/Wagon	Nissan	LEAF	5	40
Sedan/Wagon	Nissan	LEAF SV	5	60
Sedan/Wagon	Polestar	Polestar 212	5	77
Sedan/Wagon	Polestar	Polestar 2 Dual Motor13	5	77
Sedan/Wagon	Porsche	Taycan AWD14	4	109
Sedan/Wagon	Porsche	Taycan Cross Turismo15	4	109
Sedan/Wagon	Porsche	Taycan GTS Sport Turismo	4	109
Sedan/Wagon	Porsche	Taycan Perf Battery/Battery Plus	4	109
Sedan/Wagon	Tesla	Model 3 AWD21	5	84
Sedan/Wagon	Tesla	Model 3 RWD	5	60.9
Sedan/Wagon	Tesla	Model S	5	104
SUV	Audi	e-tron quattro/S1	5	95
SUV	Audi	e-tron Sportback/S Sportback1	5	95



Vehicle Type	Make	Model	Seats	Battery Capacity (kWh)
SUV	Audi	Q4 e-tron	5	82
SUV	Audi	Q4 e-tron quattro	5	95
SUV	Audi	Q4 e-tron Sportback	5	82
SUV	BMW	iX M60	5	111
SUV	BMW	iX xDrive50	5	76
SUV	Cadillac	Lyric	5	119
SUV	Cadillac	Lyric AWD	5	119
SUV	Fisker Automotive	Ocean Extreme, One		113
SUV	Ford	Mustang Mach-E AWD	5	116
SUV	Ford	Mustang Mach-E AWD CAL RT 1/EXT5	5	116
SUV	Ford	Mustang Mach-E GT6	5	116
SUV	Ford	Mustang Mach-E RWD Extended	5	116
SUV	Ford	Mustang Mach-E RWD (incl. LFP)	5	91
SUV	Hyundai	Kona Electric	5	64
SUV	Jaguar	I-PACE EV400	5	86
SUV	Lexus	"RZ 450e AWD		
(18"/20" Wheels)7"	5	71		
SUV	Mercedes- Benz	EQS 450 4MATIC (SUV)	5	111
SUV	Mercedes- Benz	EQS 450+ (SUV)	5	111
SUV	Mercedes- Benz	EQS 580 4MATIC (SUV)	5	111
SUV	Rivian	R1S16	7	144
SUV	Rivian	R1S Dual Motor17	7	144
SUV	Subaru	Solterra AWD20		72



Vehicle Type	Make	Model	Seats	Battery Capacity (kWh)
SUV	Tesla	Model X22	5-7	104
SUV	Tesla	Model Y AWD21	5-7	84
SUV	Toyota	bZ4X23	5	71
SUV	Toyota	bZ4X AWD23	5	72
SUV	VinFast	VF 8 Eco/Plus24		88
SUV	Volkswagen	ID.4 AWD Pro/Pro S	5	81
SUV	Volkswagen	ID.4 S/Pro/Pro S	5	81
SUV	Volvo	C40 Recharge Twin	5	77

2.4 BARRIERS AND INCENTIVES TO ADOPTION

This section highlights many of the common barriers to EV adoption, concerns regarding low-temperature impacts on EV usefulness and potential opportunities to help navigate a path to EV adoption.

BARRIERS TO ADOPTION

Generally, emerging technologies often face barriers to market acceptance. This is also the case with EVs. While some initial concerns are overcome through innovation, others are more persistent. The following highlights some of the typical major barriers seen in the EV and EVSE market:

- **Lack of Charging Infrastructure:** Potential concerns about finding charging locations.
- **Lack of Awareness/Inertia:** Misunderstandings or misconceptions about the existing technology.
- **Long Recharging Times:** Even using a DCFC, recharging an EV requires more time than refueling an internal combustion engine vehicle.
- **Limited Model Types or Used Options:** Until recently, there was a lack of truck, SUV/crossover models available on the market. Turnover is still limited, leaving fewer options to buy used.
- **Lack of Dealer Knowledge:** Dealers are unfamiliar with the technology or purchase incentives for EVs.



- **Lack of Utility Infrastructure:** Lack of site-specific back-end utility infrastructure for chargers, especially in rural and evacuation areas.
- **Range Anxiety for Long Trips:** Limited awareness of the EVSE network leads to concerns about charging.
- **Ownership Cost:** EV models on the past and current markets have been typically higher initial cost than a comparable internal combustion engine vehicle.
- **EV Charging Speed:** Relationship between the function of power delivery of EVSE and how much power an EV can accept.
- **Rural/Underserved Infrastructure Gaps:** EVSE is typically located where adoption is highest.

CLIMATE IMPACT CONCERNS

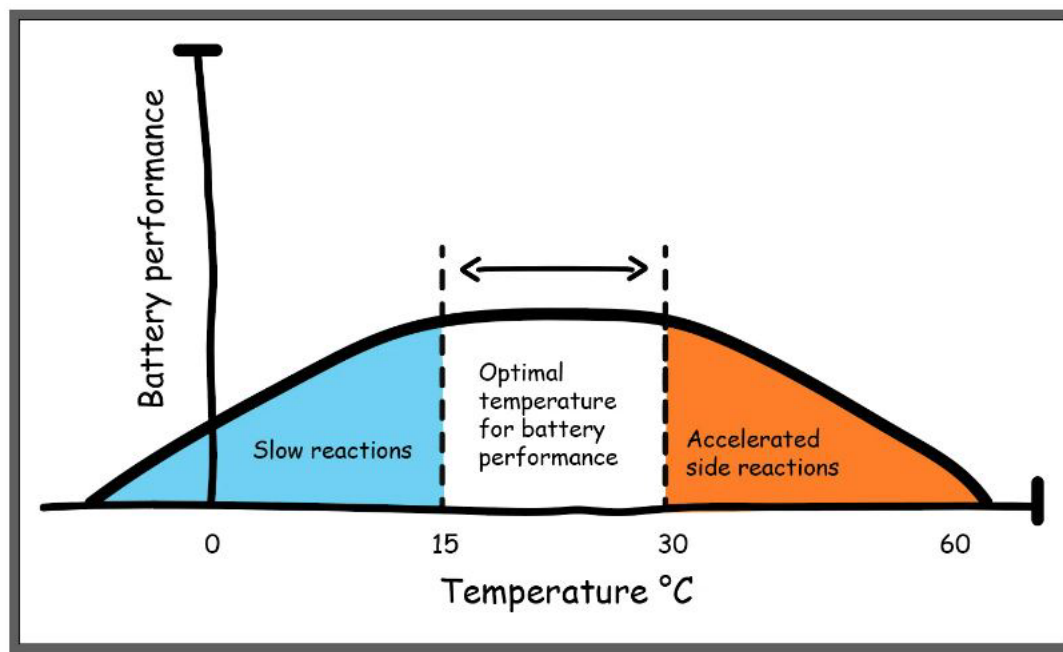
Concerns regarding the impact of the Minnesota climate on EVs (especially EV range) can pose a major barrier to adoption for those considering an EV. In Minnesota, weather conditions vary widely throughout the year. Winters are notably cold, with temperatures often dropping to lows of -10°F or even lower, while summers bring warmer weather, with highs reaching into the 70s or higher. These temperatures can have a significant impact on EV charging and range.

Cold temperatures slow the chemical and physical reactions occurring within the battery. This leads to longer charging times and a temporary reduction in range. The cold will likely reduce range in the short-term but will likely not cause long-term damage to the battery. Warming the vehicle cabin is also known to lead to lower range, as it takes more energy to heat and maintain the cabin temperature in cold weather, effectively reducing the amount of energy that can be used for range. A 10% to 40% range reduction can occur in cold weather with the current technology. Additionally, snow and internal combustion engine accumulation may pose challenges for EV owners accessing charging stations or maintaining traction on the road.

During hot summer months, the charging process, as well as the system in the charging station, may generate heat. In hotter conditions, the thermal management system works harder to cool battery temperatures, causing it to consume more energy. One test showed that by keeping the EVSE and EV shaded/cool, the EV charged 15 minutes faster and used 2 kWh less energy per charge, showing the significant impact heat can have on charging.



Figure 10: Battery/Charging Performance through Different Ambient Temperatures, Recurrent Auto, August 2023



PURCHASING INCENTIVES

A current challenge with EV ownership is that with a higher sticker price than their gas-powered counterparts, the relative cost of purchasing a new or used EV is prohibitive for many with lower incomes. Promoting equitable EV adoption involves understanding current barriers to EV adoption and specific gaps that exist in the current charging network. According to [data from Cox Automotive](#), the average price of a new EV is roughly \$7,000 more than that of an internal combustion engine vehicle. While government incentives such as the New or Used Clean Vehicle Credit can reduce the cost of purchasing an EV, the benefit may not reach those in low-income households. [Recent research](#) has shown that low-income households primarily buy used automobiles, either from a dealership or informally, with only 17% of car purchases being new cars from a dealership. While the Used Clean Vehicle Credit can help those purchasing a used EV from a dealership, the availability of used EVs is still limited and those that are available are often older models with significantly lower ranges than present-day EVs.

The Clean Vehicle Credit, both New and Used, is also non-refundable, meaning taxpayers cannot earn back more than they have paid in federal taxes; for low-income households with smaller federal liabilities or who would already expect a large refund through other available deductions and credits, the Clean Vehicle Credit is less impactful. Changes in 2024 allow EV purchasers to transfer the



credit to a participating dealership and receive the full credit at the point of sale, but this relies on both the dealership participating and educating prospective EV buyers about the credit.

Additionally, the Minnesota Department of Commerce funds an application-based EV rebate program launched on February 7, 2024, which distributes funds on a first-come, first-served basis. For new electric vehicles, owners/lessees may receive a rebate up to \$2,500 and for used electric vehicles, owners may receive a rebate up to \$600.

3 MINNESOTA USER CONTEXT

This chapter provides a snapshot of the characteristics of potential EV adopters within the state. Special consideration is given to users that may face a larger number of barriers to adopting EVs, namely disadvantaged and tribal communities.

3.1 DRIVER POPULATION CHARACTERISTICS

Minnesota's 2022 population was reported as 5,717,184 individuals. This statewide population navigates a vast multimodal transportation system. More than half of the state's population lives within the Twin Cities metropolitan area. The remaining population lives in one of the state's seven other metropolitan areas, or in the more suburban and rural communities collectively referred to as "Greater Minnesota."

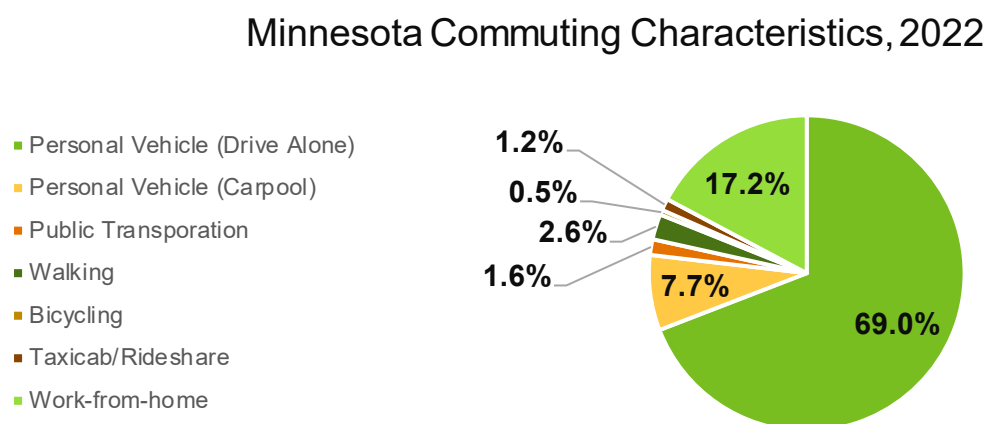
One of the primary enablers of EV adoption is access to at-home charging and space available to install a charger. Within Minnesota, 72% of the housing units are owner-occupied¹. However, rising housing costs and increased housing instability pose barriers to installing at-home EV charging, particularly for low-income households. Additionally, those living in multi-family housing are less likely to purchase an EV as their ability to charge at home is limited without the implementation of EV supportive building mandates. For example, mandating a certain percentage of parking spaces in multifamily developments be equipped with EV charging infrastructure, such as wiring and conduits, to facilitate future installation of charging stations.

Figure 11 below reflects the preferred mode of transportation for commuters in Minnesota. In 2024, 7.3 million vehicles were registered in Minnesota. Of the population surveyed as part of the American Community Survey (ACS) Data, over 75% rely on personal vehicles to commute to work and only about 5% use alternative means such as public transit or active transportation. However,



even those who primarily use alternative commuting methods for work often own a personal vehicle for other essential uses, including shopping, services and other trips. This means that a large proportion of trips occurring on Minnesota roads are being made in internal-combustion engine (ICE) vehicles.

Figure 11: Minnesota Commuting Characteristics, ACS 1-Year Estimates, 2022



3.2 DISADVANTAGED POPULATIONS & TRIBAL COMMUNITIES

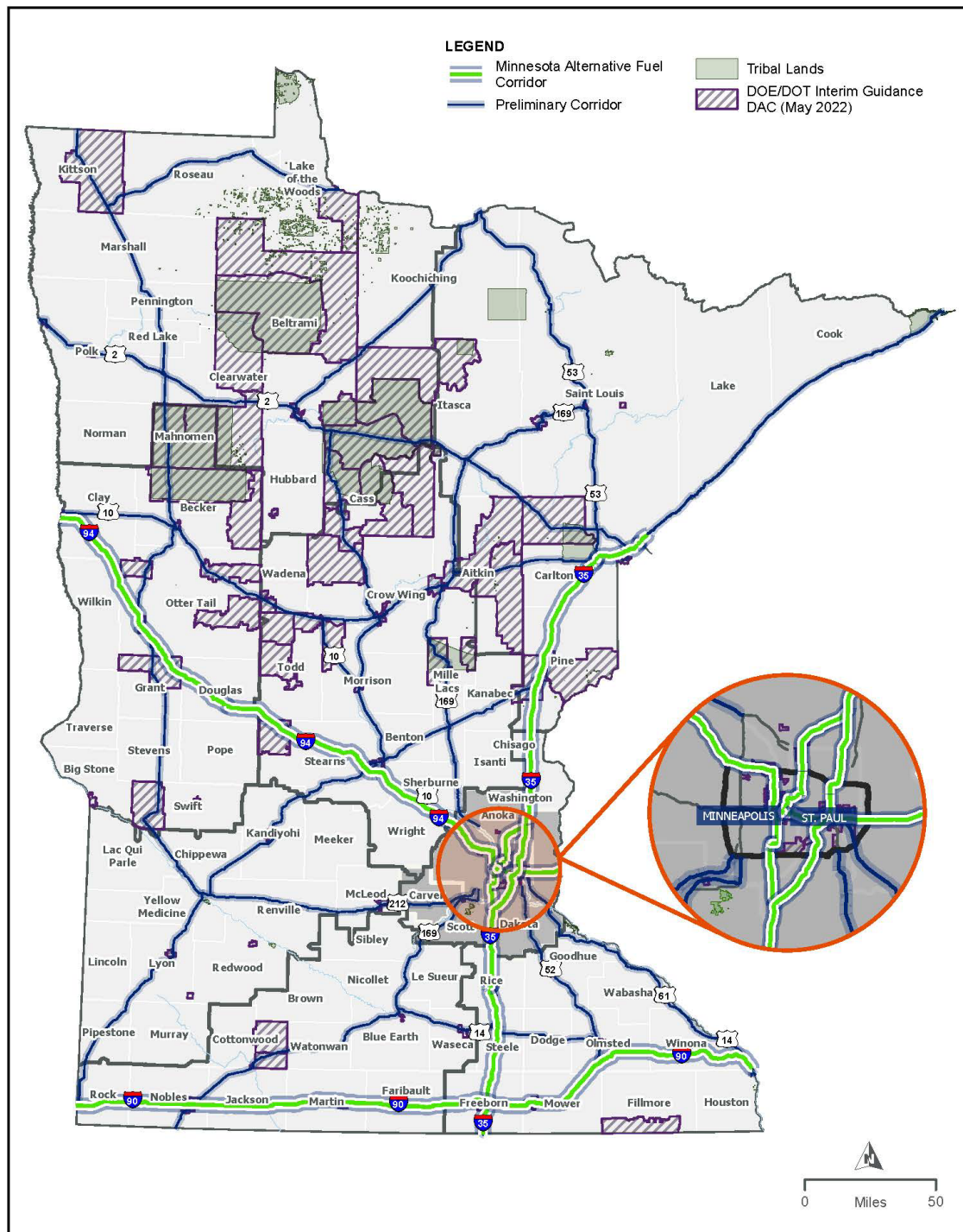
Considering both tribal and disadvantaged populations in the planning process is crucial for addressing barriers and exploring opportunities for public funding or publicly available chargers, promoting inclusive adoption strategies across the state. MnDOT prioritizes tribal engagement, evident through ongoing collaboration with Tribal Nations and local organizations like Native Sun Community Power Development. Feedback from these engagements works to inform EV adoption efforts in Minnesota, highlighting the need to expand the fast-charging network geographically to serve rural, tribal and disadvantaged communities. [Figure 12](#) identifies disadvantaged communities and Minnesota Tribal areas.

In Minnesota, [11 sovereign American Indian nations](#), including seven Ojibwe (Chippewa, Anishinaabe) federally recognized reservations and four Sioux (Dakota) communities, underscore the state's diverse landscape. The Upper Midwest Inter-Tribal Electric Vehicle Charging Community Network, known as "Electric Nation," reflects a Native-led effort to promote EV adoption and overcome transportation barriers in tribal communities. Collaborating with the Standing Rock Sioux Tribe, Red Lake Nation and 21 other tribal Nations across Minnesota, North Dakota and South Dakota, Electric Nation emphasizes the importance of flexible EV program design to promote inclusivity and equity across diverse communities.



In 2021, the Minnesota Department of Transportation performed a comprehensive demographic analysis, the [2021 Minnesota Electric Vehicle Assessment](#), to inform equitable expansion of EV infrastructure in the state. This analysis identified priority areas for EV charging deployment, including north-central Minnesota, parts of the Twin Cities metro like north Minneapolis and Saint Paul and regions in Greater Minnesota near or on tribal lands. MnDOT's EV DCFC Network Vision, found in the [2022 Minnesota Electric Vehicle Infrastructure Plan](#), was centered on equity indicators identified by the Department of Energy, prioritizing the allocation of overall benefits from federal programs to disadvantaged communities in Minnesota, including tribal lands. This network, covering high-demand travel corridors, seeks to connect Minnesota's rural and underserved areas, including tribal lands in northern Minnesota.

Figure 12: Disadvantaged Communities and Tribal Populations, Climate and Economic Justice Screening Tool, 2024





4 ELECTRIC VEHICLE ADOPTION

This chapter provides an overview of the EV population and market share currently in Minnesota. MnDOT created the Minnesota Electric Vehicle Assessment in 2021 which contained current and projected adoption at the time. Utilizing the baseline 2021 data, previous forecasting efforts and new data, projection scenarios for EV adoption leading out to 2040 were calculated. The chapter also highlights the associated vehicle miles traveled (VMT) projections that would be correlated with the EV adoption to provide an understanding of the potential environmental impacts.

4.1 CURRENT EV REGISTRATIONS

The following section discusses the EV population share, EV market share and general location of EVs (based on zip code registration data) in Minnesota. The difference between population share and market share can be defined as follows:

- EV Population Share: the percentage of all vehicles registered in the state that are EVs
- EV Sales Market Share: the percentage of new vehicle registrations that are EVs

EV POPULATION SHARE

In Minnesota, the landscape of transportation is evolving, evidenced by the increasing presence of EVs on the road.

As of November 2024, there are 65,679 EVs registered in Minnesota according to data obtained from [Atlas Public Policy](#). The Atlas data undergoes periodic updates to improve accuracy, with typical variations of less than 1%, which can occasionally cause dashboards to update with new data. In total, EVs make up less than 1% of the 7.3 million vehicles registered in Minnesota.

- 46,111 are battery electric vehicles (BEVs), which use only an electric motor
- 19,568 are plug-in hybrid electric vehicles (PHEVs), which use both an electric motor and gasoline engine

Public Agency Fleets

The Minnesota Department of Administration has led the way in light-duty EV adoption, committing to a 20% EV state fleet by 2027. Notably, the state has several light-duty EVs through state contracts and was among the first in the Midwest to acquire Chevrolet Bolts. Several cities across the state, including Minneapolis, Edina and Elk River, have purchased EVs using the state

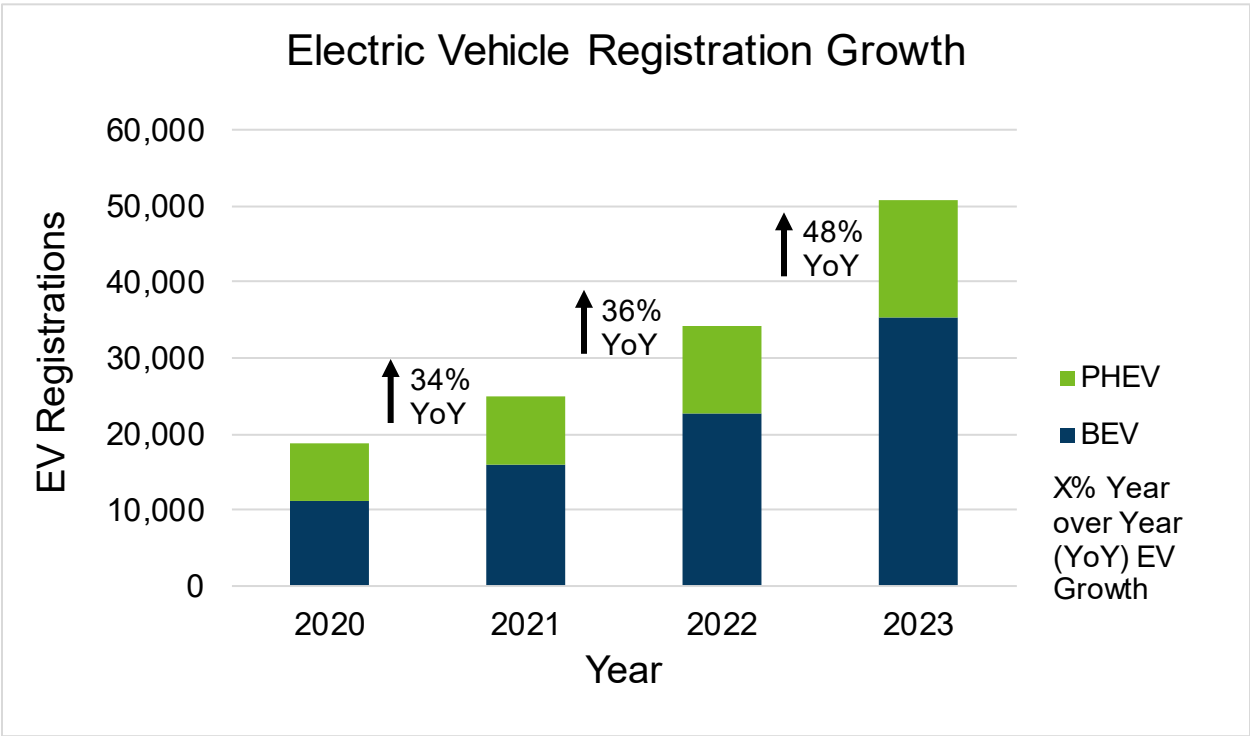


contract. The EV registration numbers include all light-duty vehicle uses such as public agency fleets and rental cars. Fleet data is not available for all public agencies in Minnesota but is available for state agencies. The state of Minnesota operates 6,300 light duty vehicles across 22 agencies and 269 (4%) of these vehicles are EVs. Public agency fleets are not a substantial share of the number of light-duty vehicles registered in Minnesota, but their transition to EVs will be important to track as these fleets can bring EV awareness to the public.

EV MARKET SHARE

EVs accounted for 4% of new light-duty vehicle registrations in Minnesota in 2023, up from 3% in 2022. Year-over-year EV registration growth has increased in the past three years, showing early signs of continued growth (Figure 13). The main driver of this growth has been from BEVs, which has outpaced PHEV growth. However, to meet Minnesota’s targets, EV adoption must increase significantly.

Figure 13: Electric Vehicles in Minnesota



EV REGISTRATION BY ZIP CODE

Table 5 identifies the change in EV registrations by associated zip code comparing 2021 to 2023, while Figure 14 and Figure 15 provide a geographical representation of the same. The concentration of EVs in Minnesota’s metropolitan areas indicates that there are likely greater barriers to adoption



in rural areas. However, within this three-year timeframe, the number of counties with at least one registered EV increased. In 2021, there were 322 zip codes without an EV registered and in 2024 that number decreased to 181, a 44% decrease. Identifying the areas with no registrations to lower registrations will be used in future phases of analysis to inform potential areas to focus on future infrastructure investments.

Table 5: EV Registration by Zip Code Comparison Table, (2021 and 2024) MnDOT Electric Vehicle Dashboard

EVs Registered (Group Ranges)	Number of Zip Codes (2021)	Number of Zip Codes (2024)	Change (DELTA)
0	322	181	-141
1 – 25	407	491	84
26 – 50	47	47	0
51 – 100	41	40	-1
101 – 250	55	55	0
251 – 500	15	50	35
501+	0	23	23



Figure 14: EV Registration by Zip Code in Minnesota in 2021, MnDOT Electric Vehicle Dashboard

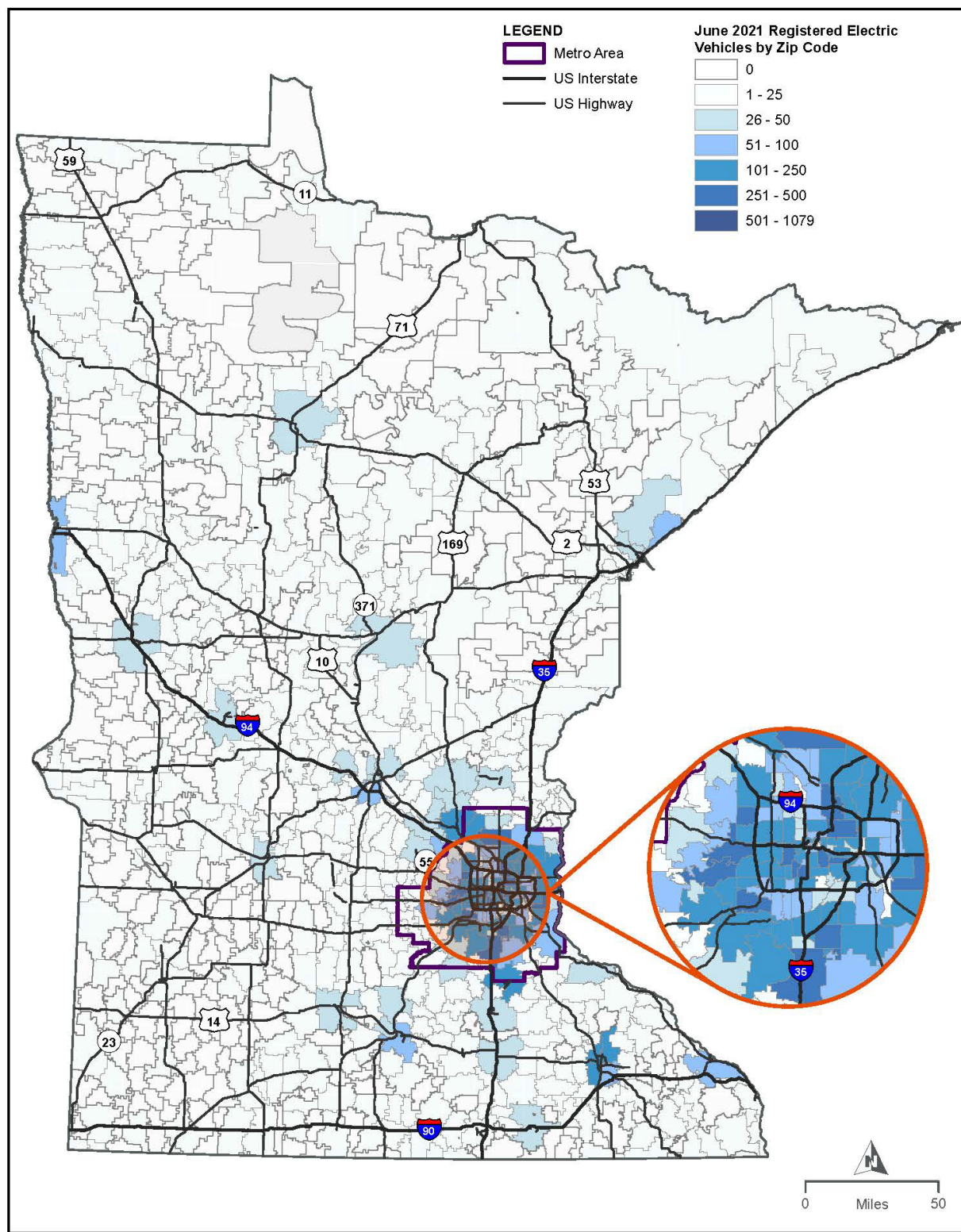
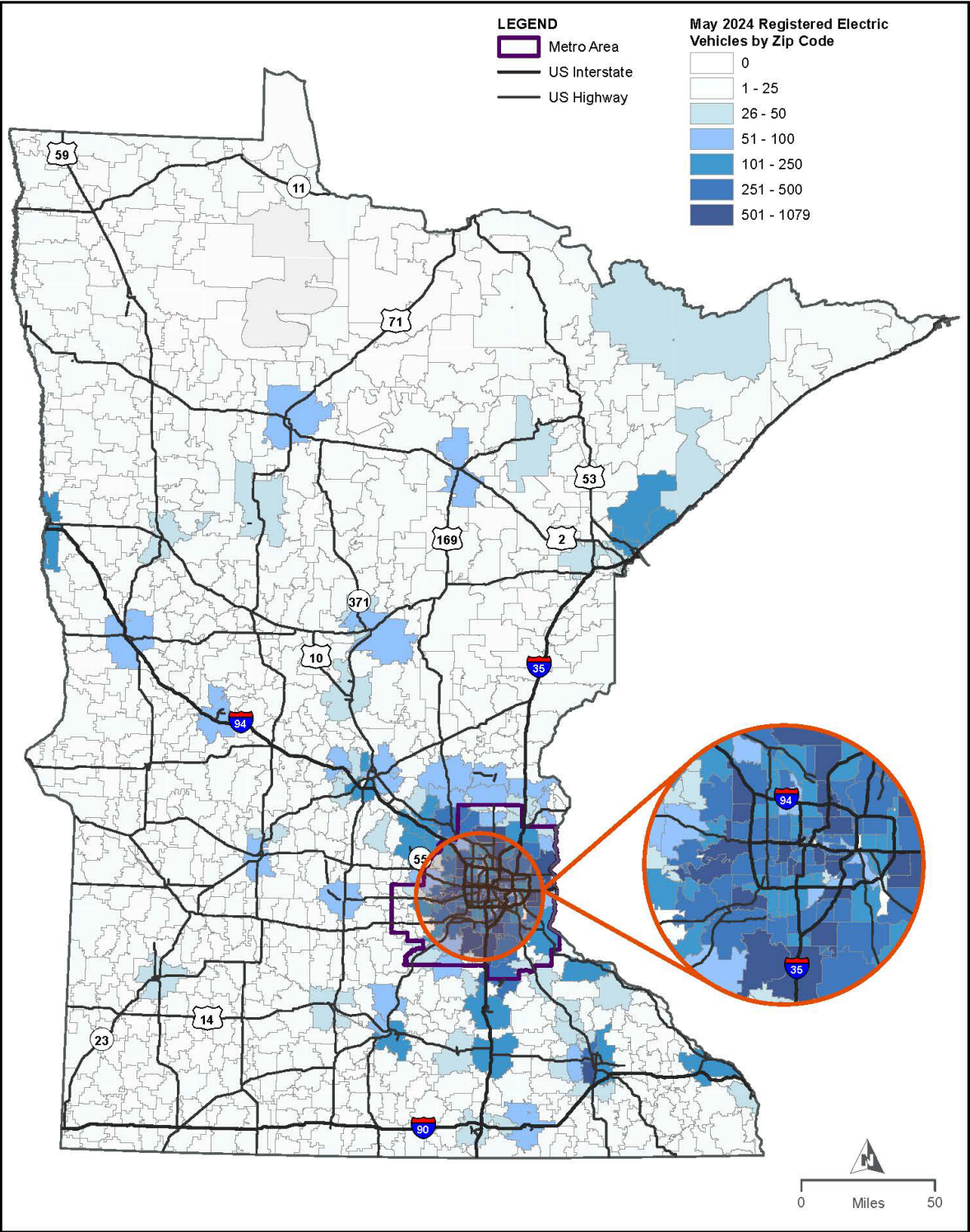




Figure 15: EV Registration by Zip Code in Minnesota in 2024 (Jan-May), MnDOT Electric Vehicle Dashboard





4.2 ADOPTION LEVEL PROJECTIONS

EV adoption forecasts are important pieces in determining how much charging infrastructure could be needed to support future levels of EVs in Minnesota. A forecast was completed as part of the 2021 Minnesota Electric Vehicle Assessment, but an updated forecast was warranted because of available updated data and new EV adoption targets.

EV ADOPTION TERMINOLOGY, TARGETS AND LAWS

When looking at adoption forecasts and targets, it is important to define the two main metrics:

1. **EV sales market share:** the number of new registrations that are EVs.
2. **EV population share:** the number of total registrations that are EVs.

MnDOT has set the following targets for [EV sales market share](#):

- 60% by 2030 and
- 100% by 2035.

They have also set the following targets for [EV population share](#):

- 5% by 2025
- 20% by 2030
- 45% by 2035
- 65% by 2040

Along with these targets, Minnesota has adopted [Clean Car Standards](#), which requires auto manufacturers to deliver more vehicles with zero tailpipe emissions for sale in Minnesota, increasing each year. These standards took effect in 2024 for model year 2025 and later vehicles. The standards require 22% of model year 2025 and later vehicles sold to be zero emission. However, there are aspects of the rule that provide some flexibility to Original Equipment Manufacturers (OEMs), such as early-action credits and a one-time credit allotment.

Another consideration to reaching these targets is the market availability of EVs. The amount of new EVs entering the market may not be equal to the demand needed to reach these targets. Due to these factors, Minnesota will likely not reach the target of 22% of new registrations as EV.



UPDATED ADOPTION FORECAST

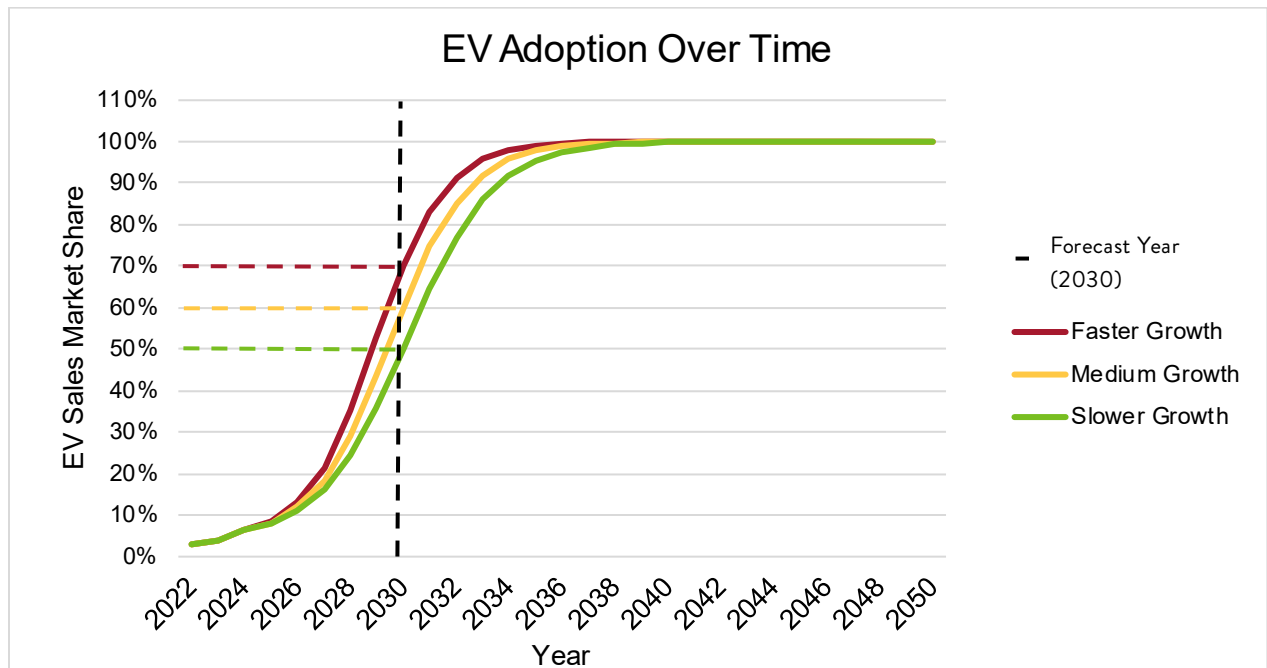
In the 2021 forecast, multiple adoption scenarios were presented, leading to a forecasted EV sales market share range of 5-60% in 2030. The updated forecast looked at a smaller range of 2030 sales market share scenarios, using the Minnesota target of 60% as the baseline, “medium” growth scenario. A Slower Growth (50%) and a Faster Growth (70%) scenario were included as well to account for other growth possibilities.

Figure 16 shows what the EV sales market share could look like over time. The adoption curve is projected to be an S-curve shape, which is commonly found in disruptive technology adoption. The S-curve shows that new technologies first go through an initial period of product development with small numbers of early adopters, followed by a period of rapid growth and increased visibility after the innovation’s reliability and functionality have been proven, before finally reaching a peak level of market saturation following mass adoption. This is typically shown in a graph with the y-axis referring to the increase in performance for the innovation and the x-axis related to time. While an innovation’s early growth will follow a linear or constant rate of growth, growth in subsequent stages is exponential.

For EV sales market share projections, the S-curve model was applied with the percent increase in sales correlated to the increase in performance; this correlation was made with the assumption that an increase in sales would occur with an increase in performance and reliability of EVs.



Figure 16: EV Sales Market Share Projections



EV sales can be translated to the total vehicle population by accounting for growth in vehicles registered, total vehicle sales and vehicles being retired.

- **Vehicle registrations** are estimated to grow 0.3% annually based on 2050 statewide population projections from the Minnesota State Demographic Center. This growth rate is slower than the ~2% growth rate the past two years, but this is assumed to be above the norm as the auto market rebounds from the COVID-19 pandemic.
- **Total vehicle sales** are estimated to be 5.6% of registrations based on 2023 original registration data. Original registrations are not an exact match with vehicle sales as original registrations can include used vehicles that are brought into Minnesota and registered. However, this is the best source available as new vehicle sales data is not available at the state level.
- **Vehicles retired** are assumed to be the difference between total vehicle sales and net registration growth year over year. For example, if 400,000 vehicles are sold in a year but net registrations increased by 300,000 vehicles, then 100,000 vehicles are assumed to be retired.

Each of the sales growth scenarios (slow/medium/fast), when applied to the expected fleet turnover, all result in a total number of registered EV's well under the statewide EV registration target. If Minnesota's targets are met, there would be 3.4 million EVs in 2030. Minnesota target values were



calculated using the total number of registrations for each target year and the associated EV population target, as the total number of registrations is consistent across each scenario.

Table 6: EV Population Forecast (Number)

EV Population of Light-Duty Vehicles (Total Number of EVs Registered)				
Forecast Years	Slower	Medium	Faster	MN Targets
2025	104,000	105,000	106,000	368,000
2030	610,000	717,000	822,000	1,496,000
2035	2,051,000	2,249,000	2,402,000	3,418,000
2040	3,470,000	3,633,000	3,753,000	5,015,000
2045	4,601,000	4,726,000	4,818,000	N/A
2050	5,497,000	5,592,000	5,662,000	N/A

Table 7: EV Population Forecast (Percentage)

EV Population of Light-Duty Vehicles (Total Percent of EVs Registered)				
Forecast Years	Slower	Medium	Faster	MN Targets
2025	1%	1%	1%	5%
2030	8%	10%	11%	20%
2035	27%	30%	32%	45%
2040	45%	47%	49%	65%
2045	59%	60%	61%	N/A
2050	69%	70%	71%	N/A

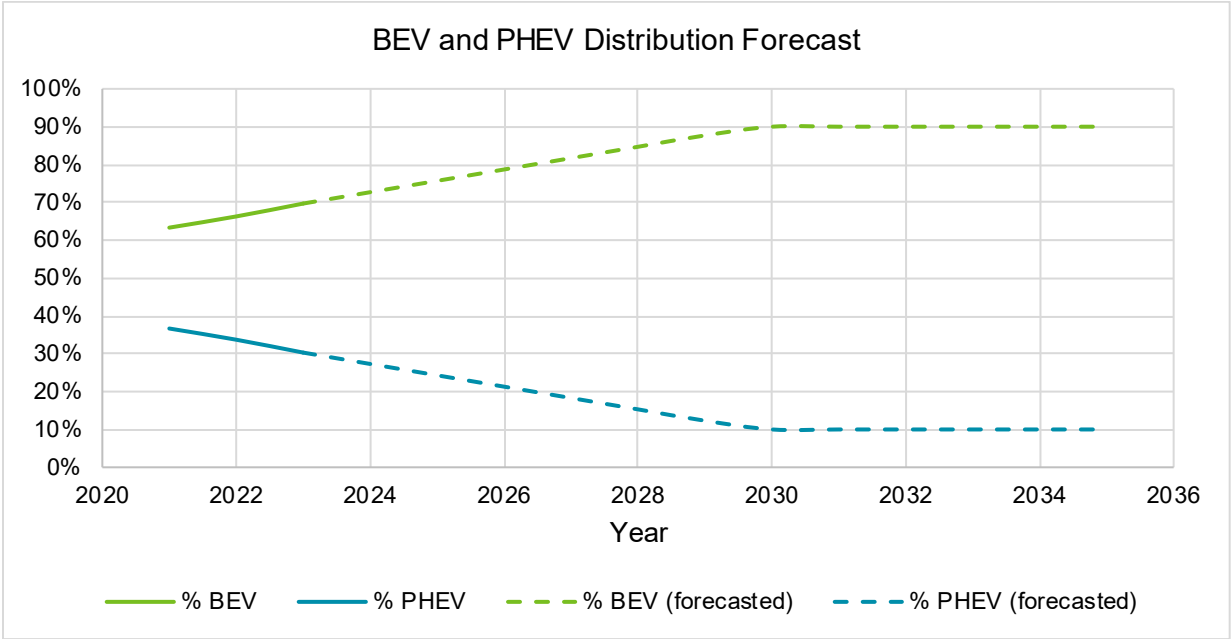
These forecasted scenarios all fall short of Minnesota's statewide EV population targets. If growth continues according to the historic trend data, the 2025 target will not be met. To meet the longer-term targets, both EV market share and vehicle turnover will have to increase. Increasing vehicle turnover is more important, as even if EV sales market share was 100% in 2025 and on, only 61% of vehicles would be electric in 2045, 4% less than the target of 65% EVs in 2040. To meet the 2030 and later targets, the percentage of registrations that are new vehicles would have to double to 12%. This type of growth will require some sort of external factor that leads to Minnesota drivers replacing their vehicle quicker than normal.



BEV & PHEV DISTRIBUTION

As this forecast is used to project charging needs, it is important to consider the distribution of battery electric and plug-in hybrid EVs since the charging needs between the two types are significantly different. Between 2021 and 2023, the share of EVs that are BEVs increased from 63% in 2021 to 70% in 2023. This trend is likely due to the increased availability and range of BEV models. This growth is forecasted to continue until a maximum split is reached, which is estimated to be 90% BEV and 10% PHEV (Figure 17), as some drivers are expected to still prefer PHEVs.

Figure 17: BEV and PHEV Distribution Forecast



KEY TAKEAWAYS

Key takeaways were identified from this analysis:

- EV growth is increasing in Minnesota and is showing early signs of what will likely be continued growth.
- To meet longer term statewide EV population targets, aggressive new vehicle sales of BEVs / PHEVs compared to internal combustion engine cars will need to occur in concert with an increase in the rate at which Minnesota drivers replace their vehicles.
- EV forecasts become more robust with each year of registration data, as this data has only begun to be tracked in the last few years. As more data becomes available over time, the forecast should be updated to reflect the most recent growth and market conditions.

4.3 EV VMT PROJECTIONS

In 2022, MnDOT estimates there were 57.5 billion vehicle miles traveled (VMT) in the state. Assuming that EVs have the same VMT as other LDVs, EVs traveled over 270 million miles in 2023. It is noted that a portion of these miles are traveled by out-of-state vehicles, both EVs and non-EVs. It is not practical to estimate the share of miles traveled by these vehicles. Estimates are able to be made with the overall VMT data on how EV VMT could increase over time.

Minnesota has a target of [reducing the VMT per capita by 20% by 2050](#) (equivalent to a 7% reduction in total VMT if the current population forecast holds). **Table 8** below forecast VMT by fuel type, incorporating the target of overall VMT reduction. In the medium growth scenario, EVs will travel over 5 billion miles in 2030 and over 11 billion miles in the targets met scenario.

Table 8: EV VMT Over Time by Growth Scenario and Current Minnesota Targets

YEAR	TOTAL VMT (MI)	LOW GROWTH VMT		MEDIUM GROWTH VMT		FASTER GROWTH VMT		TARGETS MET VMT	
		ICE (MI)	EV (MI)	ICE (MI)	EV (MI)	ICE (MI)	EV (MI)	ICE (MI)	EV (MI)
2022	57.5 B	57.2 B	0.3 B	57.2 B	0.3 B	57.2 B	0.3 B	57.2 B	0.3 B
2025	57 B	56.2 B	0.8 B	56.2 B	0.8 B	56.2 B	0.8 B	54.2 B	2.9 B
2030	56.2 B	51.7 B	4.6 B	50.9 B	5.4 B	50 B	6.2 B	45 B	11.3 B
2035	55.6 B	40.5 B	15 B	39.1 B	16.4 B	37.9 B	17.6 B	30.6 B	25 B
2040	54.8 B	30.1 B	24.7 B	29 B	25.8 B	28 B	26.7 B	19.2 B	35.7 B

5 EXISTING AND PLANNED ELECTRIC VEHICLE SUPPLY EQUIPMENT

The existing and planned EVSE chapter identifies the existing charging infrastructure built in Minnesota. Building from this data, the discussion then documents the existing planning efforts that have been undertaken by MnDOT, various partners and other agencies for EV infrastructure across the state. This includes the Minnesota Electric Vehicle Infrastructure Plans that are part of the NEVI program and other localized plans from public/private partners.



Balancing the relationship between the number of EVs and the associated number of EV chargers needed to meet demand is critical. EVINA will ultimately recommend locations for new EVSE, so building a solid understanding of existing and planned infrastructure is critical to creating a path for efficient and effective recommendations.

5.1 EXISTING CHARGERS

EXISTING CHARGING STATION TYPES AND DISTRIBUTION IN MINNESOTA

As of May 2024, Minnesota had 880 charging stations as identified by [Alternative Fuels Data Center](#) located throughout the state. This is likely not a comprehensive list of all chargers, but the best resource of charging station data publicly available at this time. Existing charging stations are either private stations, public stations, or Tesla stations and range from having one level 2 charger to one or more DC fast chargers (DCFCs). The seven-county Twin Cities metro area has the highest concentration of existing charging stations, the majority of which are public. There are 322 charging stations distributed around the rest of the state, typically located along U.S. Highways or Interstates. **Figure 18** shows existing charging stations in Minnesota by access type and number of ports. **Table 9** and **Table 10** summarizes existing charging station access and types for Greater Minnesota and the Twin Cities metro, respectively based on available AFDC data, which as stated previously, has limited data.

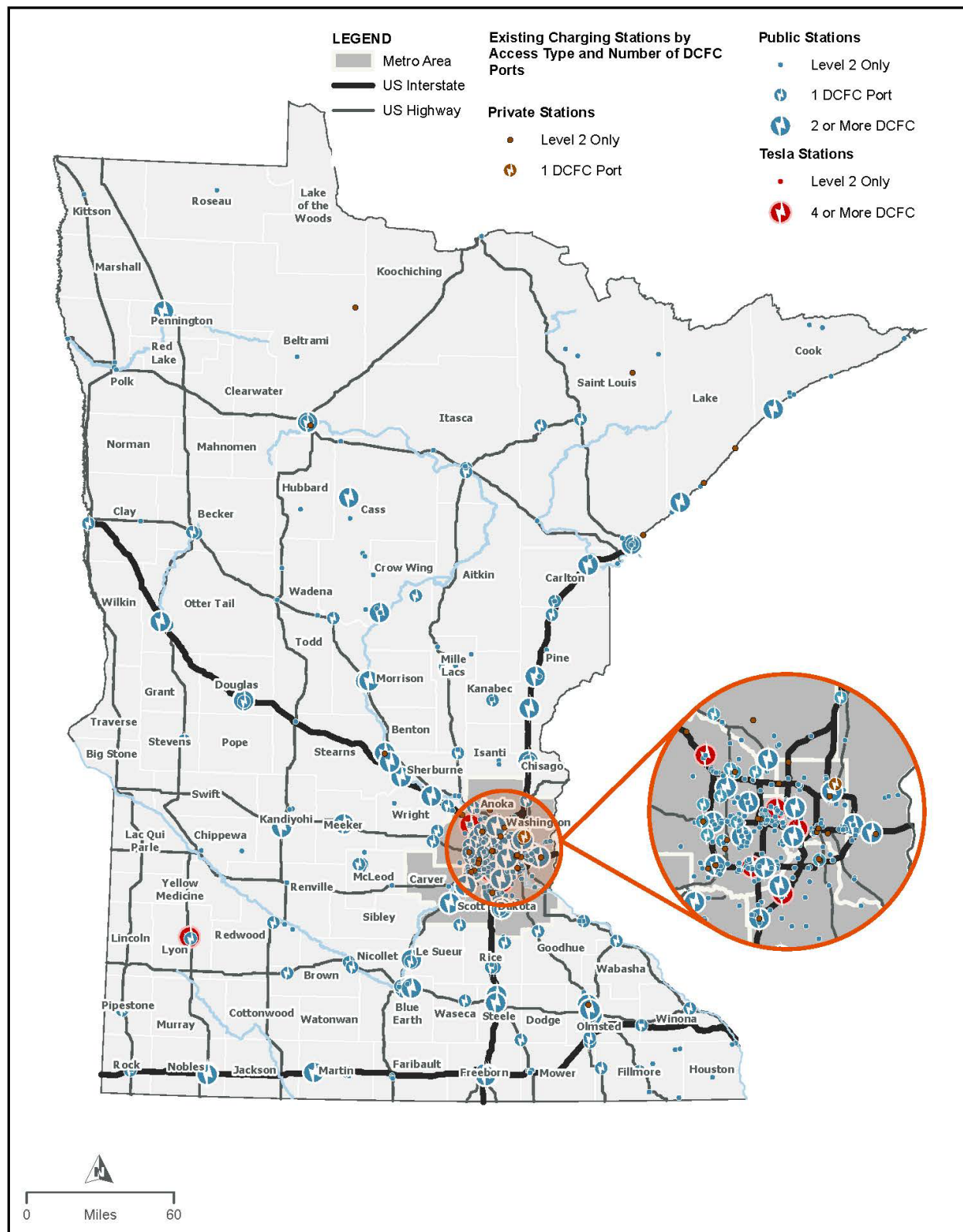
Table 9: Existing Charging Station Locations in Greater Minnesota by Accessibility, AFDC, May 2024

Charging Station Location Type	Private	Public	Tesla	Total
Charging Stations with Level 2 charging only	8	175	26	209
Charging Stations with 1 DCFC	0	60	0	60
Charging Stations with 2 or more DCFCs	0	34	19	53
Total	8	269	45	322

Table 10: Existing Charging Station Locations in the Seven-County Twin Cities Metro Area by Accessibility, AFDC, May 2024

Charging Station Location Type	Private	Public	Tesla	Total
Charging Stations with Level 2 charging only	21	437	37	495
Charging Stations with 1 DCFC	1	27	0	28
Charging Stations with 2 or more DCFCs	0	21	14	35
Total	22	485	51	558

Figure 18: Existing Charging Stations in Minnesota, AFDC, May 2024



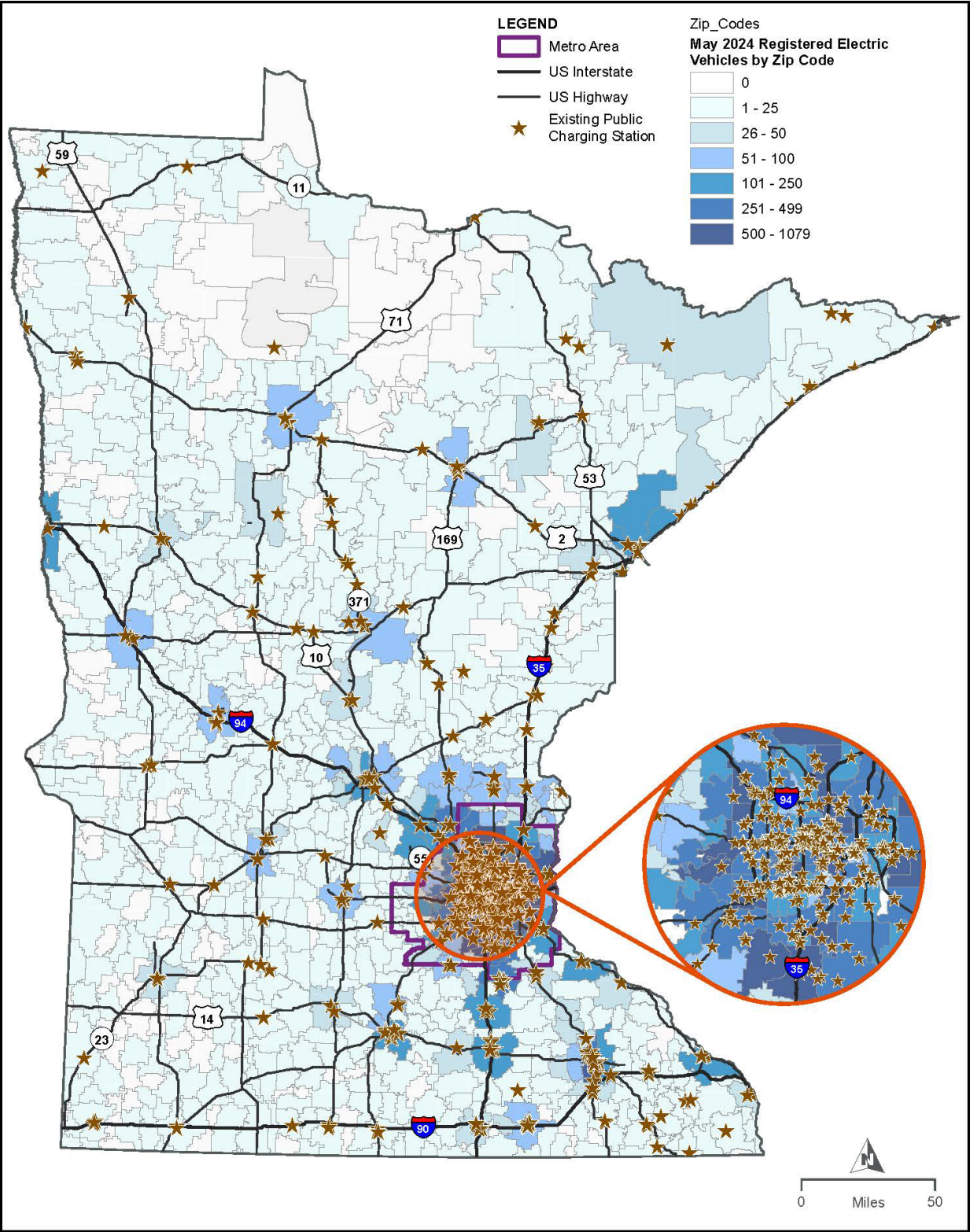


The distribution of electric vehicles to charging stations across the state is helpful to understand where charging stations may not meet charging demand. **Figure 19** shows the concentration of registered EVs per public charging station by zip code in the state. The metro has the highest proportion of EVs to public charging stations with several zip codes between 150-300 EVs per station and a few zip codes at 300-1,000 vehicles per charging station. Many zip codes in Greater Minnesota have 1-25 EVs per charging station. The majority of zip codes outside of the Minneapolis-St. Paul metropolitan region have an EV registered, but no public ports. This can become a concern as EVs would have to travel multiple zip codes to access a public charger should they need one outside of their home. Additionally, some areas of the state, particularly in the northwest, have neither.

A standard ratio of public chargers to EVs has not been adopted at this time. The [International Energy Association \(IEA\)](#) has estimated that there should be a public charger for every 10-15 registered electric vehicles within an area, but this may be aggressive in areas with low adoption rates. Identifying the balance between supplying charging infrastructure in order to reduce barriers to adoption, without oversaturating the market is a delicate analysis. For example, if operating under an assumed ratio of 25 EVs per port, zip codes in the highest concentration classes (seen in **Figure 19**) would still be far more likely to experience significant congestion at public charging stations. The perception of extreme delays and wait time may serve as a barrier to potential future EV use and perpetuate the issue of finding a balanced ratio.



Figure 19: Registered EVs in Minnesota per Public Charging Station by Zip Code, May 2024





5.2 PLANNED CHARGING STATIONS

MNDOT NEVI FORMULA PROGRAM

MnDOT completed their inaugural [National Electric Vehicle Infrastructure \(NEVI\)](#) program planning in 2022. The U.S. Department of Transportation's (USDOT) Federal Highway Administration (FHWA) NEVI Formula Program provides funding to states to strategically deploy EV charging stations and establish an interconnected network to facilitate data collection, access and reliability.

MnDOT is using NEVI funding to add EV chargers to the Alternative Fuel Corridors (AFC) of I-35, I-90 and I-94. The 2023 EV plan identified 18 clusters along I-35 and I-94 containing a total of 57 viable exits for NEVI-funded charging stations and the 2024 EV plan added 8 additional clusters along I-90 and modified some of the clusters from 2023. Through an RFP process, MnDOT identified grantees who will own, operate and maintain the charging stations for a period of 5 years after construction. One location was chosen per cluster. A list of the grantees and additional details about the NEVI program and locations funded can be found on MnDOT's [National Electric Vehicle Infrastructure program in Minnesota](#) webpage.

CHANGES TO NEVI PROGRAM

On February 6, 2025, MnDOT received a memo from US DOT Federal Highway Administration that stated:

"The new leadership of the Department of Transportation (U.S. DOT) has decided to review the policies underlying the implementation of the NEVI Formula Program. Accordingly, the current NEVI Formula Program Guidance dated June 11, 2024 and all prior versions of this guidance are rescinded. The FHWA is updating the NEVI Formula Program Guidance to align with current U.S. DOT policy and priorities, including those set forth in DOT Order 2100.7, titled "Ensuring Reliance Upon Sound Economic Analysis in Department of Transportation Policies, Programs and Activities." The FHWA aims to have updated draft NEVI Formula Guidance published for public comment in the spring. After the public comment period has closed, FHWA will publish updated final NEVI Formula Guidance that responds to the comments received.

As result of the rescission of the NEVI Formula Program Guidance, FHWA is also immediately suspending the approval of all State Electric Vehicle Infrastructure Deployment plans for all fiscal years. Therefore, effective immediately, no new obligations may occur under the NEVI Formula Program until the updated final NEVI Formula Program Guidance is issued and new State plans are submitted and approved. Instructions for the submission of new State plans for all fiscal years will be included in the updated final



NEVI Formula Program Guidance. Since FHWA is suspending the existing State plans, States will be held harmless for not implementing their existing plans. Until new guidance is issued, reimbursement of existing obligations will be allowed in order to not disrupt current financial commitments.”

MnDOT is moving forward with the build out of EV charging through the Round 1 and 2 awards of the NEVI program with a mix of federal and state funds. After FHWA issues new guidance MnDOT will determine how to proceed.

ADDITIONAL FUNDING SOURCES

Additional funding sources for EV charging are guiding the future deployment of charging stations as well. The VW settlement funds administered through the Minnesota Pollution Control Agency (MPCA) and Carbon Reduction Program (CRP) funds through the IJA administered by MnDOT are sources of new chargers in the state. These planned chargers associated with the NEVI clusters are displayed in [Figure 20](#).

VW Settlement

MPCA is using funds from Minnesota’s share of the national Volkswagen (VW) settlement to build charging infrastructure across the state. To date, the MPCA has funded:

2018 (Phase 1):

- 4 DCFC (50 kW charger with a Level 2 backup)
- 25 Level 2 dual port Charging Stations

2023 (Phase 2):

- 41 Level 2 Charging Stations with 2 to 11 ports

In the third and final phase of the settlement planned for 2024-2027, the MPCA has \$1.5 million remaining that is eligible for additional EVSE. [Table 11](#) summarizes planned (not constructed) charging stations in the state as of April 2024.

Table 11: Planned VW Settlement Program Funded Charging Stations Through MPCA, April 2024

Program Phase	Grantee	Location	Type	Access
1	City of St. Paul	St Paul	Level 2	Public
2	Blue Earth Light and Water	Blue Earth	Level 2	Public
2	Blue Earth Light and Water	Blue Earth	Level 2	Public



Program Phase	Grantee	Location	Type	Access
2	City of Shakopee	Scott County	Level 2	Public
2	City of Shakopee	Scott County	Level 2	Public
2	Crow Wing Power Electrical Cooperative	Brainerd	Level 2	Public
2	Douglas County Public Works Dept.	Kensington	Level 2	Public
2	Pope Douglas Solid Waste Management	Alexandria	Level 2	Public
2	Pope Douglas Solid Waste Management	Alexandria	Level 2	Public
2	Red Wing	Red Wing	Level 2	Public
2	ZEF	La Crescent	DCFC	Public
2	ZEF	Luverne	DCFC	Public
2	ZEF	Park Rapids	DCFC	Public
2	ZEF	Granite Falls	DCFC	Public
2	ZEF	Glencoe	DCFC	Public
2	ZEF	Madelia	DCFC	Public
2	Greenlots	Erskine	DCFC	Public

Carbon Reduction Program

Electric vehicle supply equipment (EVSE) is an eligible expense under IJA's Carbon Reduction Program (CRP). [Table 12](#) summarizes the planned charging stations funded with CRP funds MnDOT is aware of as of April 2024.

Table 12: Planned CRP Funded Charging Stations in Minnesota, April 2024

Fiscal Year Funding	Grantee	Location	Type	Access Type
2024	City of Detroit Lakes	Heartland Trailhead	TBD	Public
2024	Otter Tail County	Otter Tail County Govt. Services Center	TBD	Private
2024	City of St. Peter	405 St. Julien St.	Level 2	Public
2024	City of St. Peter	400 W. St. Julien St	Level 2	Private
2024	City of St. Peter	600 S. 5th Street	Level 2	Public
2024	Redwood County	Redwood County Hwy Dept	Level 2 and DCFC	Public
2024	Redwood County	Redwood County Government Center	Level 2 and DCFC	Public



2024	City of St. Cloud	Stearns County History Museum	DCFC	Public
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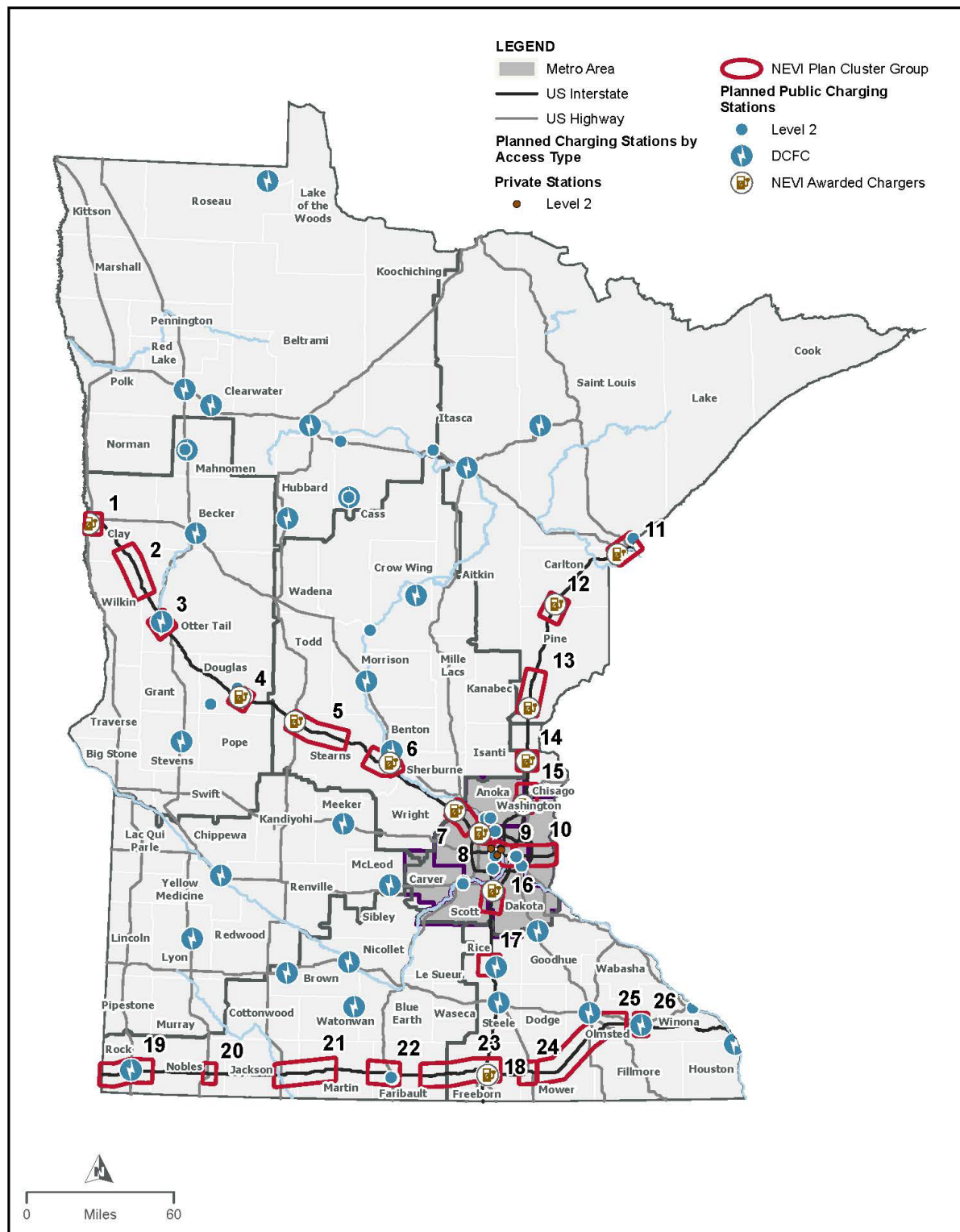
MnDOT is also aware of two DCFC charging stations funded through a federal Rebuilding American Infrastructure with Sustainability and Equity (RAISE) grant planned for installation in 2025 or 2026 at the Avera Medical Center in Marshall, Minnesota. These stations will be publicly accessible.

Native Sun Community Power Development

As described in Minnesota’s 2023 EV plan, [Native Sun Community Power Development](#) has received funding from the U.S. Department of Energy for the Upper Midwest Inter-Tribal EV Charging Community Network which includes the Red Lake Band of Chippewa in Minnesota and the Standing Rock Sioux Tribe in North and South Dakota. The number and locations of chargers planned as part of this program are still being determined, but three public charging stations have been identified:

- Redby Community Center in Redby, MN
- Red Lake Retail Center in Red Lake, MN
- Little Rock Community Center in Little Rock, MN

Figure 20: Planned Charging Stations in the State of Minnesota, MnDOT, 2024





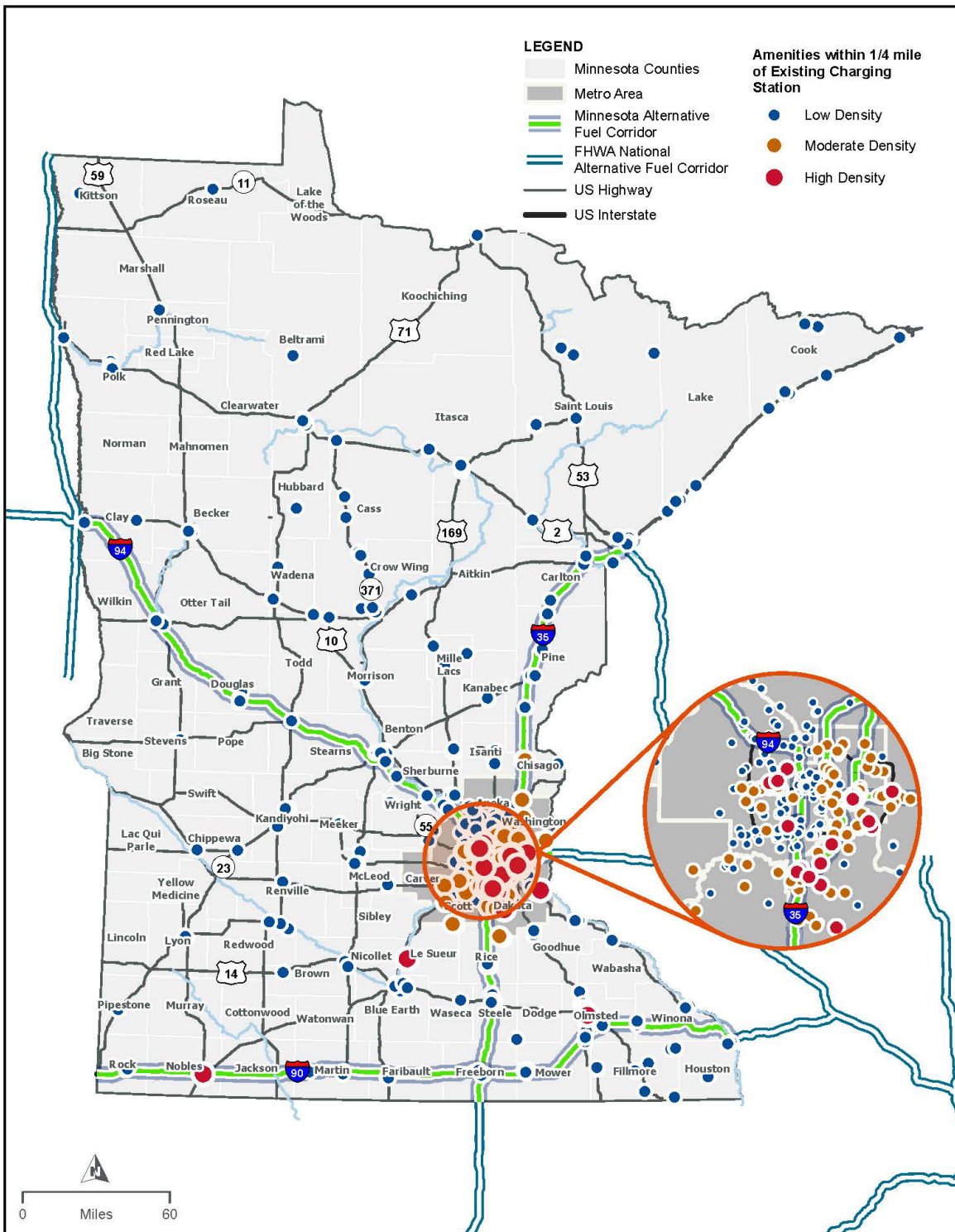
5.3 CHARGING STATION AMENITIES

Public desire for amenities at charging locations emerged as a consistent theme across public engagement conducted for previous Minnesota EV plans. Engagement conducted for the 2022 EV Plan revealed that participants want DCFCs to be easily accessible and near amenities such as restrooms and food and beverage options and to have 24-hour access. An additional round of engagement conducted during the development of Minnesota's 2023 EV Infrastructure Plan revealed that Minnesotans would like the EV charging experience to mimic the experience of 'pumping gas' at a gas station. Casinos were also suggested as good sites for charging locations in rural areas in Minnesota during this round of engagement, as they are open 24/7 and have amenities.

To understand amenities available at or near existing charging stations that could fulfill the charging experience desired by Minnesotans is a complicated exercise. There is not currently a publicly available data source that captures existing retail, commercial, or public and institutional uses. **Figure 21** used what data is currently publicly available hosted by Minnesota's Geospatial Information Office - from suppliers that have opted-in to share their data - to prepare an initial geographical representation of the potential amenities available around existing chargers within a ¼ mile or five-minute walkshed across the state. The ¼ mile walkshed is used to express a reasonable walking distance from a charging station to access an amenity. As shown in the map, charging stations with the highest concentration of amenities within ¼ mile will tend to be along or near Minnesota Alternative Fuel Corridors or in the more metropolitan areas. This assessment will be critical when evaluating the available capacity of the utilities and their planned improvements when developing recommendations for future sites of chargers.

EV Charging Station Guidelines that provide recommendations for available amenities at charging locations will be created in the next phase of EVINA. These guidelines will be utilized in a later phase of the EVINA project when recommendations for new sites for charging infrastructure are developed and consideration to assess the potential amenities within this walkshed is needed.

Figure 21: Amenities within ¼ Mile of Charging Stations Statewide, Minnesota Geospatial Commons, 2024



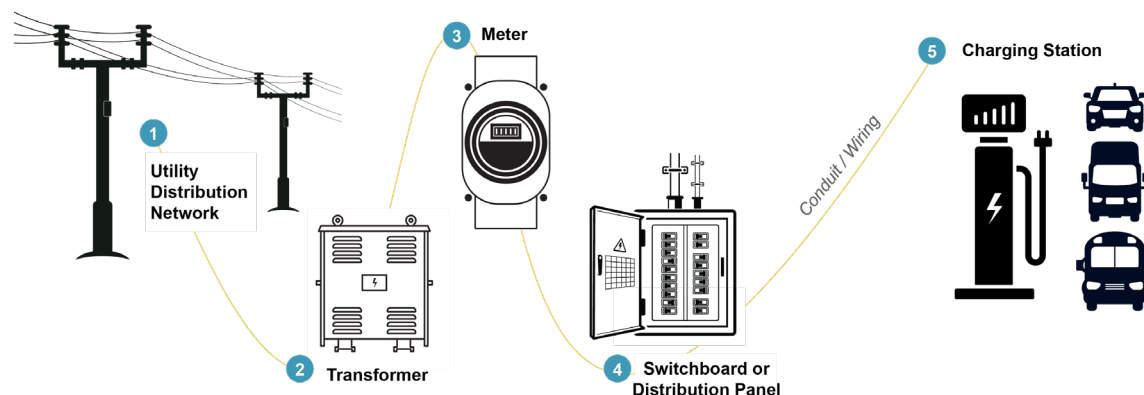
Source: [Address Points, Compiled from Opt-In Open Counties, Minnesota](#)



6 UTILITY INFRASTRUCTURE

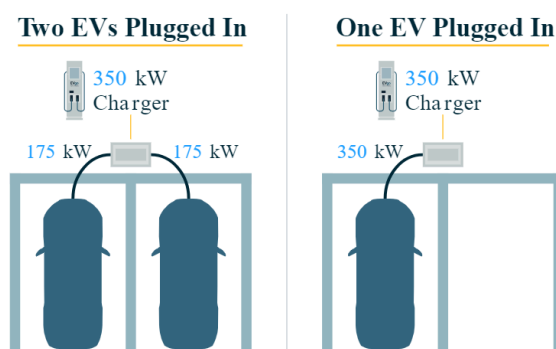
Figure 22 is a general visual representation of the basic service of powering an EV from the utility. It includes a service connection to the utilities distribution system, including a service transformer like you would see on a power pole or pad mounted on the ground, a meter and current transformer, switchgear, distribution panels (can be one cabinet or separate cabinets depending on the charging equipment location needs) and then finally the feed to the charging station itself.

Figure 22: EVSE Diagram



Additionally, different types of charging can occur at the charging station including, single, multiple (simultaneous), sequential and dynamic. Each of these has a different capacity and cost implication.

Figure 23: Example of Simultaneous and Single Charging



When considering utility coordination efforts, the focus is on the transformer needs and location to assure the needs of the project are either met or planned for. Some utilities may not want excess transformer capacity for a project and offer to upsize the transformer as expansion needs occur. It is



also important to keep in consideration that this technology is constantly improving and could look different in the future.

UTILITY PARTNERS

There are 175 electric utilities, comprised of investor-owned utilities, municipal-owned utilities and cooperative utilities, serve Minnesota customers. According to recent [Energy Storage Capacity Study](#), three of these utilities were responsible for roughly 60% of electric sales in Minnesota in 2022 and 10 of these utilities served 77% of Minnesota customers. MnDOT engaged Minnesota's electric grid providers throughout past EV planning processes and has a cursory understanding of where 3-phase power is available along its AFCs. [Figure 24](#) shows the boundaries of all utility providers in the state.

The [Edison Electric Institute](#) (association representing all U.S. investor-owned electric companies) identifies several ways in which electric utilities can and are facilitating a transition to an electric transportation future. These include deploying upgraded infrastructure such as service connection upgrades and new EV supply infrastructure to bring power to EV charging equipment (supplied by the site host, not the utility), as illustrated in the earlier [Figure 22](#), offering electric rates that encourage EV charging at off-peak times of day and requiring charging equipment with managed charging capabilities that allow the charging station to receive demand response signals from the utility.

Coordination with Utilities is critical to achieving a well-planned charging network. Understanding the needs of the utility compared to the needs of the state and users can be started with a conversation based on the following:

Utilities will need to know the initial following information from the applicant:

- Design information for service evaluation: voltage and load of the site
- One-line diagram to understand the equipment arrangement: utility service size, main switchboard size and charger size
- Load Letter (sometimes) / Electrical Service Application: indicates applicant name, address, load size and voltage of the applicant site

MnDOT and other Agencies will need to determine the following to develop projects:

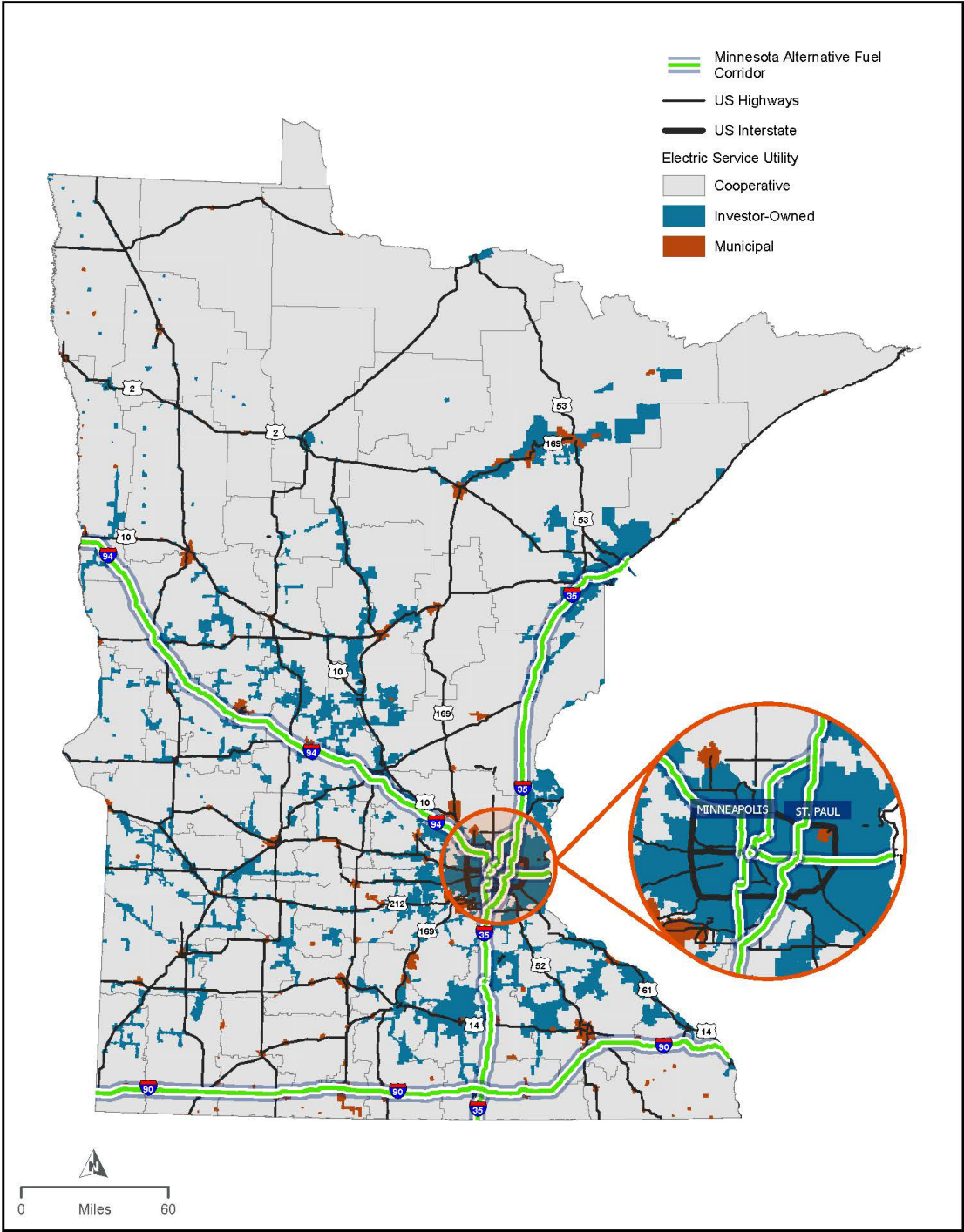
- Capacity available to meet project needs
- Points of contact to coordinate electrical service



- Costs for upgrades from electric company



Figure 24: Minnesota Utility Providers Boundaries, MnDOT, 2024





EXISTING INFRASTRUCTURE

The existing utility infrastructure for all of Minnesota is not readily available as GIS data at this scale is difficult to update and maintain, but information on specific elements can be assessed through different agencies including [IT Services Public Utilities Infrastructure Information](#) and the [Homeland Infrastructure Foundation-Level Data's Open Portal](#).

Initial review of these data sites indicates that there is likely an area of concern in North Central Minnesota (particularly in the tribal areas) that may have lower access to transmission that could be a barrier for EVSE and EV adoption.

There are many ongoing and planned projects to upgrade existing and build new infrastructure. The following highlights some of the major projects underway:

- **Minnesota Energy Connection:** Construction of the Minnesota Energy Connection (MNEC) Project, a new 345-kilovolt (kV) double-circuit transmission line between the existing Sherco Substation in the city of Becker, Minnesota and a new substation (Terminal Substation) proposed near the town of Garvin in Lyon County, Minnesota. Either 171 or 174 miles in length depending on the determined route.
- **Minnesota Power:** Upgrade to high-voltage direct current (HVDC) transmission line from Center, ND to Hermantown, MN – “HVDC Terminal Expansion Capability Project”
- **Xcel Energy:** Fireproofing electric grid infrastructure along with three microgrid projects in Minneapolis to support solar, battery and microgrid technologies in communities of color.

Data from these sources will be considered as gaps and siting recommendations will be analyzed in later phases of the project.

CAPACITY: GENERATION, TRANSMISSION AND DISTRIBUTION

Minnesota plays an important role in electricity generation in the Midwest region. Electricity generation in Minnesota accounts for 29% of total energy use in the state and a significant proportion of the state's electricity generation already comes from renewable sources including wind and solar. 175 electric utilities serve retail customers in Minnesota. In 2015, the state's largest electric utilities, Xcel Energy and Minnesota Power, accounted for nearly 60% of total electricity retail sales in the state according to [Minnesota's 2025 Energy Action Plan](#).

In order to support capacity growth sufficient to meet future demand needs, Minnesota continues to prioritize grid modernization and innovative pricing strategies. Minnesota transmission-owning



utilities previously developed the [Capacity Validation Study](#) in 2009 to identify the impacts of the electric transmission system in the state with the addition of new transmission infrastructure.

Renewable resources, including wind, solar, hydropower and biomass, generate the largest share of Minnesota's electricity. In 2022, renewables accounted for 31% of total in-state electricity net generation, coal-fueled 27%, nuclear power supplied 24% and natural gas contributed 18% according to data from the [U.S. EIA Electricity Data Browser](#).

The Minnesota Public Utilities Commission (MPUC) established six transmission planning zones across Minnesota as shown in [Figure 25](#). The MPUC publishes a [biennial report](#) (most recently in 2023) which identifies the status of transmission systems and possible solutions to anticipated inadequacies that exist in each of these planning zones.

Figure 25: Transmission Planning Zones in Minnesota, Minnesota Electric Transmission Planning, 2024



The 2023 Report identifies future transmission expansion needs to increase reliability in each planning zone as well as a list of completed, ongoing and planned studies and expansion projects to address these needs. As of 2023, there are 14 utilities owning or operating high-voltage transmission lines in Minnesota:



- American Transmission Company, LLC
- Central Minnesota Municipal Power Agency
- East River Electric Power Cooperative
- Dairyland Power Cooperative
- Great River Energy
- ITC Midwest LLC
- L&O Power Cooperative
- Minnkota Power Cooperative
- Northern States Power Company (Xcel Energy)
- Rochester Public Utilities
- Minnesota Power
- Missouri River Energy Services
- Otter Tail Power Company
- Southern Minnesota Municipal Power Agency

Additional information on planned transmission projects and future needs are typically available in individual utility transmission plans online including [Xcel Energy](#), [Minnesota Power Cooperative](#) and [OtterTail Power Company](#). Assessment of the impacts of these and other plans will be necessary when accessing the needs and developing recommendations for siting charging locations. A planning-level assessment of the relationship between these plans and recommendations may be covered in later phases of the EVINA.

COORDINATION WITH UTILITY PARTNERS

Implementation of the recommendations that will be developed as part of this EVINA project will necessitate the continued and even more direct and regular coordination with utility partners in Minnesota. Recommendations for locations and types of chargers can be tailored based on these conversations that understand the potential loads that would be required.



7 REGULATIONS AND POLICIES

Federal, state and local governments all play a role in incentivizing EV adoption. Each of these levels of government can enact rules and regulations that incentivize or reduce/remove barriers to the growth of the EV ecosystem. The following sections highlights some of the more prominent regulations and policies currently in effect as of September 2024.

FEDERAL POLICY

The Inflation Reduction Act

The Inflation Reduction Act (IRA) supports a target of a 40% reduction in carbon emissions by 2030 through investment in domestic clean energy production and manufacturing, lower energy costs and EV tax credits. The price premium for EVs remains a significant barrier for adoption and permanent tax credits for select EV models will help private citizens, companies and municipalities adopt electric vehicles at scale. Challenges with using this credit have been noted which, coupled with a limited used EV inventory, poses an equity challenge to those looking for a lower-priced vehicle to enter the market.

Infrastructure Investment and Jobs Act (IIJA)

The IIJA includes several programs such as the National Electric Vehicle Program (NEVI) program formula funds and the associated discretionary funds of the Charging and Fueling Infrastructure (CFI) program. The NEVI Program provides funding to states to strategically deploy EV charging stations and to establish an interconnected network to facilitate data collection, access and reliability. The CFI funds strategically deploy publicly accessible electric vehicle charging and alternative fueling infrastructure in the places people live and work – urban and rural areas alike – in addition to along designated Alternative Fuel Corridors (AFCs).

This CFI program provides two funding categories of grants: (1) Community Charging and Alternative Fueling Grants (Community Program); and (2) Charging and Alternative Fuel Corridor Grants (Corridor Program). Both Direct Current Fast Charging and Alternative Current Level 2 chargers are eligible under the Community Program. The Bipartisan Infrastructure Law provides \$2.5 billion over five years for this program to strategically deploy EV charging infrastructure and other alternative fueling infrastructure projects in urban and rural communities in publicly accessible locations, including downtown areas and local neighborhoods, particularly in underserved and disadvantaged communities. As part of the second round of funding, up to \$800 million will be awarded to fund CFI Round 2 applications to strategically deploy publicly accessible EV charging and alternative fueling infrastructure in certain locations or along designated AFCs.



Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles

In March of 2024, the U.S. EPA finalized its Multi-Pollutant Emissions Standards for model year (“MY”) 2027 and later light- and medium-duty vehicles. The standards include strict pollution standards for passenger cars, light-duty trucks and medium-duty vehicles for model years 2027 to 2032. Based on EPA projections, the auto sector could meet these standards if up to 56% of all light-duty vehicle sales are electric by 2032.

National Zero-Emission Freight Corridor Strategy

The transition of the freight sector is essential to reducing emissions. In early 2024, the Joint Office of Energy and Transportation and the EPA announced a four-phased strategy to develop a national zero-emission freight-corridor strategy. The phases include:

- Phase 1: Establish priority hubs based on freight volumes.
- Phase 2: Connect hubs along critical freight corridors.
- Phase 3: Expand corridor connections initiating network development.
- Phase 4: Achieve a national network by linking regional corridors for ubiquitous access.

Future federal investments will be prioritized and sequenced in accordance with this national strategy.

STATE POLICIES

Minnesota’s NEVI Program

The U.S. DOT requires MnDOT to update an annual EV Infrastructure Deployment Plan which will describe the state’s strategy and targets for the distribution of NEVI Formula funds in order to meet federal guidance. The NEVI Formula Program guidance (updated in 2023 and 2024) describes federal share and local/state match requirements, requirements for the development of state EV Infrastructure Deployment Plans and project eligibility provisions and minimum standards for charger deployment. More information about can be found at the [National Electric Vehicle Infrastructure \(NEVI\) Program webpage from FHWA](#).

Minnesota EV Toll Credit Pilot Program

Minnesota’s E-ZPass program provides a series of high-occupancy toll lanes and an electronic toll collection system that is available during times of peak congestion across the Minneapolis-St. Paul



Metro Region. The E-ZPass program offers an EV incentive for Minnesota drivers who purchase or lease a new or used EV. More information can be found at the [EZPass news and updates webpage from MnDOT](#).

Minnesota EV Rebate

All Minnesota residents are eligible for a rebate on purchased BEVs and PHEVs, whether it is a new or pre-owned purchase. New vehicles under a \$55,000 price tag are eligible for a \$2,500 rebate and used vehicles under \$25,000 are eligible for a \$600 rebate. More information can be found at the [Electric Vehicle Rebates webpage from the Minnesota Department of Commerce](#).

LOCAL REGULATIONS AND POLICIES

Minneapolis EV Charging Amendment

In 2022, the City of Minneapolis amended updates to zoning laws to incentivize building EV chargers near new developments. Installing EV chargers is now required to obtain “points” for specific categories in the zoning code and new surface parking lots are required to supply a certain number of EV chargers. For smaller developments, where obtaining funding for chargers is more difficult, the updates include a new standard to incentivize building EV chargers on the property. More information can be found at the [Electric Vehicle Charging Amendment webpage from the City of Minneapolis](#).

8 SUMMARIZED CONCLUSIONS & NEXT STEPS

The EVINA existing conditions documented the state of EVs in Minnesota as of 2025, highlighting their current population and market share as well as the existing infrastructure around the state. Additionally, recent and ongoing planning efforts for EV infrastructure around the state were documented to provide a snapshot of current plans to expand charger availability across the state. Projections for future EV population and market share were developed to provide a guide that will be used in the needs assessment analysis to assess the potential demand for chargers and its impact on the existing and planned infrastructure network.

Key takeaways from the EVINA existing conditions include the following:

- In November 2024, there were 65,679 EVs registered in Minnesota.



- In November 2024, EVs make up less than 1% of all light-duty vehicles registered in the state.
- EVs accounted for 4% of original light-duty vehicle registrations in Minnesota in 2023, up from 3% in 2022.
- If current Minnesota targets for EV adoption are met, there would be 3.4 million EVs in 2030.
- Minnesota has 880 charging stations located throughout the state.
- As EV ownership expands, planned and programmed EV chargers will need to increase to meet projected demand.

With the baseline for the EV infrastructure network defined in EVINA existing conditions and using the forecasts assumptions approved by MnDOT, the next step in EVINA will be to:

- Develop a guideline for EV charging in the state collaboratively with Minnesota agencies and stakeholders.
- Assess gaps between the existing conditions and proposed standard of service to determine the amount, location and type of infrastructure needed to meet future demand based on EV adoption projections.
- Develop recommendations and a supportive interactive mapping tool to guide EV charging infrastructure planning within Minnesota.

Appendix B

Community Engagement Summary





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1 INTRODUCTION

Transportation is the largest contributor to greenhouse gas (GHG) emissions in Minnesota. One practice to reduce GHGs from transportation is to transition away from internal combustion engine (ICE) vehicles to electric vehicles (EVs). Minnesota is preparing for the shift to EVs to meet statewide carbon reduction and electric and zero-emission vehicle targets as identified in the [2022 Statewide Multimodal Transportation Plan \(SMTP\)](#) and the [2022 Climate Action Framework](#).

The Minnesota Department of Transportation (MnDOT) launched the Minnesota Electric Vehicle Infrastructure Needs Assessment (EVINA) project to guide how and where to select and prioritize Electric Vehicle Supply Equipment (EVSE) investments across the state. EVINA takes the next step from previous planning efforts toward developing a reliable Zero Emissions Vehicle (ZEV) fueling and charging network across the state's urban, rural, and major corridor roadways. EVINA focuses on light-duty vehicles (LDVs) and associated EVSE.

EVINA outlines the methodology, engagement efforts, analysis and recommendations for a reliable charging network across the state's urban and rural corridors. Ultimately, EVINA guidance will provide more consistency in the charging experience for EV drivers in Minnesota by offering a predictable framework to guide future EV infrastructure development, including station locations, port count and station amenities.

The following outlines the EVINA engagement efforts conducted in 2024 and 2025 and the resulting community feedback. The project team utilized this input, in conjunction with technical data, to inform their recommendations, gaining crucial community insights into priorities and what people would like to see at new EV charging locations. These engagement activities also served to educate the public on EVs and to communicate MnDOT's vision for the future of transportation in Minnesota. This targeted engagement and increased EV awareness contributes to MnDOT's target of promoting EV adoption and engaging with previously underrepresented communities throughout the state.

2 2024 ENGAGEMENT

EVINA public engagement began in the summer of 2024 with the target of gathering general public opinion about EVs. The target of this first phase of engagement was focused on listening and discovery to help inform the proposed scenarios in collaboration with the technical data being collected. From May to July 2024 a number of engagement activities took place including creation

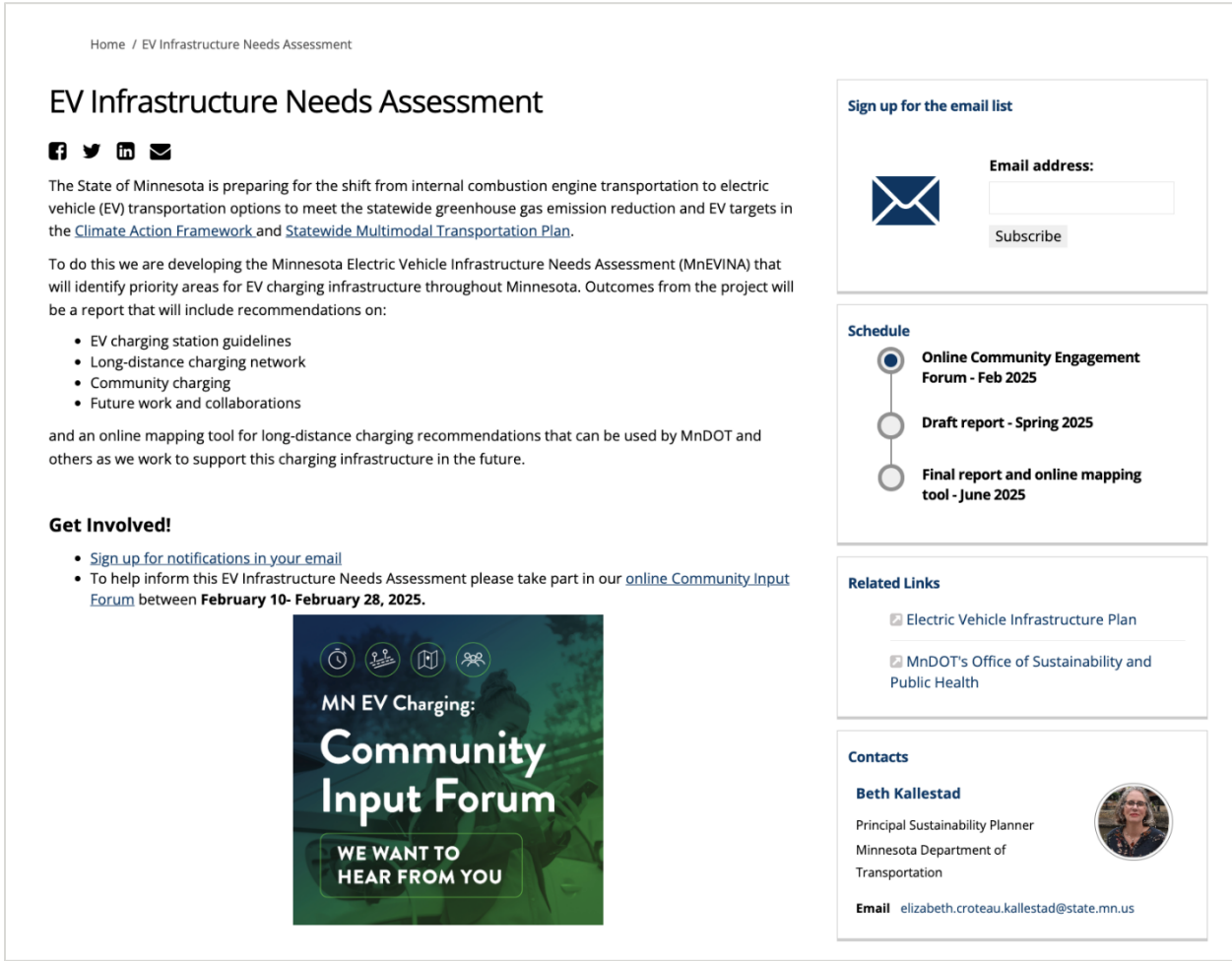


of a dedicated MnDOT Let’s Talk Transportation webpage, an online survey, social media posts with calls to action, interviews and attendance at community events.

2.1 LET’S TALK TRANSPORTATION ENGAGEMENT PLATFORM

To create one source of information for the EVINA project, a Let’s Talk Transportation (LTT) page was created on MnDOT’s webpage. This webpage (talk.dot.state.mn.us/mnevina) contained an overall description of the project, a place to sign up for GovDelivery email newsletters, a schedule, links to related content, contact information and any timely updates or opportunities to participate in providing feedback.

Figure 1: Screenshot of EVINA “Let’s Talk Transportation” webpage



During the main public engagement period for EVINA (July 2024 to February 2025) the Let’s Talk Transportation (LTT) EVINA webpage had approximately 3,700 visitors. Most of the pageviews and visitors occurred in July 2024, which coincided with promotion of the first survey and launch of the LTT page.



Of those 3,700 visitors, just over 3,000 actively engaged with the LTT webpage by either visiting multiple project pages or interacting with a tool. More than 550 people visited the site's interactive map during engagement in 2024, with over 300 people placing a pin showing where they would like to see an EV charging station. Participants also had the opportunity to leave additional feedback, with 355 people adding additional context to their locations.

Additionally, 1,500 people clicked on the survey page when it was live in July and August 2024, with a maximum rate of 337 visitors per day.

2.2 ONLINE SURVEY

As part of that engagement, a survey was conducted to better gauge people's understanding and opinions of EVs as well as how they perceived barriers and benefits to driving an EV. The survey was translated into Spanish, Somali and Hmong.

The survey was open to the public from June 4 to August 16, 2024. This survey was administered through MnDOT's Let's Talk Transportation platform and promoted on social media. The EVINA survey questions can be found in Attachment A of this document.

SURVEY RESULTS

The survey garnered 1,479 visitors to the website, with 880 participants completing the survey. The survey consisted of two tracks with one track asking questions to those who either own/leased an EV or would like to in the future and the other track shortened for those who do not own/lease an EV and would not consider owning/leasing in the future.

Of the respondents, a majority were directed towards the first track, which provided a series of questions about preferences and usage. This included approximately 45% of respondents who either currently owned or leased an EV and approximately 27% who would like to or plan to own or lease an EV in the future.

The remaining 28% of respondents did not own/lease an EV and said they would not consider it in the future. These participants were asked about barriers to owning/leasing an EV and their current vehicle usage.

The survey participants were fairly evenly distributed across all categories in terms of typical daily driving distances and age ranges. However, most respondents identified as white with a college graduate education.

Of those that were not interested in owning/leasing an EV, nearly 84% said that they would still not consider it if better and faster EV infrastructure were in place. The top barriers to owning/leasing an



EV included a lack of charging stations, vehicle range, price of an EV, limited capabilities (off-road, snow-friendly, towing/hauling, etc.) and charging time.

In the second group of respondents that either owned/leased an EV or would like to, the top barrier by far was that there are not enough charging locations near their home or common destinations where they work or grocery shop. Other top barriers to owning/leasing an EV included existing EV charging stations taking too long or being in use when needed, the cost of an EV, a lack of services near charging stations and EV battery ranges being too short for their needs.

The priority for this group was geographic areas conducive to simple EV charger installations. This was followed by a near-equal preference for focusing on either urban or rural locations. Notably, they also strongly advocated for MnDOT to prioritize addressing gaps in the current charging network followed by tourist destinations. They also said they were most likely to stop to charge an EV at a Park-and-Ride or transit hub, followed by educational centers, visitor centers, public buildings, entertainment locations, parks, gas stations and retail businesses with public parking. The most important amenities desired included lighting, restrooms, food or beverage and shade or shelter.

2.3 SOCIAL MEDIA

To promote the survey, paid social media ads were run on MnDOT’s Facebook page. Zip codes were chosen by cross referencing EV registration numbers with previous results from the previous National Electric Vehicle Infrastructure (NEVI) survey conducted by MnDOT. Areas chosen were previously under engaged and had higher EV registrations.

Table 1: Social Media Zip Codes for Promotion

Community	Zip Code
St. Cloud	56301
Alexandria	56308
Willman	56201
Princeton	55371
Elk River	55330
Faribault	55021
Owatonna	55049/55060
North Branch	55056
Cambridge	55008
Mankato	56001/56003



Community	Zip Code
Fairmont	56031
Albert Lea	56007
Pine Island	55963
Red Wing	55066
Cannon Falls	55009
Brainerd	56401/56425
Pine River	56474
Walker	56484
Winona	55987
Rochester	55901/55902/55904/55906
New Ulm	56073
Willmar	56201
Paynesville	56362
Benson	56215
Fergus Falls	56537
Detroit Lakes	56501
Dodge Center	55927
Austin	55912
Waconia	55387

The two Facebook ads ran in separate campaigns from July 22, 2024, to August 12, 2024.

Several graphics were created to generate interest and motivate people to click and take the online survey. These ads featured people engaging with EVs in an effort to humanize the material and make it feel less technical.

Figure 2: MnDOT Survey Facebook Advertisement 1



Figure 3: MnDOT Survey Facebook Advertisement 2



Table 2: Campaign Feedback Results

Campaign Dates	Reach	Impressions	Engagements	Link Clicks
July 22-31, 2024	13,063	22,778	496	345
August 1-14, 2024	8,272	14,774	244	151

Key:

- Reach – total number of unique users who see the content
- Impressions – total number of times the content is displayed, whether was clicked on or not
- Engagements – total number of times users interact with the content
- Link Clicks – total number of users who actively clicked a link

SOCIAL MEDIA FEEDBACK

The paid Facebook ads that were part of the promotion of the survey generated a lively conversation and comments from people interacting with the posts. Several themes came up during these discussions, which shed light on public opinion around EVs.



There was some confusion by the public about the role that MnDOT plays in the planning and funding of EV infrastructure. Several respondents perceived MnDOT as being the owner of new EV charging stations rather than a distributor of already received government funds.

People also asked basic financial questions about EVs such as:

- How much does it cost to charge your car fully?
- Will this affect my electric bill?
- What is the ongoing maintenance cost of an EV?
- Is the State's EV regulatory surcharge enough of a contribution to help maintain Minnesota's roads?

Additionally, there were some concerns and barriers raised during these conversations.

- What is the grid capacity of our EV infrastructure?
- Who is responsible for maintaining the EV infrastructure system?
- Is there any protection against vandalism?
- Can EVs operate reliably in Minnesota's cold winters?

Finally, some respondents shared benefits they had experienced by driving an EV.

- There are far less maintenance costs (no oil changes, transmission fluid changes, etc.)
- You can charge your car during off-peak hours for an even lower cost.
- These would be a great amenity near restaurants and shopping areas.
- Adding EV charging stations would help bring expanded growth to tourist areas.
- EV charging stations are good for business since they create a captive audience.

The engagement on these social media ads shows there is an enthusiasm for more community conversation about the future of the EV charging network as well as more education about how the cars and systems work. Fostering these conversations could lead to a greater comfort in accelerating the adoption of electric vehicles in Minnesota.

2.4 EVINA MEETINGS ATTENDED BY MNDOT

MnDOT Staff partnered on the EVINA project by attending community events and speaking to relevant groups. This partnership leveraged resources and allowed for more engagement by the project team.



Caption: Members of the public interact with MnDOT's EVINA table at the World Refugee Day event, June 22, 2024.

Table 3 summarizes the events attended by MnDOT staff in 2024.

Table 3: Events Attended by MnDOT Staff:

Stakeholder Event	Stakeholder Type	Meeting Date	Approx # of Attendees
World Refugee Day	public	6/22/2024	50
Shakopee Ride & Drive	public	6/24/2024	15
Itasca-Mantrap Powered Up workshop	public	7/26/2024	100
Regional Development Organization (RDO) Climate & Energy Group	RDO staff	7/25/2024	15
RDO Quarterly meeting	RDO transportation staff	8/8/2024	20
Beltrami Ride & Drive	public	10/3/2024	75
Fair for the Future	Fresh Energy Event	10/9/2024	100 (800 people at event, about 100 stopped by table)



Stakeholder Event	Stakeholder Type	Meeting Date	Approx # of Attendees
MN Tribal Environmental Committee	Tribal national environmental staff	11/12/2024	40
Drive Electric Minnesota	Utilities, Nonprofits	11/14/2024	31
MnDOT DBE Workforce Collaborative	workforce development, contractors	11/20/2024	30
RDO Climate & Energy Group	RDO Staff	11/21/2024	15
Charging Smart Cities	City EV staff	11/21/2024	12
Southwest Area Transportation Partnership (ATP)	City/County Transportation staff	12/6/2024	40
West Central ATP	City/County Transportation staff	12/6/2024	15
Fargo-Moorhead Metropolitan Planning Organization (MPO)	MPO, City/County staff	12/12/2024	45
Northwest Regional Development Commission/ATP	City/County Transportation staff	12/16/2024	16

2.5 EVINA MATERIALS

Several different materials were created for MnDOT staff to use in their engagement activities including a presentation, a postcard and several engagement boards. As the public engagement effort was a partnership between MnDOT staff and the consultants, the target was to create evergreen materials that would be flexible for use in a variety of spaces. This allowed for a flexible and efficient approach to engagement and enabled MnDOT staff to join many existing events to engage on EVINA.



Figure 4: Front of Postcard

Preparing for the future of EV charging in Minnesota

WHAT IS THE ELECTRIC VEHICLE INFRASTRUCTURE NEEDS ASSESSMENT?

Given the expected growth in EVs and the need for more charging stations across Minnesota, MnDOT is devising and prioritizing plans for EV infrastructure needs and growth to meet the goal of 20% passenger EV adoption by 2030.

✓ A mix of federal, state and private funds will be used to start building an EV charging network in the state. MnDOT will receive \$68 million in federal funds over 5 years to get started.

WHERE DOES MINNESOTA NEED EV CHARGERS?

YOUR INPUT MATTERS

MnDOT will install chargers along I-94 and I-35. Once those charging stations are built we can look to other areas of the state. We want to hear from you about your needs and where the chargers should go.

WHAT'S COMING NEXT

MnDOT is developing a statewide vision for a charger network through major roadways that best fits the needs of Minnesota's diverse communities and geographies. We will use your feedback to build a statewide plan and will bring this plan back to you for additional input and changes.

WHY EVINA?

- Identify priority areas for EV charging infrastructure
- Encourage economic development and job growth
- Select types of public locations to place charging stations
- Guide the state and partners on EV charging priorities

Figure 5: Back of Postcard

Minnesota's Draft EV Charging Network

WHAT IS THE DRAFT EV CHARGING NETWORK?

A network of roadways within Minnesota that will support EV charging across the state.

- Provides coverage across the state
- Connects to other networks
- Serves all of Minnesota's communities

YOUR INPUT

- Take the survey
- Join an engagement session
- Sign up for email alerts

STAY CONNECTED

Scan this QR code with your phone or visit our website to sign up for email alerts, learn more about the program and share input!

TALK.DOT.STATE.MN.US/MNEVINA

LEGEND

- Out of State AFC
- In-State AFC
- Potential Future Network



Figure 6: EVINA Overview Presentation Board

Preparing for the future of EV charging in Minnesota

m DEPARTMENT OF TRANSPORTATION

WHAT IS THE ELECTRIC VEHICLE INFRASTRUCTURE NEEDS ASSESSMENT?

Given the expected growth in EVs and the need for more charging stations across Minnesota, MnDOT is devising and prioritizing plans for EV infrastructure needs and growth to meet the Minnesota goal of 20% passenger EV adoption by 2030.

WHY EVINA?



Identify priority areas for EV charging infrastructure.



Select types of public locations to place charging stations.



Encourage economic development and job growth.



Guide the state and partners on EV charging priorities.

WHERE DOES MINNESOTA PLAN TO BUILD CHARGERS?

YOUR INPUT MATTERS

MnDOT will install chargers along I-94 and I-35. Once those charging stations are built we can look to other areas of the state. We want to hear from you about your needs and where the chargers should go.

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MnDOT is developing a statewide vision for a EV charger network through major roadways that best fits the needs of Minnesota's diverse communities and geographies. We will use your feedback to build a statewide plan and will bring this plan back to you for additional input and changes.



Scan this QR code with your phone or visit our website to sign up for email alerts, learn more about the program and share input!

[TALK.DOT.STATE.MN.US/MNEVINA](https://talk.dot.state.mn.us/mnevina)

A mix of federal, state and private funds will be used to start building an EV charging network in the state. MnDOT will receive **\$68 million** in federal funds over 5 years to get started.



Figure 7: EVINA Information Presentation Board



What is Electric Mobility?

Electrifying transportation includes cars and much more.

ELECTRIC VEHICLES (EVs)
EVs use a battery to power an electric motor, which generates zero tailpipe emissions and can cost less to operate and maintain.
• Fully electric vehicles, sometimes called battery electric vehicles (BEVs), use only electricity to power the vehicle. These vehicles typically have a travel range of 150 to 400 miles. As of October 2022, there were almost 20,000 BEVs registered in Minnesota.
• Plug-in hybrid electric vehicles (PHEVs) combine a smaller battery for local or shorter trips with a gasoline-powered engine to make longer trips. There are more than 10,300 PHEVs on the road in Minnesota.

E-BIKES
E-bikes are an increasingly popular alternative to traditional bicycles, offering the same benefits of cycling with a motorized system that makes the ride easier, especially when traveling up hills or over longer distances.

EV RIDESHARE
Companies that allow passengers to reserve a ride in a private vehicle, like Lyft and Uber, have set goals to become zero-emission by 2030, and they offer incentives for drivers to switch to EVs.

EV CARSHARING
Members pay to use an EV when needed, with pricing by the minute, hour, or day, including discounts for low-income households. Evis Carshare is an all-electric carshare service operating in portions of Minneapolis and Saint Paul that offers a convenient, cost-effective alternative to owning a vehicle.

SCOOTERS
Similar to bike sharing, companies like Bird, Lyft, Lime, Spin, and Vao operate electric scooter rental programs in local communities for short trips. Many of these companies offer discounted rates for qualified users with limited incomes.

SCHOOL BUSES
Electric school buses create a healthier environment for students by improving air quality and reducing noise, and they lower fuel costs for schools. Osseo Area Schools, which serves part of Brooklyn Park, uses three electric buses and was one of the first districts in Minnesota to add electric school buses.

TRANSIT
In addition to the electric light rail system, Minnesota is now testing electric buses, including on Metro Transit's C Line. In the immediate future, Metro Transit plans to purchase more.

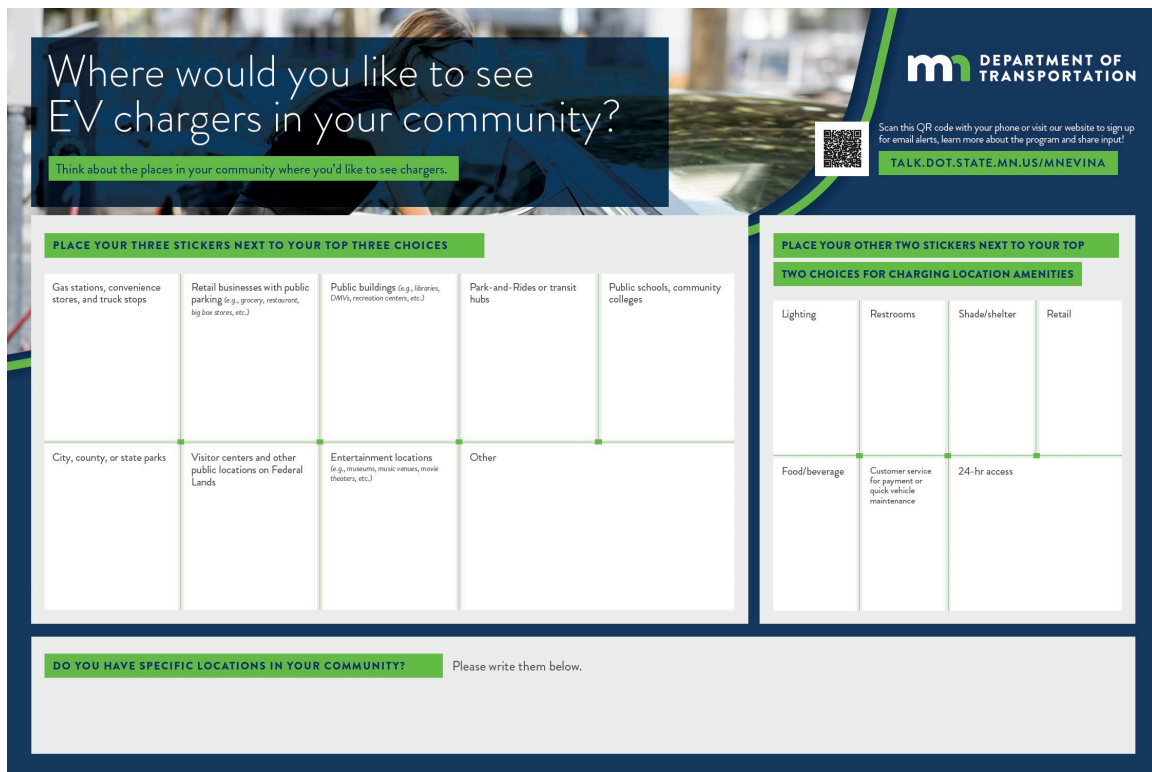
HEAVY-DUTY VEHICLES
Other medium- and heavy-duty EV options are becoming available for delivery services, waste hauling, and a variety of other commercial needs.

RECHARGING ELECTRIC VEHICLES
EVs need to be plugged in to charge the battery. Many EV drivers can use a regular household power outlet (120 V) to plug in when parked at home or work.
Drivers traveling farther, or using larger batteries, may benefit from a higher voltage (240 V), referred to as Level 2 charging. This is common in public charging locations and can be installed at home.
The fastest recharging comes from direct current (DC) power supplies. This type of charger is more expensive.
To make EVs a viable option for everyone, charging stations are needed in many places, including public locations, fleet facilities, workplaces, and homes.

Learn more about electric vehicles and charging at: CleanAirChoice.org and at AFDC.energy.gov

Scan this QR code with your phone or visit our website to sign up for email alerts, learn more about the program and share input!
TALK.DOT.STATE.MN.US/MNEVINA

Figure 8: EVINA Presentation Board with Interactive Element



Where would you like to see EV chargers in your community?

Think about the places in your community where you'd like to see chargers.

Scan this QR code with your phone or visit our website to sign up for email alerts, learn more about the program and share input!
TALK.DOT.STATE.MN.US/MNEVINA

PLACE YOUR THREE STICKERS NEXT TO YOUR TOP THREE CHOICES

Gas stations, convenience stores, and truck stops	Retail businesses with public parking (e.g., grocery, restaurant, big box stores, etc.)	Public buildings (e.g., libraries, DMVs, recreation centers, etc.)	Park-and-Rides or transit hubs	Public schools, community colleges
City, county, or state parks	Visitor centers and other public locations on Federal Lands	Entertainment locations (e.g., museums, music venues, movie theaters, etc.)	Other	

PLACE YOUR OTHER TWO STICKERS NEXT TO YOUR TOP TWO CHOICES FOR CHARGING LOCATION AMENITIES

Lighting	Restrooms	Shade/shelter	Retail
Food/beverage	Customer service for payment or quick vehicle maintenance	24-hr access	

DO YOU HAVE SPECIFIC LOCATIONS IN YOUR COMMUNITY? Please write them below.

Figure 9: EVINA Presentation Board with Interactive Element 2



2.6 HOURCAR INTERVIEW SUMMARY



In the [HOURCAR](#) Interview Patty Day (Principal Consultant, Stardust Communications) and Paul Schroeder (President and CEO of HOURCAR) discussed the need for improved electric vehicle



(EV) infrastructure to address range anxiety and encourage widespread adoption. Paul emphasized the importance of corridor charging, particularly in disadvantaged communities, and highlighted operational challenges of keeping chargers consistently available. They discussed the potential of expanding car sharing in rural areas and the need for a fleet card for electric vehicle charging. They explored user experience and fleet management of car sharing services and provided insights on usage patterns, including most trips being for work or medical appointments. They also discussed the electric vehicle charging infrastructure in Minneapolis and St Paul, with a focus on dedicated charging networks and seasonal usage patterns.

The following highlights key points of the conversation held as part of this interview. Suggested Action Items

- HOURCAR has applied for and will re-apply for Charging and Fueling Infrastructure funding from the Federal Highway Administration to support expansion.
- MnDOT should consider pairing charging infrastructure investments in disadvantaged communities with funding for electric vehicle car sharing programs to improve access.
- MnDOT could explore the feasibility of a "fleet card" system for EV charging.

FEEDBACK RECEIVED FROM HOURCAR

Improving EV charging infrastructure for long-distance travel

- Patty and Paul discussed range anxiety as a major barrier to EV adoption, particularly for long trips like visiting friends in Wisconsin.
- There is a need for corridor charging to address this issue, as it would provide more convenient and faster charging options for EV owners.
- On average, someone will rent a two-way HOURCAR vehicle for eight hours, however some rent these vehicles for days.

Creating a network for electric vehicle charging infrastructure

- There are barriers to EV adoption in Minnesota, including lack of infrastructure.
- HOURCAR advocates for a universal charging card for electric vehicles to enhance convenience and accessibility, like a ZEF network card. Currently, this is not available and makes charging vehicles more difficult. Paul noted the lack of an interoperable payment system for EV charging, like the Wex card used for gas stations. This lack of a universal system creates challenges for car sharing companies like HOURCAR, who currently rely on a combination of charge cards and reimbursement processes. A fleet card system could simplify operations and enhance convenience for EV users.

Car sharing and electric vehicle charging solutions



- Disadvantaged communities face barriers to using car share service for intercity travel.
- There are one-way and round-trip car sharing options, with round-trip service mostly used for longer trips and one-way mostly for errands, medical appointments and childcare.
- Paul explained the difference in pricing between one-way and round-trip car sharing, with round-trip being a cheaper option for longer trips.

Electric vehicle charging reliability and market dynamics

- HOURCAR shared their initial success story of using electric vehicles in a two-way fleet, despite initial concerns about users understanding of how to charge the vehicle.
- Chargers have notoriously low reliability in public space.
- Market dynamics are challenging for charging providers. Charging providers do not make money from charging EV vehicles and would need to subsidize revenue by adding complementary services, like gas stations.

Electric vehicle charging infrastructure and user experience

- Gas stations make money on transactions, not electricity so charging network providers need to find other ways to make money.
- HOURCAR's approach to charging infrastructure for round trip, two-way electric vehicles is to install dedicated chargers, not available to the public, to ensure adequate charging. There are additional public chargers at these stations.
- HOURCAR incentivizes drivers to leave the vehicles charging by adding a future credit to their account.
- There are challenges with initiating charge and missing additional steps, and how their company incentivizes people to park at charging stations. The use of the word "charge" may be confusing since to most people it implies they only need to plug it in. Using words like fueling might help drivers understand the process better.

Electric vehicle charging infrastructure and adoption in Minnesota cities

- St Paul and Minneapolis have 70 public EV charging stations, with 38 in St Paul and 32 in Minneapolis.
- The city's affordable electric vehicle rentals with charging infrastructure could help low-income residents access transportation.
- Familiarity drives adoption, making electric vehicles more likely to be purchased.
- Two-way vehicles get used 2-3 hours at a time, with one-way trips being more frequent and usually less than an hour each time.

Expanding electric vehicle car sharing service, prioritizing high-density areas



- The company has doubled its fleet of electric vehicles from 2021 to now, with 171 one-way vehicles and 32 two-way vehicles in the fleet.
- As a community-based nonprofit, the company would need municipal or government investment in both cars and charging infrastructure to expand its network of EV charging statewide.
- Prioritizing high density areas for car sharing services is crucial due to potential for more users and destinations.

Rural car sharing feasibility

- There is potential for car sharing in rural areas with limited public transportation options.
- HOURCAR has explored expanding to Bemidji or Duluth.
- It would require a municipal partner to subsidize the expansion, to help cover the cost of the EV vehicles and the EV charging infrastructure.
- Expansion would require dedicated level two charging stations on a one-per-vehicle basis, with some DC fast charging available.

Usage patterns

- About 20% of HOURCAR users are heavy users, using the service multiple times a month.
- The remaining users check out an HOURCAR EV occasionally, and some keep the membership as "mobility insurance."
- People use the service for a variety of things.
 - 40% of users report using the service for work
 - 50% of users report using it for medical appointments
 - Approximately 70% of users report it for grocery shopping and other household needs. People also use it to get to and from childcare and other use cases.

Seasonal changes in transportation usage and electric vehicle range

- Winter vehicle miles travelled (VMT) across all modes, including car sharing, goes down in Minnesota due to seasonal patterns.
- While the winter range of EVs drops, there is less demand during that time.
- Hot weather expands EV range, which matches demand for the number of EV trips and the distances travelled.

Electric vehicle charging infrastructure

- Level 2 chargers are moderately fast, taking 6-8 hours to fully charge a depleted battery.
- DC fast chargers are available in the network, but demand charging isn't a huge part of their logistic strategy due to long charging times.



Car sharing in disadvantaged communities

- MnDOT should consider the potential negative externalities of charging car sharing in low-income communities, such as the inability to afford EV vehicles or vandalism.
- Simply providing charging infrastructure in these communities could lead to gentrification and may not be beneficial to residents.
- Providing shared electric vehicles would allow more people to have the experience of driving an EV, making them more likely to consider purchasing one in the future.
- Installing a car sharing EV program would make clean mobility more accessible to these communities.

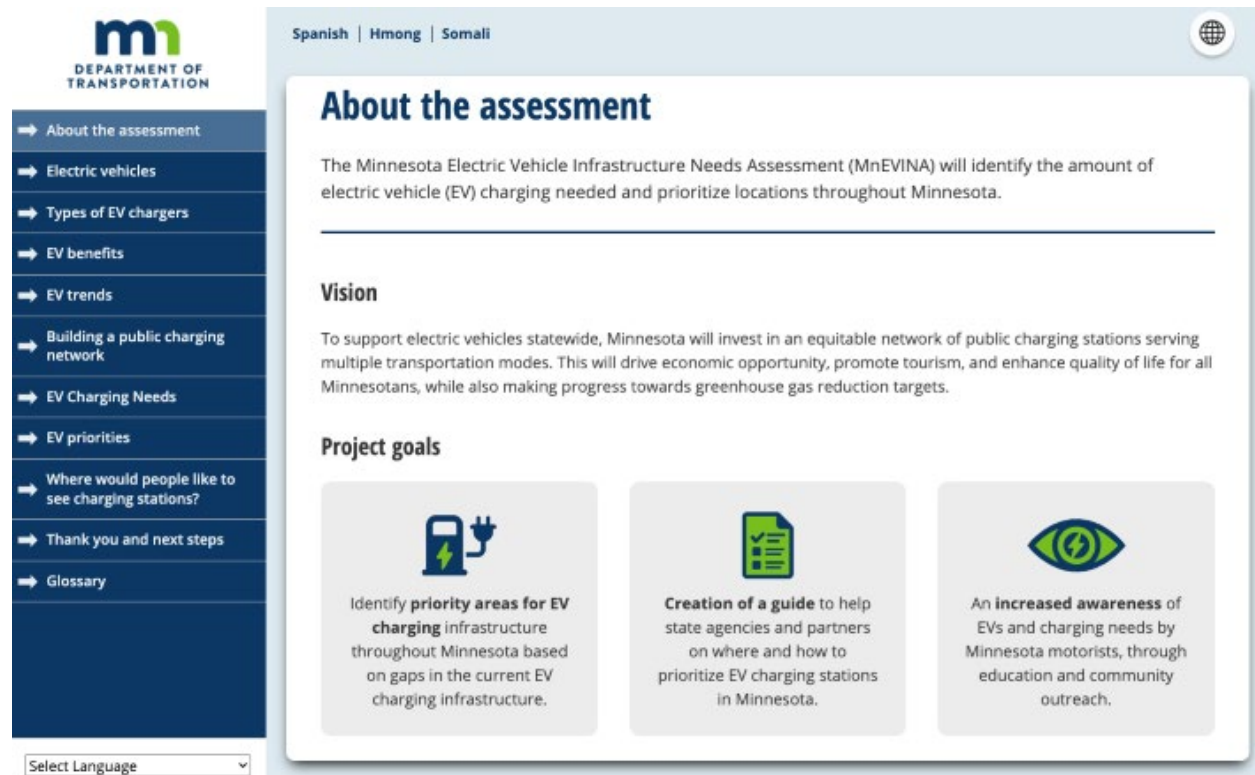
3 2025 ENGAGEMENT

Engagement efforts in 2025 included a community input forum, attendance at community events, and targeted conversations facilitated by Community Based Organizations.

3.1 INFORMATION & COMMUNITY INPUT FORUM

After the technical team completed research on the existing EV conditions in Minnesota, the focus turned to asking the public what their priorities were for investing in EVs. In February 2025, the project team launched the EVINA Information & Community Input Forum, an interactive webpage (www.mnevina.com) designed for people to leave feedback on priorities and locations.

Figure 10: Screenshot of the EVINA Community Input Forum Website



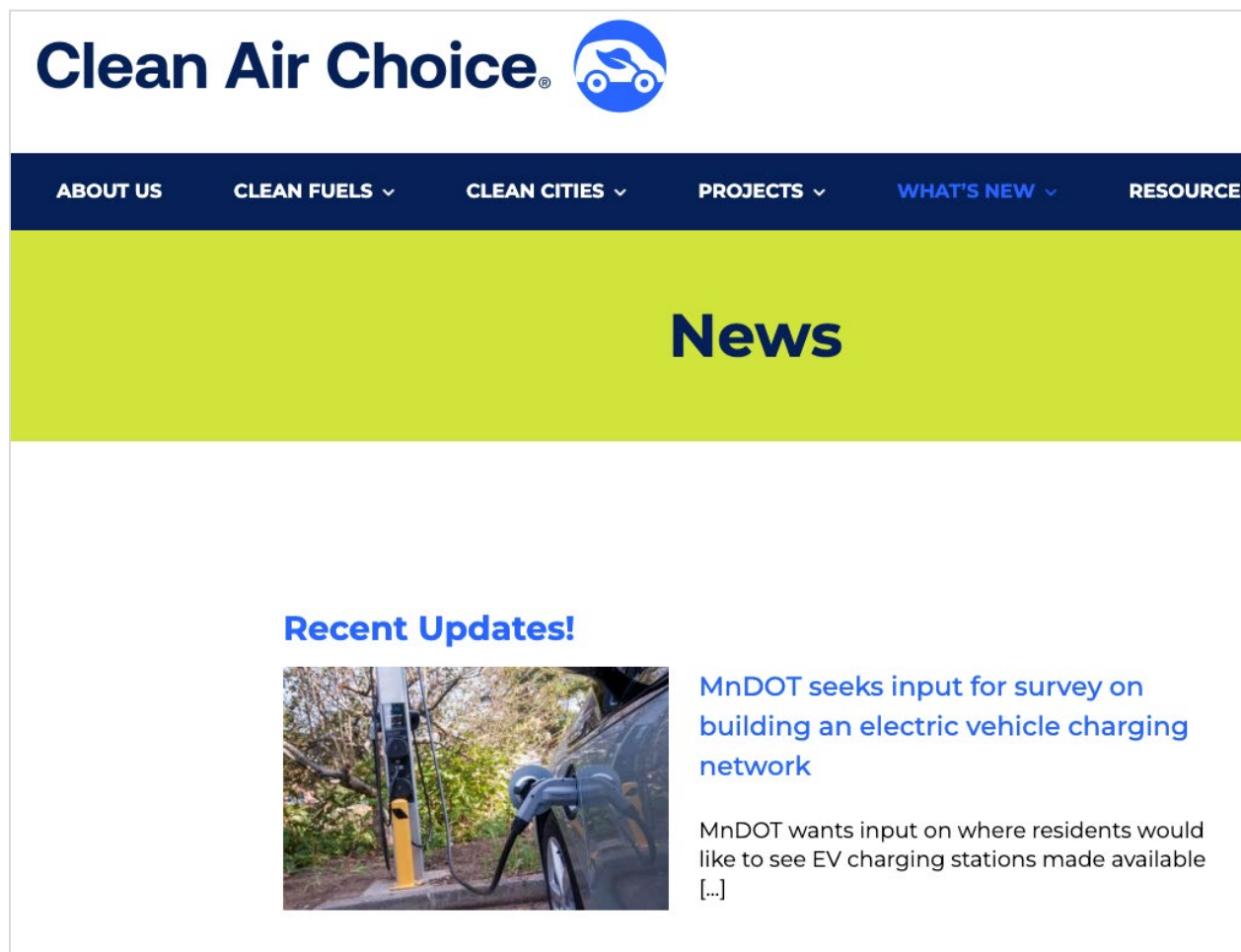
Six options were presented to the public to weigh in on: end range anxiety, integrate charging into daily travel, promote multimodal transportation, bring home charging to all and accelerate adoption of EVs. Additionally, the public again had the opportunity to place pins on a map showing where having EV chargers would be important to them. The forum website, which was translated into Spanish, Somali and Hmong, also provided educational information, data on current EV use in Minnesota and trends.

Promoting the forum website became limited due to priority changes at the federal level. However, the project team was still able to promote it on the EVINA Let's Talk Transportation page, the forum (mnevina.com) and share it to MnDOT's Statewide Electric Vehicle Infrastructure GovDelivery email list, which consists of 4,752 subscribers. Community partners also shared it with their audiences including the MN Clean Cities/American Lung Association's sharing information on the news section of their CleanAirChoice.org website, the MPCA included in it their February 2025 Airmail newsletter and the Great Plains Institute and the Community-Based Organization (CBO) networks shared it with their communities as shown in [Figure 10](#) and [Figure 11](#).

Figure 11: Somali TV Facebook Forum Promotion



Figure 12: Screenshot of Minnesota Clean Air Coalition Website – News Section



3.2 EVINA MEETINGS ATTENDED BY MNDOT

MnDOT staff partnered on the EVINA project by attending community events and speaking to relevant groups. This partnership leveraged resources and allowed for more engagement by the project team.

Table 4 summarizes the events attended by MnDOT staff in 2025.

Table 4: Events Attended by MnDOT Staff

Stakeholder Group(s)	Stakeholder Type	Meeting Date	Approx # of attendees
Grand Forks/East Grand Forks MPO	MPO, City/County staff	1/8/2025	16

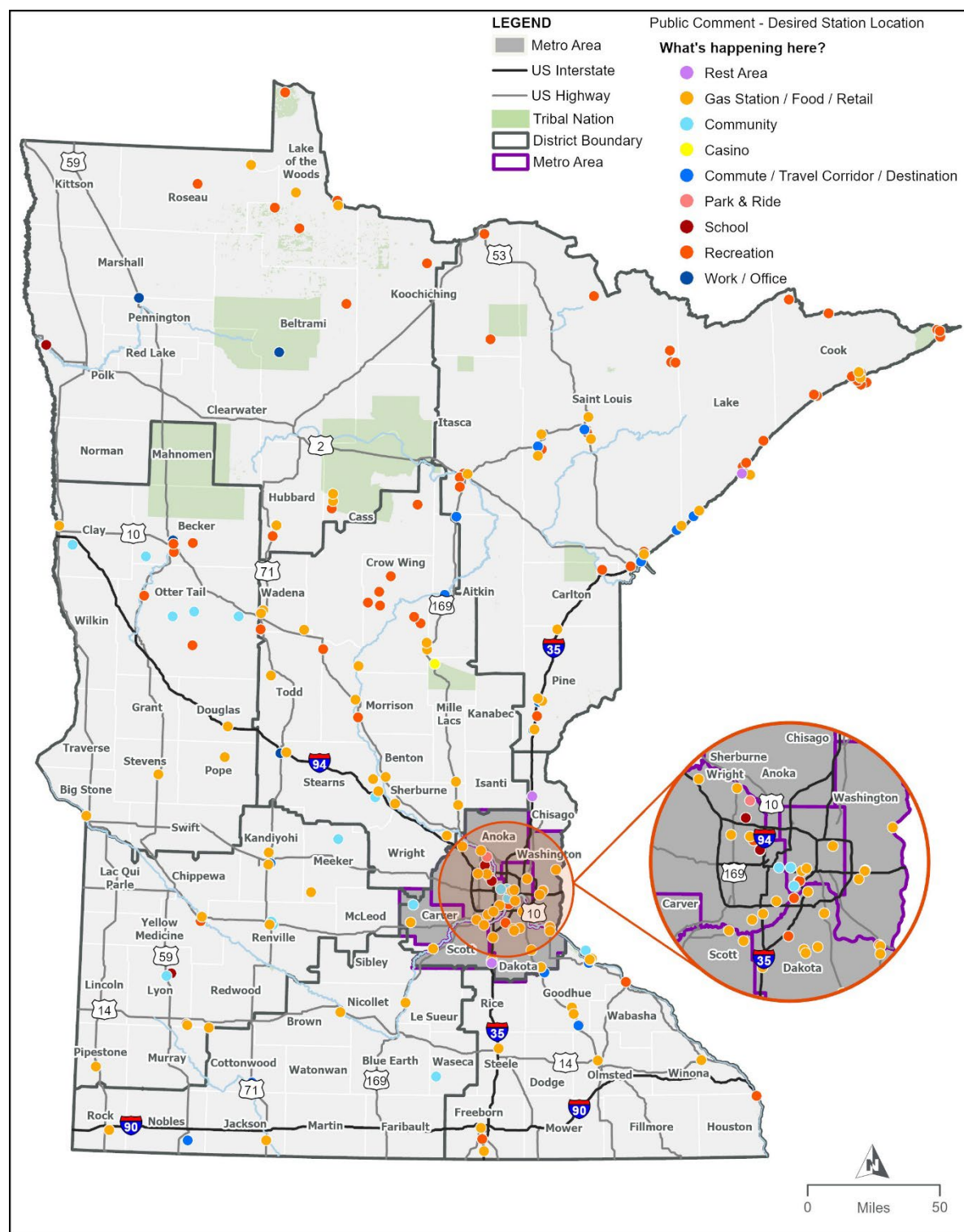


Stakeholder Group(s)	Stakeholder Type	Meeting Date	Approx # of attendees
Metropolitan Council Transportation Advisory Board, Transportation Advisory Committee, Planning Committee	MPO, City/County staff	1/9/2025	27
Southeast ATP	City/County Transportation staff	1/10/2025	22
South Central ATP	City/County Transportation staff	1/10/2025	15
Metropolitan Interstate Council - Transportation Advisory Committee	MPO, City/County staff	1/14/2025	24
Mankato/North Mankato Area Planning Organization	MPO, City/County staff	1/16/2025	15
Central ATP	City/County Transportation staff	1/27/2025	25
St Cloud Area Planning Organization	MPO, City/County staff	2/6/2025	20
Northeast ATP	City/County Transportation staff	2/12/2025	40
MnDOT - All Planners Group	MnDOT staff	2/13/2025	60
Drive Electric MN	mix of members	2/13/2025	26

3.3 FORUM COMMENT SUMMARY

During the open forum period, from Feb. 10 - 28, 2025 over 400 people interacted with the website. Of those, 219 pins were dropped by participants on the EVINA interactive map ([Figure 13](#)), with locations covering much of the State of Minnesota.

Figure 13: Community Input Forum Comment Map, February 2025



Along with placing locations on the map, participants were asked what kind of activities would be associated with these locations and how long they would typically stay (Table 5). A majority of



people chose shopping/retail or recreation as a primary activity and associated it with a shorter stop. However, these locations also had the highest number of responses for longer periods of downtime (4+ hours).

Table 5: Public Suggested Locations Activity and Time Period, February 2025

What's happening here?	0-1 hours	2-4 hours	4+ hours	No Response	Total
Rest Area	3	1			4
Gas Station	4				4
Shopping / Retail	69	14	4		87
Community Center	6	1			7
Casino			1		1
Commute / Travel Corridor / Destination	18	3	3		24
Park & Ride			1		1
School		1	4		5
Recreation	27	30	23	1	81
Work / Office			5		5
Total	127	50	41	1	219

Additionally, there were 22 comments captured that give more insight into reasons behind wanting chargers at certain locations, barriers to using existing EV infrastructure and other policy considerations.

There was also an opportunity for participants to rank which scenario they thought was the most important to consider for Minnesota with the following results:

Ranking	Priority 1	Priority 2	Priority 3
End Range Anxiety	77 %	0 %	0 %
Integrate Charging into Daily Travel	14 %	26 %	0 %
Promote Multimodal Transportation	5 %	17 %	3 %
Bring Home Charging to All	3 %	31 %	8 %
Accelerate Adoption	1 %	22 %	26 %
Fill in the Gap	0 %	4 %	63 %



Ranking	Priority 1	Priority 2	Priority 3
TOTAL	77 %	0 %	0 %

SUMMARY OF FINDINGS

Need for more charging infrastructure in specific locations:

- Highway 52 Gap: A major concern is the lack of charging stations along Highway 52 between Rochester and St. Paul, a busy route with limited charging options.
- Northern Minnesota/Rural Areas: There's a strong desire for more chargers in recreational areas and underserved rural regions, particularly in the north, to improve accessibility and address range anxiety.
- Specific Town Suggestions: People are suggesting specific locations like Zumbrota, Hill City, Floodwood, Aitkin and Waconia for new charging stations.

Emphasis on Tesla Superchargers:

- Reliability and Ease of Use: Many respondents strongly prefer Tesla Superchargers due to their perceived reliability (99% uptime) and user-friendly experience.
- Criticism of Non-Tesla Chargers: There's widespread frustration with the unreliability and complexity of some charging networks.

Concerns about charger reliability and maintenance:

- Frequent breakdowns: A major issue is the frequent failure of existing public chargers.
- Lack of Maintenance and Repair: Respondents emphasize the need for real-time monitoring, 24/7 repair and reliable maintenance plans to ensure charger availability.
- Impact on EV Adoption: Unreliable chargers are seen as a major barrier to EV adoption, as they can lead to range anxiety and negative experiences.

Funding and private vs. public sector involvement:

- Opposition to Taxpayer Funding: Many respondents believe that EV charging infrastructure should be funded by the private sector, not taxpayers.
- Market-Driven Approach: They argue that charging stations should be built by investors and private companies, similar to gas stations.

Practical considerations for charging stations:

- Charging Speed: There's a strong preference for faster charging (150 kW or higher), especially for larger vehicles and in cold weather conditions.
- Winter Considerations: Respondents emphasize the need to account for reduced range in winter due to cold temperatures and wind.



- **L2 Charger Placement and Policies:** Suggestions include placing L2 chargers in less convenient spots to avoid parking congestion, implementing idle fees and using market-based pricing.
- **Plug Compatibility:** Requests for multi-plug charging stations to accommodate various EV models.

EV adoption and range anxiety:

- **Range Limitations:** Range anxiety is a significant concern, particularly for long-distance travel and in cold weather.
- **Need for PHEVs:** Some respondents have opted for plug-in hybrid electric vehicles (PHEVs) due to range limitations of battery electric vehicles (BEVs).
- **Promoting EV Benefits:** Suggestions to highlight the reduced cost of operation and maintenance as a key selling point for EVs.

In summary, the feedback reveals a strong desire for a more robust, reliable and user-friendly EV charging network in Minnesota, with a focus on a mixed type of chargers, strategic placement in underserved areas and a shift towards private sector funding.

4 INCORPORATION OF FEEDBACK

The feedback received from the public and stakeholders in its various formats throughout the project was referenced at key points in the development of recommendations. Community response and insights were critical to observing the human behaviors that are not necessarily apparent in technical data. Understanding resident and stakeholder priorities for EV chargers (i.e., general locations and amenities) were used to help refine recommendations for priority clusters, the EV Charging Station Guidelines and the non-infrastructure recommendations.

The feedback we received regarding priority scenarios - with “End Range Anxiety” as the highest priority - were used to develop recommendations for policy and programs, collaboration and outreach initiatives for MnDOT and partner agencies to consider championing.

EVINA also utilized engagement activities as an opportunity to provide educational material to the public regarding EVs and Charging station as well as to communicate MnDOT's vision for the future of transportation in Minnesota. This targeted engagement and increased EV awareness contributes to MnDOT's target of promoting EV adoption and engaging with previously underrepresented communities throughout the state.



5 ATTACHMENT A: 2024 EVINA SURVEY QUESTIONS

EVINA ONLINE ENGAGEMENT SURVEY – JUNE 2024

Minnesota's target is to have 20% of passenger vehicles in the state be Electric Vehicle (EV)s by 2030 and we want to make sure we have the EV fast charging infrastructure in place to support this growth. A mix of federal, state, local government and private dollars are being used to help build this charging network so people can get where they need to go.

WE NEED YOUR INPUT!

Any input provided in this survey by July 15, 2024, will be used by MnDOT to inform the planning for additional locations and needs and standards of service for further EV charging equipment outside of those currently planned. The survey takes around 5-10 minutes to complete, and your answers are anonymous.

MnDOT is collecting this data to inform the planning of an EV charging network. Data collected in this survey will not be used for any other purpose than stated above. All data will be shared in aggregate and individuals will not be identified. Individuals are not required to respond to this survey and there are no consequences for not responding. Please be aware that data may be shared upon a court order or provided to the state or legislative auditor. Minors responding to this survey have the right to request that parental access to private data be denied.

Electric Vehicle Infrastructure Plan Questions

1. Which of the following applies to you? (Select one)
 - I **own/lease** an EV (logic: track 1)
 - I do not own/lease an EV now, but **plan to purchase/lease** one in future (logic: track 1)
 - I do not own/lease an EV, but **would like to** (logic: track 1)
 - I do not own/lease an EV and **would not consider owning/leasing** one (logic: track 2)

Logic Track 1 (On question 1, if selected I **own/lease** an EV, I do not own/lease an EV now, but **plan to purchase/lease** one in the future, I do not own/lease an EV, but **would like to**)

2. If you use a car as your primary mode of travel, how many miles do you typically drive in a day?



- Less than 10 miles
 - 10-19 miles
 - 20-29 miles
 - 30-39 miles
 - 40-49 miles
 - 50 miles or more
 - I don't use a car as my primary mode of travel
3. If you're not likely to charge at home, how far are you willing to travel to a charging station?
- Less than 5 miles
 - 6-10 miles
 - 11-20 miles
 - More than 20 miles
4. What challenges or barriers do you currently experience to owning/leasing an EV? (Select all that apply)
- I do not have any challenges/barriers
 - There are not enough charging locations near my home and/or common destinations (where I work, grocery store, etc.)
 - Available charging locations take too long or are typically in use when I need them
 - There is a lack of services (shopping, etc.) near existing charging locations
 - I'm not able to charge at home or charging at home is inconvenient
 - I do not feel that EV technology fits my vehicle needs (towing, hauling, etc.)
 - EV battery ranges are too short for my needs
 - I do not feel EVs are a reliable transportation option
 - Public chargers are too expensive
 - Vehicles are too expensive
 - I do not feel safe charging at some locations
 - Other

On the following questions, rate your support (in order of priority) for charger installation after I-94 and I-35 have been completed.



5. Areas of Minnesota that should take priority:

(Place in order of importance to you)

- Areas that currently have zero charging stations within a 50-mile radius
- Rural areas
- Urban areas that need additional charging stations due to usage
- Areas that have access to easy installation (due to proximity of power supply)
- Other

6. Criteria MnDOT should use to prioritize planning for locations of additional chargers outside of I-94 and I-35 (Select your top three criteria)

- Traffic volumes
- Addressing issues of health in which people are vulnerable to existing vehicle exhaust (health concerns, disabilities, etc.)
- Convenience and closeness to services (shopping, restaurants, etc.)
- Addressing gaps in the existing charging network
- Charging needs in disadvantaged communities
- Locations that have large numbers of people commuting for work (job centers)
- Tourism destinations
- Other

7. What types of locations are you more likely to stop at to charge an EV?

Place in order of importance to you.

- Gas stations, convenience stores and truck stops
- Retail businesses with public parking (grocery, restaurant, big box stores, etc.)
- Public buildings (libraries, DMVs, recreation centers, etc.)
- Park-and-Rides or transit hubs
- Public schools, community colleges, universities
- City, county, or state parks
- Visitor centers and other public locations on Federal Lands
- Entertainment locations (museums, music venues, movie theaters, etc.)
- Other



8. Rate the importance of the following amenities for fast charging stations.

Respondents will answer on a scale from 1-5 with 5 being highly support.

- Lighting
- Restrooms
- Shade/shelter
- Retail
- Food/beverage
- In-person customer service for payment or assistance with stations
- 24-hr access
- Pull-through charging (trailers, longer vehicles, etc.)

9. What are some locations in your community at which you'd like to see EV fast charging stations? (*Open ended*)

10. What are some locations in your community at which EV fast chargers should not be placed? (*Open ended*)

11. Are there additional comments or questions that you would like us to consider? (*Open ended*)

12. Would you like to stay engaged in our EV Infrastructure Needs Assessment and other future EV planning efforts?

- Yes (sign up for email updates)
- No

Demographic Questions

Please enter the zip code of your residence.

What is the last grade or level of education that you completed? Was it...

- High school or less
- Technical or vocational school
- Some college
- College graduate
- Post graduate work or advanced degree



- Prefer not to answer

What is the primary language spoken in your home?

- Amharic
- Arabic
- Chinese
- English
- Hmong
- Karen
- Oromo
- Russian
- Somali
- Spanish
- Vietnamese
- Other (please specify):
- Prefer not to answer

What is your age?

- Under 18
- 18-24
- 25-34
- 35-44
- 45-54
- 55-64
- 65-74
- 75+
- Prefer not to answer

Which of the following describes how you think of yourself? Select all that apply.

1. Female
2. Male
3. Non-binary (please specify if you wish):
4. Transgender



5. Prefer not to answer

Are you of Hispanic descent?

- Yes
- No
- Prefer not to answer

Which of the following best describes your racial background?

- American Indian or Alaska Native
- Asian
- Black or African-American
- Native Hawaiian or other Pacific Islander
- White
- Some other race/More than one race (please specify if you wish):
- Prefer not to answer

Do you have a long-lasting or chronic condition (physical, visual, auditory, cognitive or mental, emotional, or other) that substantially limits one or more of your major life activities (your ability to see, hear, or speak; to learn, remember, or concentrate)?

- Yes
- No
- Prefer not to answer

Logic Track 2 (if selected on question 1 “I do not own/lease an EV and **would not consider owning/leasing one**”)

1. What prevents you from considering an EV? (*Select all that apply*)

- Price of vehicle
- Lack of available charging stations
- Inconvenient charging stations
- Unsure of charging costs
- Unsure of how to charge
- Vehicle range
- Charging time



- Charging requirements are inconvenient
 - Access to local dealership
 - Access to parts and services support
 - Safety concerns
 - Limited capabilities (off-road, snow-friendly, towing/hauling, etc.)
 - Concerns about environmental impacts of battery production
 - Other
2. Would you consider purchasing/leasing/renting an EV if better infrastructure were in place for faster charging and more charging stations?
- Yes
 - No
 - Unsure
 - Why or why not?
3. If you use a car as your primary mode of travel, how many miles do you typically drive in a day?
- I don't use a car as my primary mode of travel
 - Less than 10 miles
 - 10-19 miles
 - 20-29 miles
 - 30-39 miles
 - 40-49 miles
 - 50 miles or more
4. Are there additional comments or questions that you would like us to consider? (*Open ended*)
5. Would you like to stay engaged in our EV Infrastructure Needs Assessment and other future EV planning efforts?
- Yes (sign up for email updates)
 - No



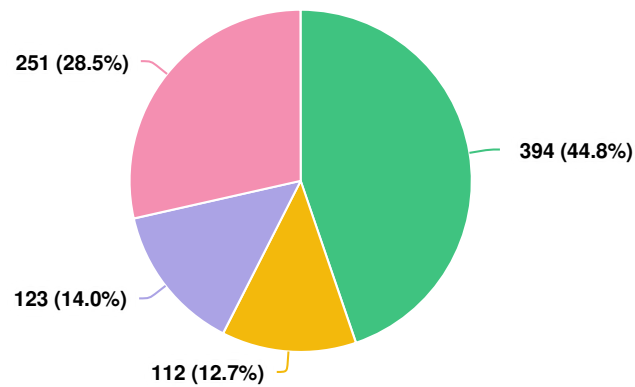
6 ATTACHMENT B: SURVEY RESULTS

ENGAGEMENT TOOL: SURVEY TOOL

Survey

Visitors	1479	Contributors	872	CONTRIBUTIONS	880
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Which of the following applies to you?



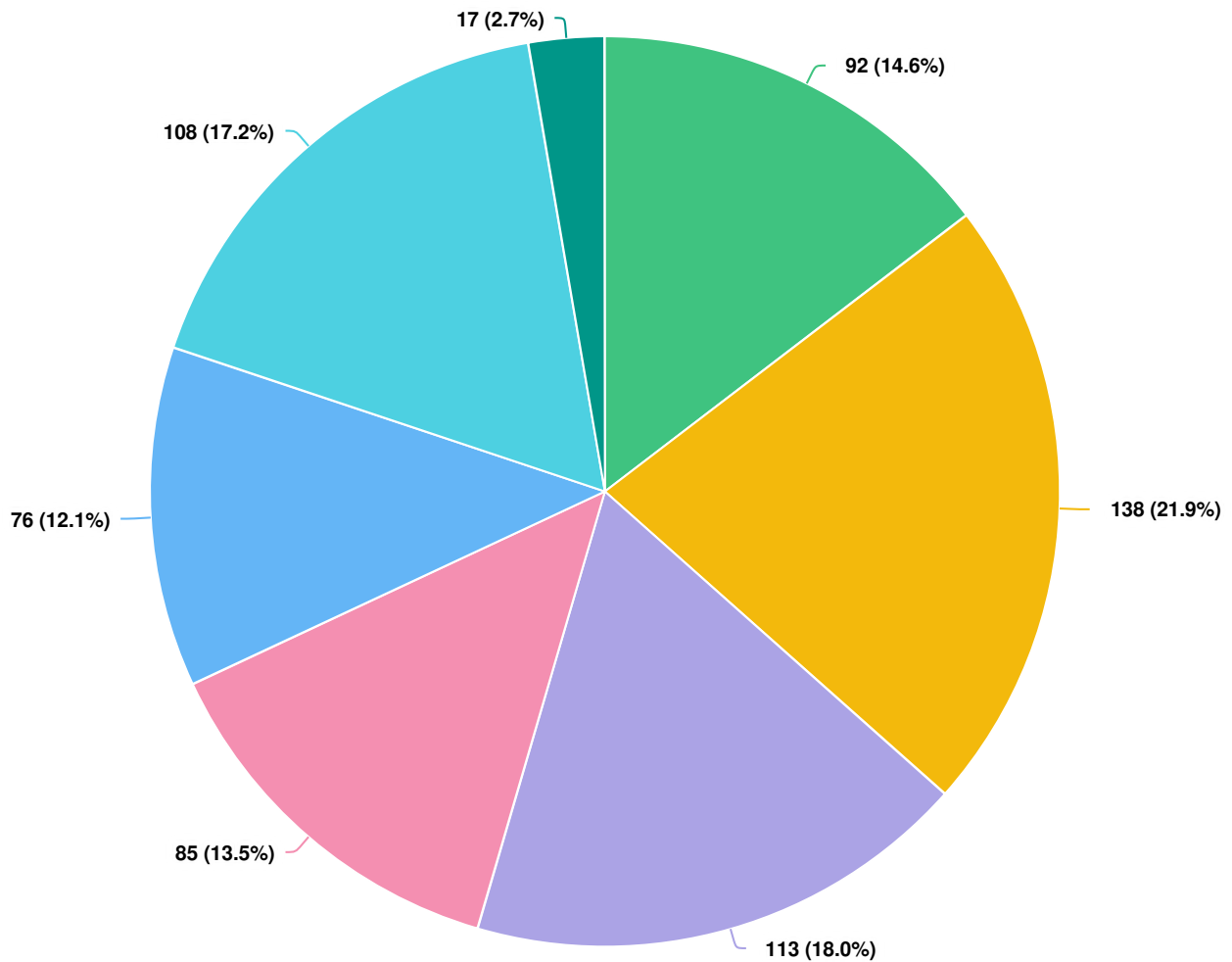
Question options

- I own/lease an EV
- I do not own/lease an EV now, but plan to purchase/lease one in the future
- I do not own/lease an EV, but would like to
- I do not own/lease an EV and would not consider owning/leasing one

Mandatory Question (880 response(s))

Question type: Radio Button Question

If you use a car as your primary mode of travel, how many miles do you typically drive in a day?



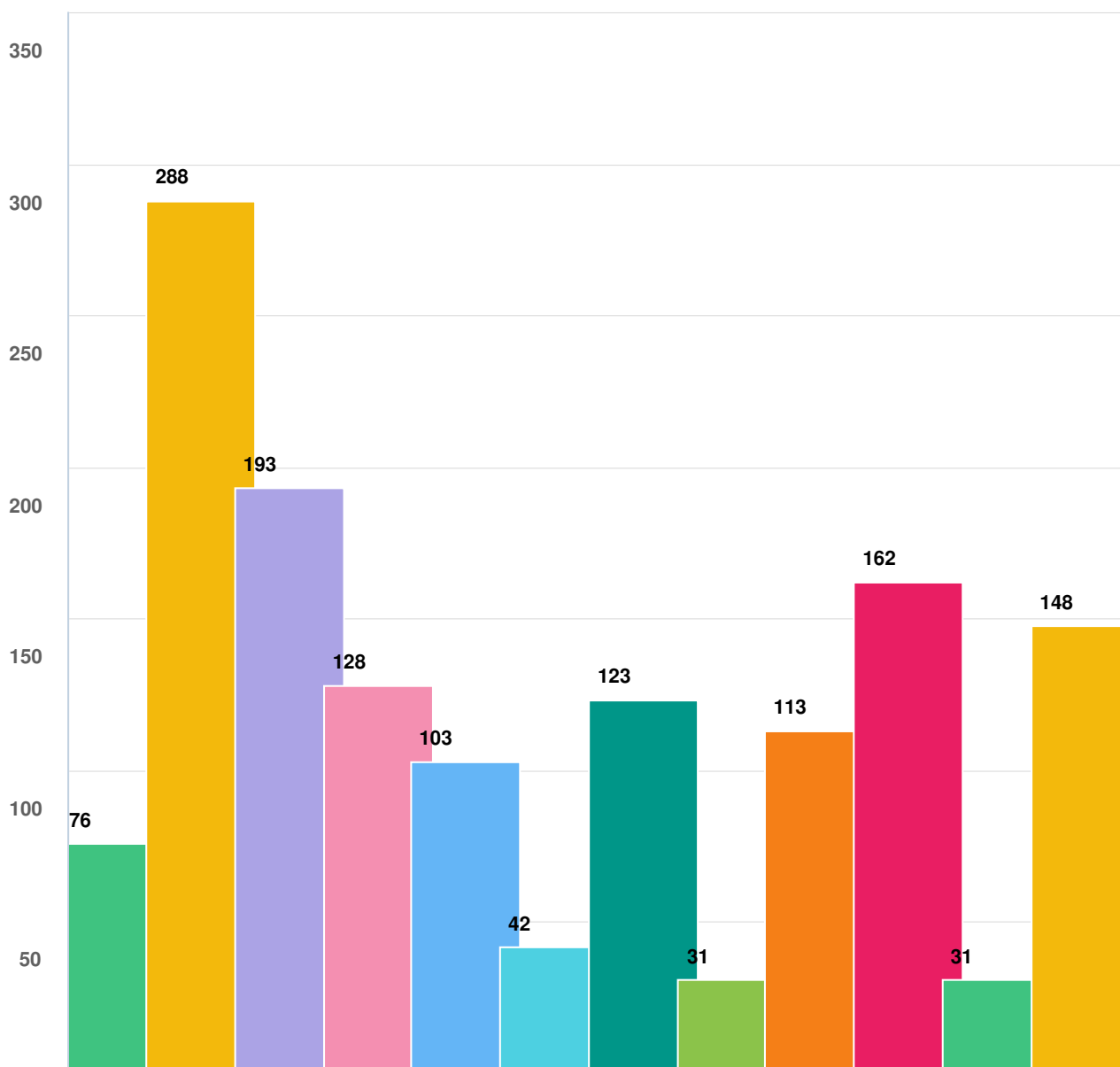
Question options

- ☐ Less than 10 miles ☐ 10-19 miles ☐ 20-29 miles ☐ 30-39 miles ☐ 40-49 miles ☐ 50 miles or more
☐ I don't use a car as my primary mode of travel

Optional question (629 response(s), 251 skipped)

Question type: Radio Button Question

What challenges or barriers do you currently experience to owning/leasing an EV? (Select all that apply)



Question options

- I do not have any challenges/barriers
- There are not enough charging locations near my home and/or common destinations (where I work, grocery store, etc.)
- Available charging locations take too long or are typically in use when I need them
- There is a lack of services (shopping, etc.) near existing charging locations
- I'm not able to charge at home or charging at home is inconvenient
- I do not feel that EV technology fits my vehicle needs (towing, hauling, etc.)
- EV battery ranges are too short for my needs
- I do not feel EVs are a reliable transportation option
- Public chargers are too expensive
- Vehicles are too expensive
- I do not feel safe charging at some locations
- Other (please specify)

Optional question (622 response(s), 258 skipped)

Question type: Checkbox Question

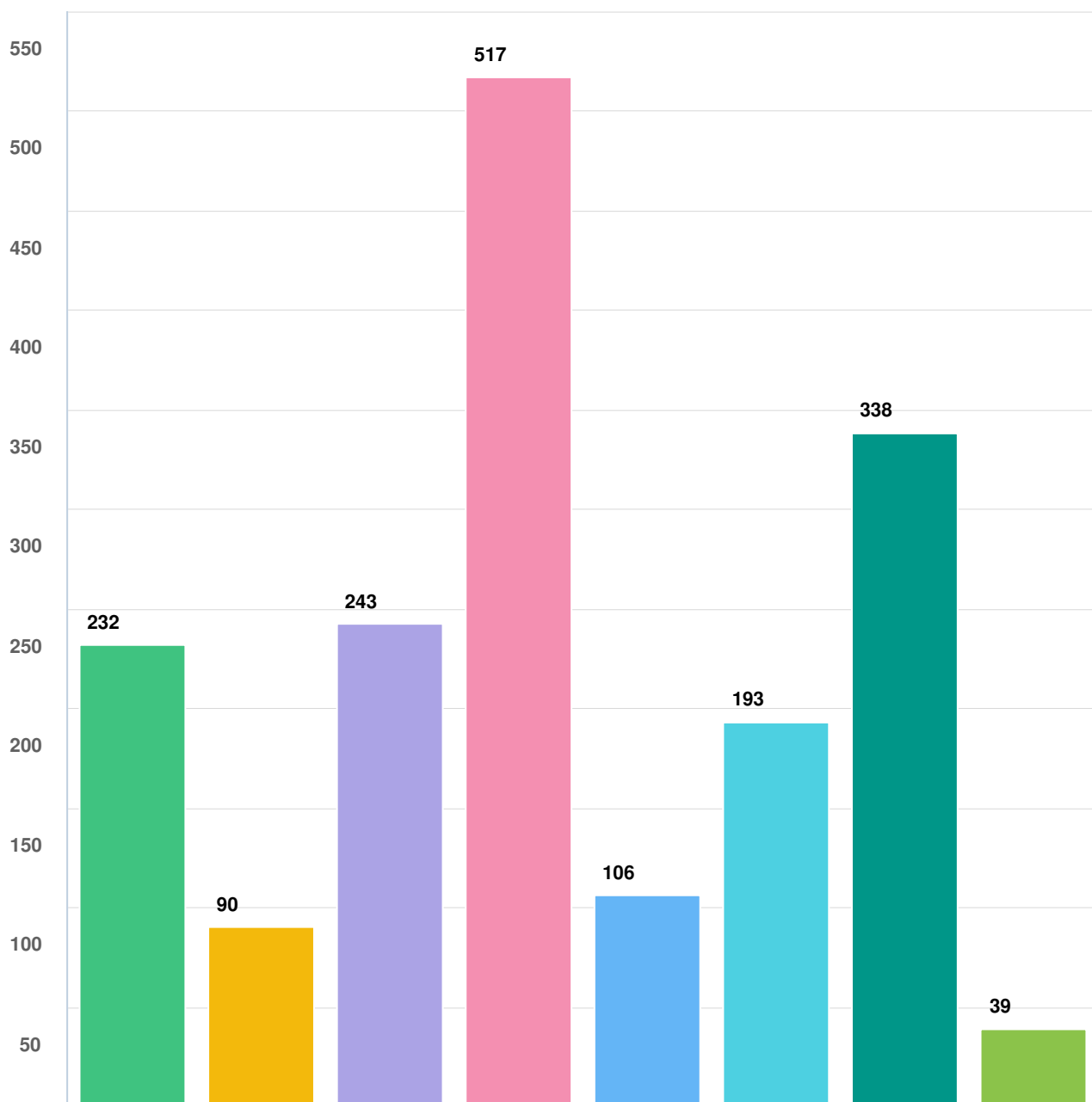
Areas of Minnesota that should take priority:

OPTIONS	AVG. RANK
Areas that currently have zero charging stations within a 50-mile radius	1.97
Rural areas	2.46
Urban areas that need additional charging stations	2.66
Geographic areas that have access to easy installation (due to proximity of power supply)	2.85

Optional question (608 response(s), 272 skipped)

Question type: Ranking Question

Criteria MnDOT should use to prioritize planning for locations of additional chargers outside of I-94 and I-35 (Select your top three criteria)



Question options

- Traffic volumes
- Addressing issues of health in which people are vulnerable to existing vehicle exhaust (health concerns, disabilities, etc.)
- Convenience and closeness to services (shopping, restaurants, etc.)
- Addressing gaps in the existing charging network
- Charging needs in disadvantaged communities
- Locations that have large numbers of people commuting for work (job centers)
- Tourism destinations
- Other (please specify)

Optional question (627 response(s), 253 skipped)

Question type: Checkbox Question

What types of locations are you more likely to stop at to charge an EV, where 1 means the first, and 8 means the last.

OPTIONS	AVG. RANK
Retail businesses with public parking (grocery, restaurant, big box stores, etc.)	3.17
Gas stations, convenience stores, and truck stops	3.47
City, county, or state parks	4.23
Entertainment locations (e.g., museums, music venues, movie theaters, etc.)	4.39
Public buildings (libraries, DMVs, recreation centers, etc.)	4.51
Visitor centers and other public locations on Federal Lands	4.83
Public schools, community colleges, universities	5.13
Park-and-Rides or transit hubs	5.39

Optional question (616 response(s), 264 skipped)

Question type: Ranking Question

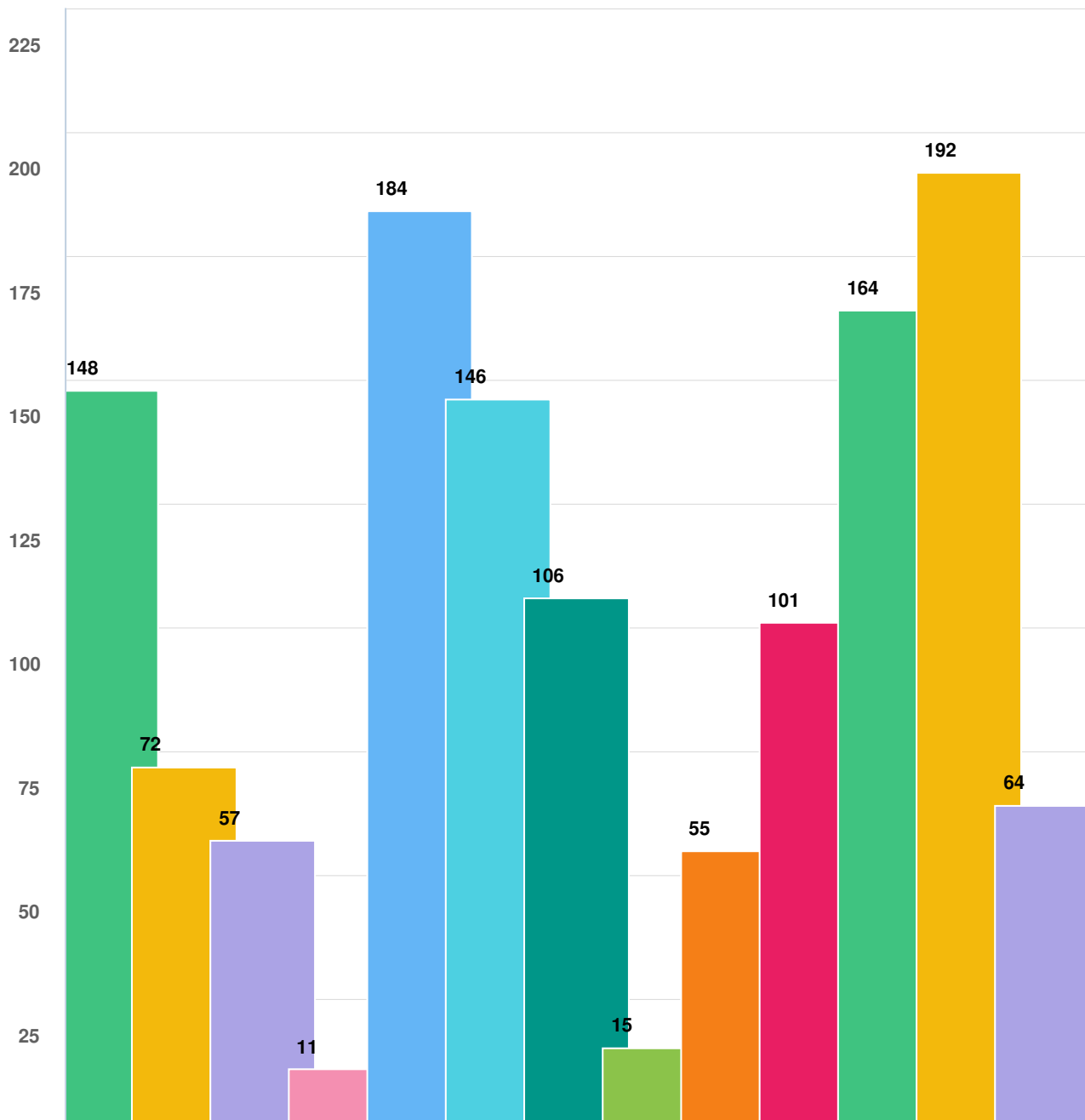
Rate the importance of the following amenities for fast charging stations.



Optional question (628 response(s), 252 skipped)

Question type: Likert Question

What prevents you from considering an EV? (Select all that apply)



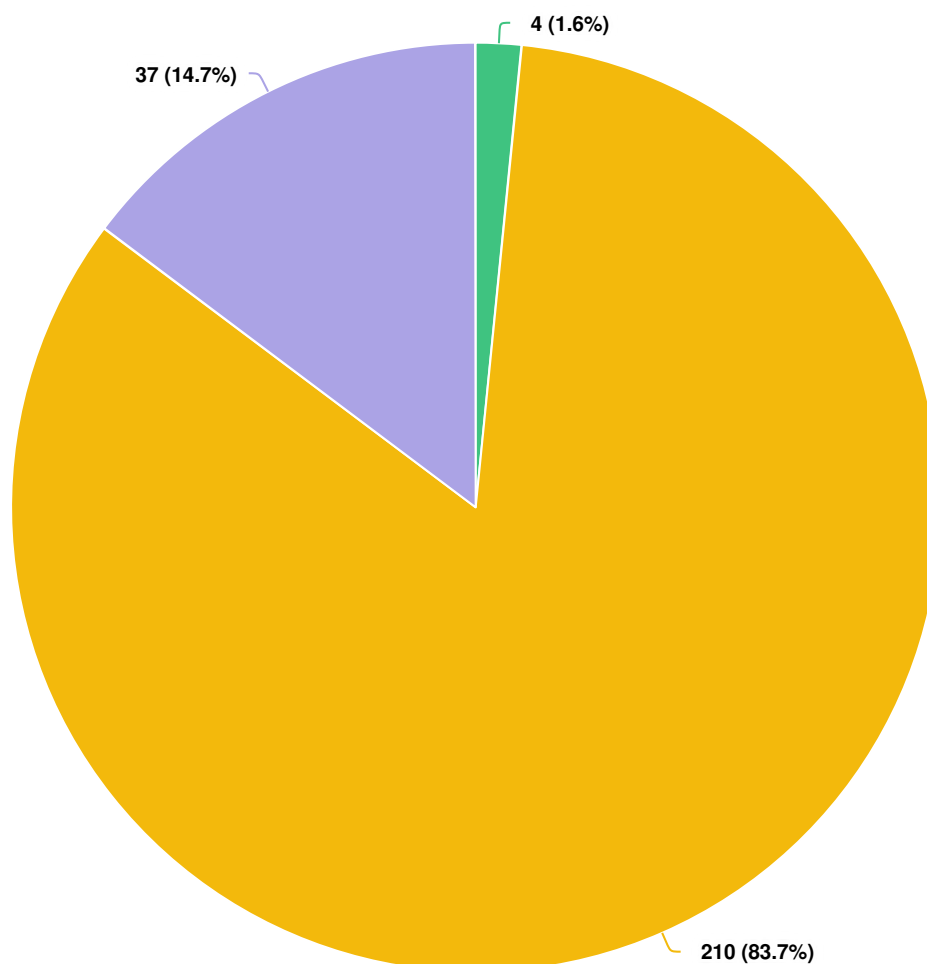
Question options

- Other (please specify) ● Concerns about environmental impacts of battery production
- Limited capabilities (off-road, snow-friendly, towing/hauling, etc.) ● Safety concerns
- Access to parts and services support ● Access to local dealership ● Charging requirements are inconvenient
- Charging time ● Vehicle range ● Unsure of how to charge ● Unsure of charging costs
- Lack of available charging stations ● Price of vehicle

Optional question (251 response(s), 629 skipped)

Question type: Checkbox Question

Would you consider purchasing/leasing/renting an EV if better infrastructure were in place for faster charging and more charging stations?



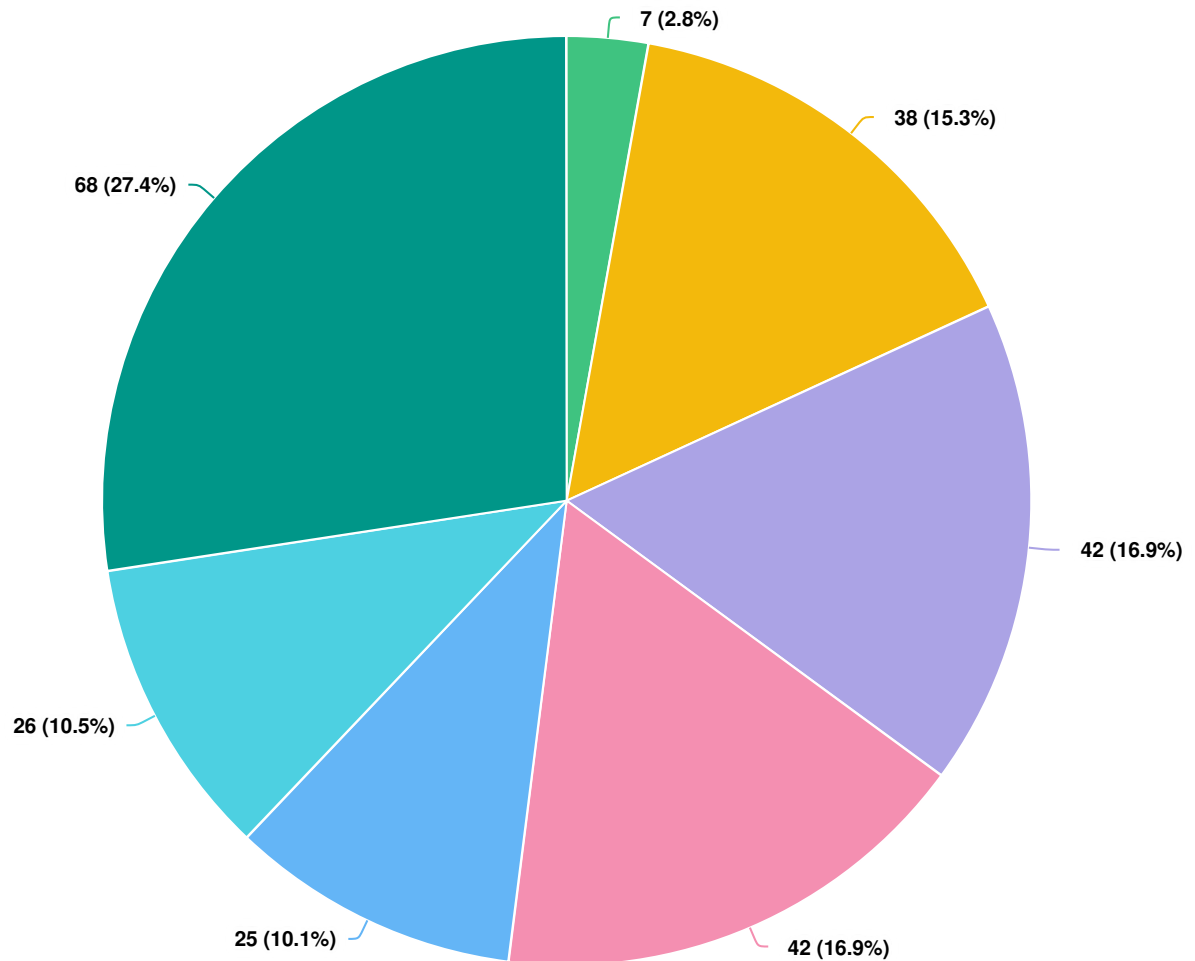
Question options

☐ Unsure ☒ No ☐ Yes

Optional question (251 response(s), 629 skipped)

Question type: Radio Button Question

If you use a car as your primary mode of travel, how many miles do you typically drive in a day?



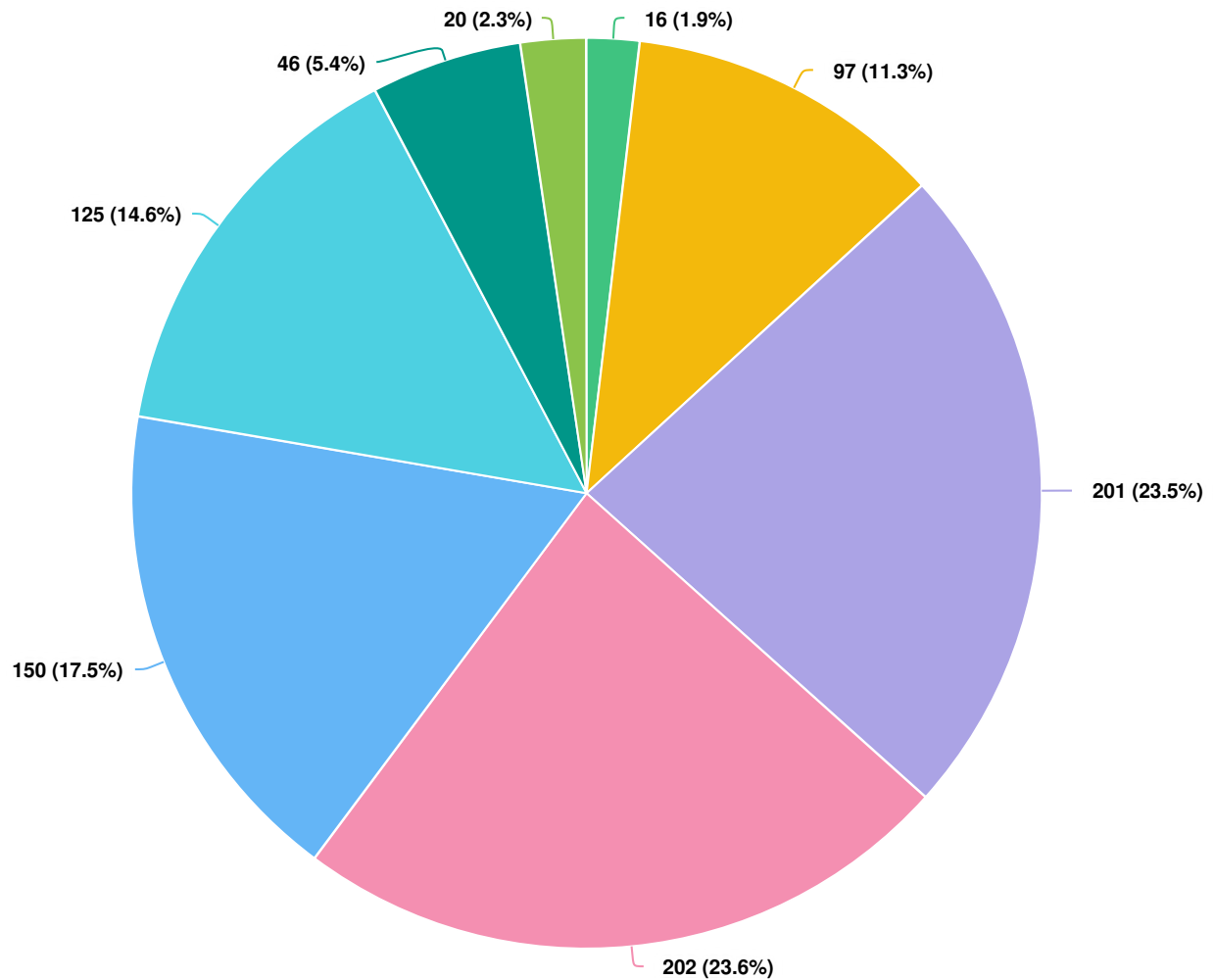
Question options

- 50 miles or more
 ● 40-49 miles
 ● 30-39 miles
 ● 20-29 miles
 ● 10-19 miles
 ● Less than 10 miles
 ● I don't use a car as my primary mode of travel

Optional question (248 response(s), 632 skipped)

Question type: Radio Button Question

What is your age?



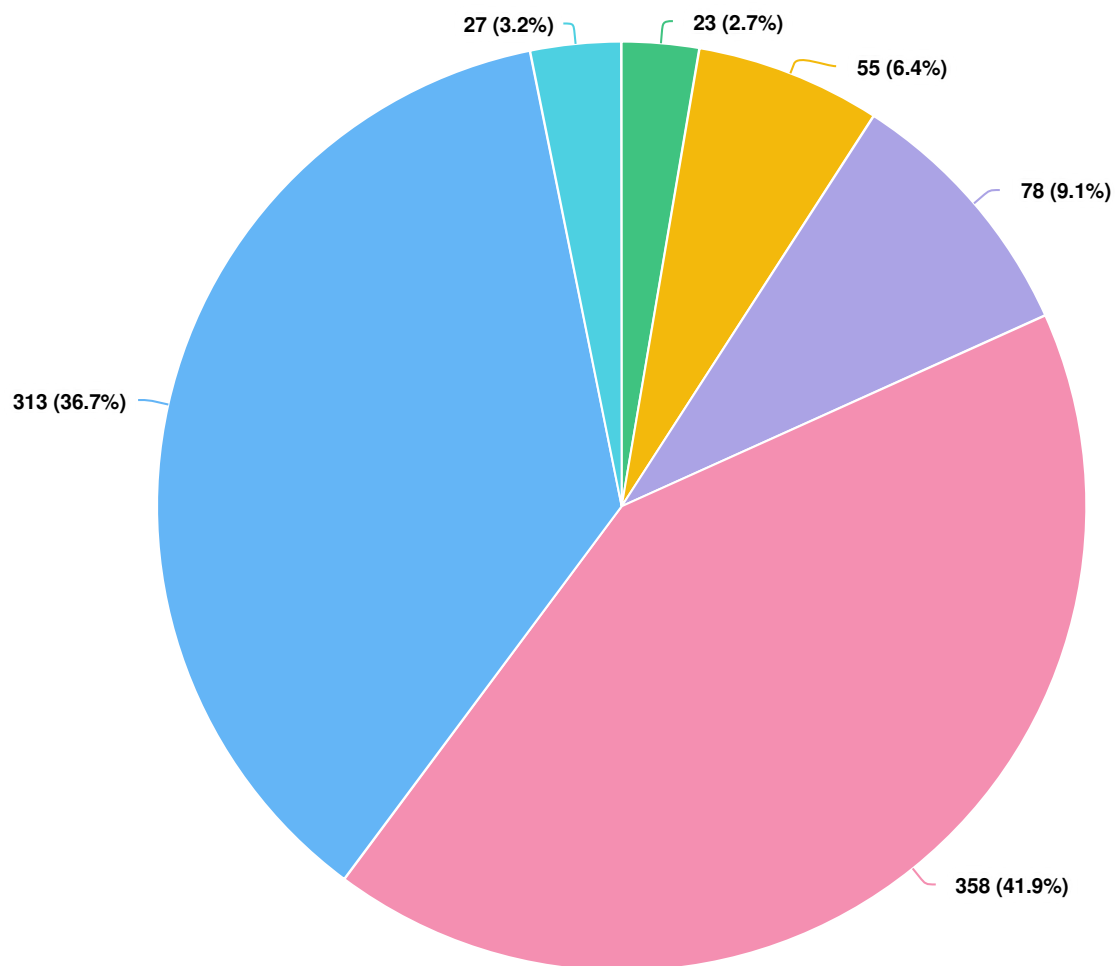
Question options

☐ Prefer not to answer ☐ 75 or older ☐ 65-74 ☐ 55-64 ☐ 45-54 ☐ 35-44 ☐ 25-34 ☐ 18-24

Optional question (857 response(s), 23 skipped)

Question type: Radio Button Question

What is the last grade or level of education that you completed? Was it...



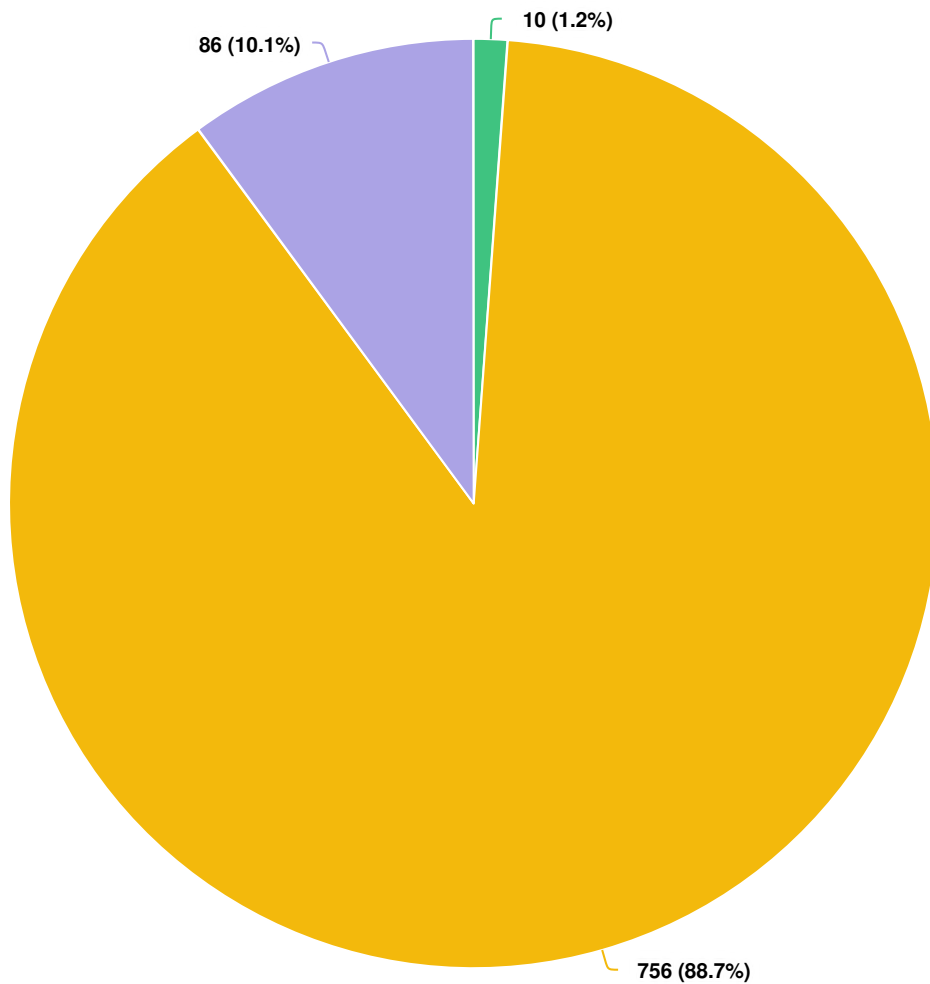
Question options

- Prefer not to answer
- Post graduate work or advanced degree
- College graduate
- Some college
- Technical or vocational school
- High school or less

Optional question (854 response(s), 26 skipped)

Question type: Radio Button Question

Are you of Hispanic descent?



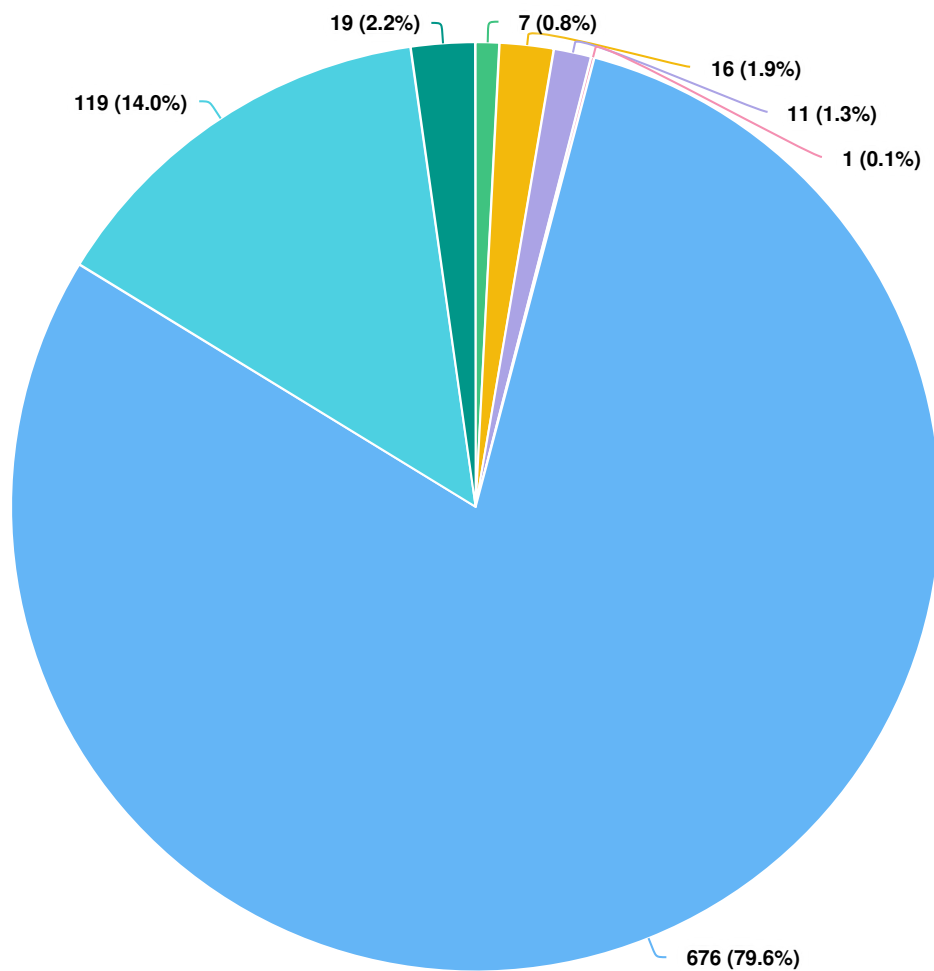
Question options

☐ Prefer not to answer ☐ No ☐ Yes

Optional question (852 response(s), 28 skipped)

Question type: Radio Button Question

Which of the following best describes your racial background?



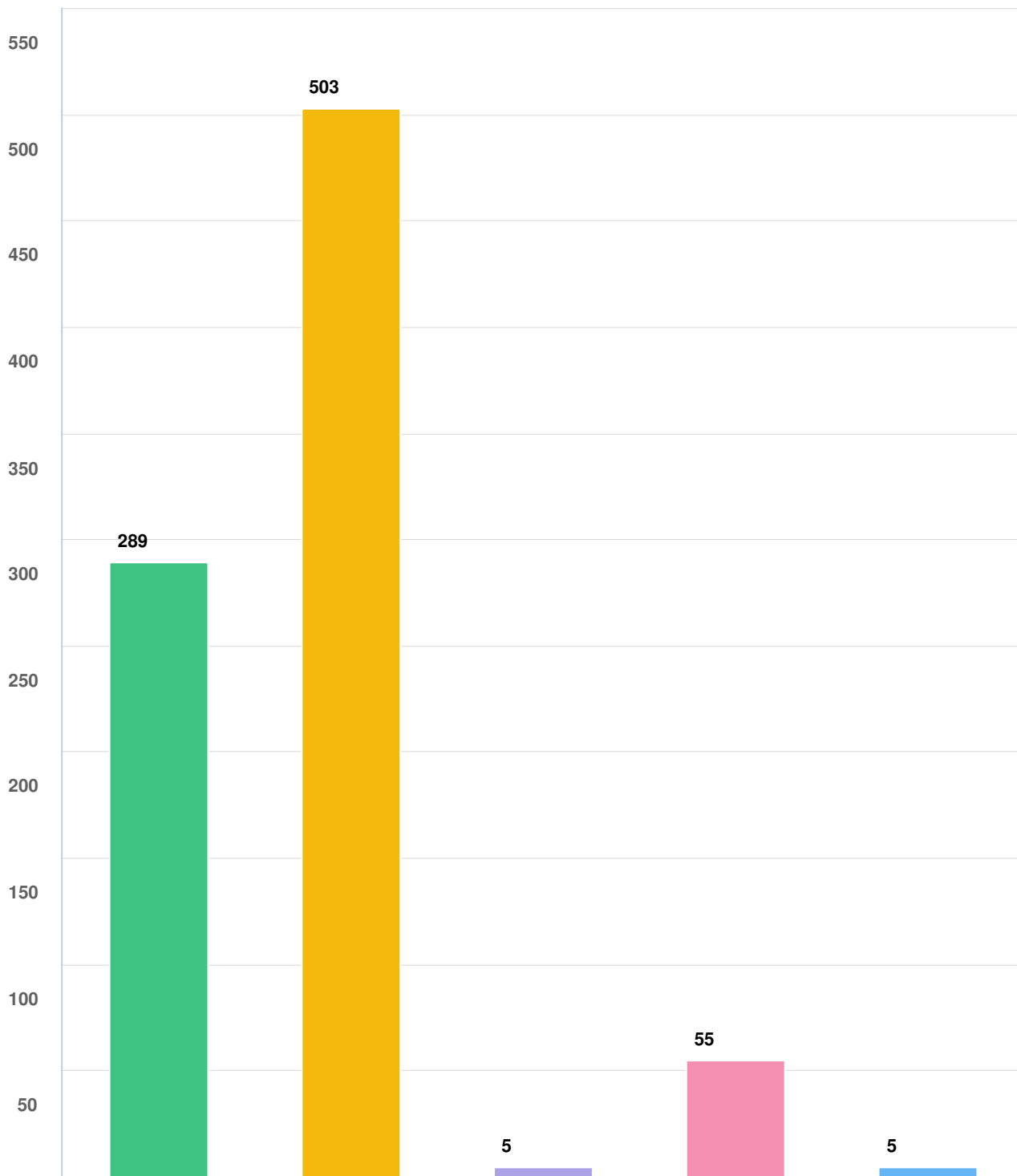
Question options

- Some other race/more than one race (please specify if you wish)
 ● Prefer not to answer
 ● White
- Native Hawaiian or other Pacific Islander
 ● Black or African-American
 ● Asian
 ● American Indian or Alaska Native

Optional question (849 response(s), 31 skipped)

Question type: Radio Button Question

Which of the following describes how you think of yourself?



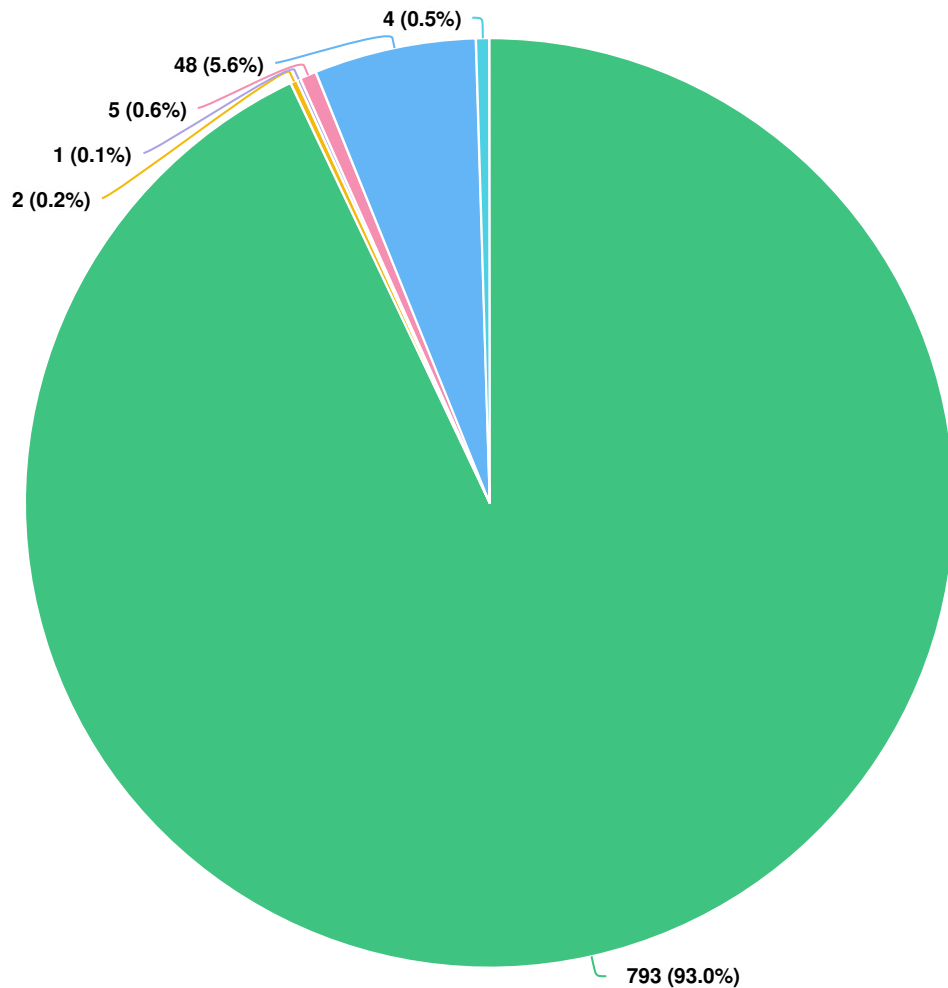
Question options

● Non-binary (please specify if you wish)
 ● Prefer not to answer
 ● Transgender
 ● Male
 ● Female

Optional question (852 response(s), 28 skipped)

Question type: Checkbox Question

What is the primary language spoken in your home?



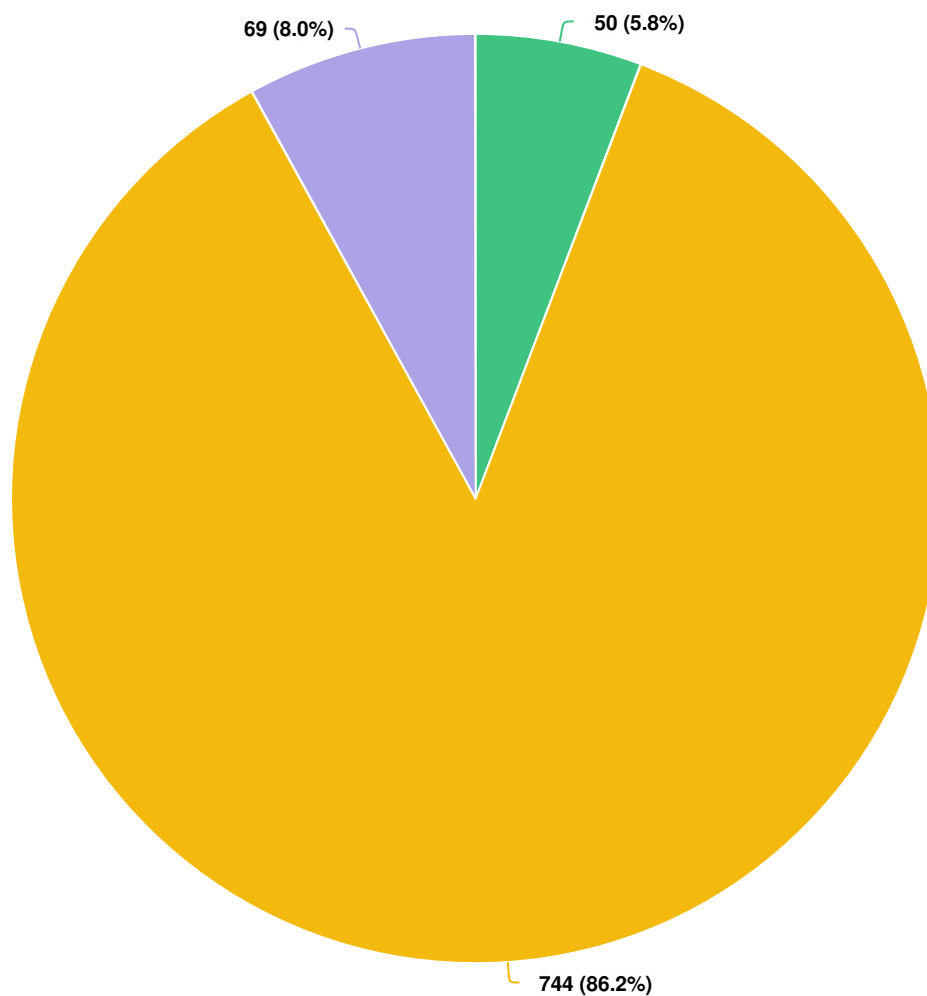
Question options

☐ Other (please specify)
 ☐ Prefer not to answer
 ☐ Spanish
 ☐ Oromo
 ☐ Hmong
 ☒ English

Optional question (853 response(s), 27 skipped)

Question type: Radio Button Question

Do you have a long-lasting or chronic condition (physical, visual, auditory, cognitive or mental, emotional, or other) that substantially limits one or more of your major life activities (your ability to see, hear, or speak; to learn, remember, or ...



Question options

☐ Prefer not to answer ☐ No ☐ Yes

Optional question (863 response(s), 17 skipped)

Question type: Radio Button Question

Appendix C

EV Charging Guidelines Technical Memo





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1 INTRODUCTION

Transportation is the largest contributor to greenhouse gas (GHG) emissions in Minnesota. One practice to reduce GHGs from transportation is to transition away from internal combustion engine (ICE) vehicles to electric vehicles (EVs). Minnesota is preparing for the shift to EVs to meet statewide carbon reduction and electric and zero-emission vehicle targets as identified in the [2022 Statewide Multimodal Transportation Plan \(SMTP\)](#) and the [2022 Climate Action Framework](#).

The Minnesota Department of Transportation (MnDOT) launched the Minnesota Electric Vehicle Infrastructure Needs Assessment (EVINA) project to guide how and where to select and prioritize Electric Vehicle Supply Equipment (EVSE) investments across the state. EVINA takes the next step from previous planning efforts toward developing a reliable Zero Emissions Vehicle (ZEV) fueling and charging network across the state's urban, rural, and major corridor roadways. EVINA focuses on light-duty vehicles (LDVs) and associated EVSE.

EVINA outlines the methodology, engagement efforts, analysis and recommendations for a reliable charging network across the state's urban and rural corridors. Ultimately, EVINA guidance will provide more consistency in the charging experience for EV drivers in Minnesota by offering a predictable framework to guide future EV infrastructure development, including station locations, port count and station amenities.

As EV adoption in Minnesota continues to accelerate and the public charging network continues to develop, these guidelines will provide Minnesotans and travelers with a dependable and worry-free public charging experience. This memo provides an overview of the elements that impacted the development of the Guidelines, including revisions based on public and stakeholder feedback.

2 EV CHARGING REGULATIONS, POLICY AND PUBLIC ENGAGEMENT

Existing regulations, policy and previous public engagement concerning EV charging stations were reviewed to help define proposed Guideline requirements.

2.1 STATUTES, RULES AND GUIDANCE

Federal and state programs, such as the National Electric Vehicle Infrastructure (NEVI) Program, Carbon Reduction Program and Volkswagen Settlement funds, have established requirements governing where public and private EV charging infrastructure can be located, as well as technical



requirements for public electric vehicle supply equipment (EVSE). The guidance from these programs is discussed in the sub-sections below. See [Attachment A: Statutes and Rules Impacting EV Charging in Minnesota](#) for additional details and the full text of regulations related to EV charging referenced in this section.

NATIONAL ELECTRIC VEHICLE INFRASTRUCTURE PROGRAM

The National Electric Vehicle Infrastructure (NEVI) Program is a federal program which seeks to add DCFC stations across all fifty states. Under the original NEVI Program guidance from February 10, 2022,¹ DCFC stations were to be located no more than every 50 miles along a state's designated Alternative Fuel Corridors (AFCs) and provide four charging ports, each capable of delivering 150 kW simultaneously (600 kW total). DCFC stations were also to be located within a maximum driving distance of one (1) mile from the AFC exit. Minnesota also chose to award additional points for NEVI Program applications for stations with 24/7 access to restrooms, food and drink, safety lighting and security cameras.

AMERICANS WITH DISABILITIES (ADA) ACT

The Minnesota Pollution Control Agency (MPCA), which is administering Volkswagen Settlement Funds for electric vehicle charging stations, requires EV stations to comply with [Design Recommendations for Accessible Electric Vehicle Charging Stations](#) for EVSE. Per recommendations, at least one (1) of every 25 charging stations must be accessible and each parking facility must have a minimum of one (1) accessible charging station.

MINNESOTA STATUTES

Minnesota Statute 160.08, Subd. 7 restricts commercial establishments, including automotive service stations, within the right-of-way of controlled-access highways. The statute does allow exceptions at safety rest and travel information center areas. Minnesota Statute 161.045, Subd. 3 restricts the use of highway user tax distribution or trunk highways funds for public electric vehicle infrastructure. Minnesota Statute 325F.185 details technical requirements for electric vehicle infrastructure installed in the state, including:

- Use of the electric vehicle infrastructure by any make, model or type of electric vehicle
- Compliance with section 326B.35 and standards set by the Society of Automotive Engineers (SAE)

¹ NEVI Program Guidance was rescinded by US DOT on Feb 6, 2025. New draft guidance will be issued in the Spring of 2025.



- Bidirectional charging capabilities, once electrical utilities achieve a cost-effective capability to draw electricity from EVs connected to the grid

2.2 PUBLIC ENGAGEMENT

In addition to reviewing existing statutes, rules and guidance concerning EV charging, previous public engagement was also reviewed to gather information on expectations for public charging.

MINNESOTA ELECTRIC VEHICLE INFRASTRUCTURE PLAN

MnDOT conducted extensive public and partner engagement in 2022 to inform the state's first annual Minnesota Electric Vehicle Infrastructure Plan (July 2022) as part of the National Electric Vehicle Infrastructure (NEVI) Program and understand public expectations for DCFC stations. Engagement activities included regular meetings of the EV Subgroup, three virtual workshops, four community events, approximately 60 targeted meetings with partners, a website providing basic information about the NEVI program and engagement opportunities and a survey that gathered over 5,600 responses. **Figure 1** and **Figure 2** detail participant responses to the survey. Key takeaways from plan engagement include:

- Interest in DCFC stations at rest areas, parks and casinos
- Concerns about charger maintenance, reliability, security, payment and fuel taxes
- Desire for EV charging experience that mirrors the gas station experience
- Prioritize rural locations and access for long trips

Figure 1: Where Should Charging Stations Be Located?

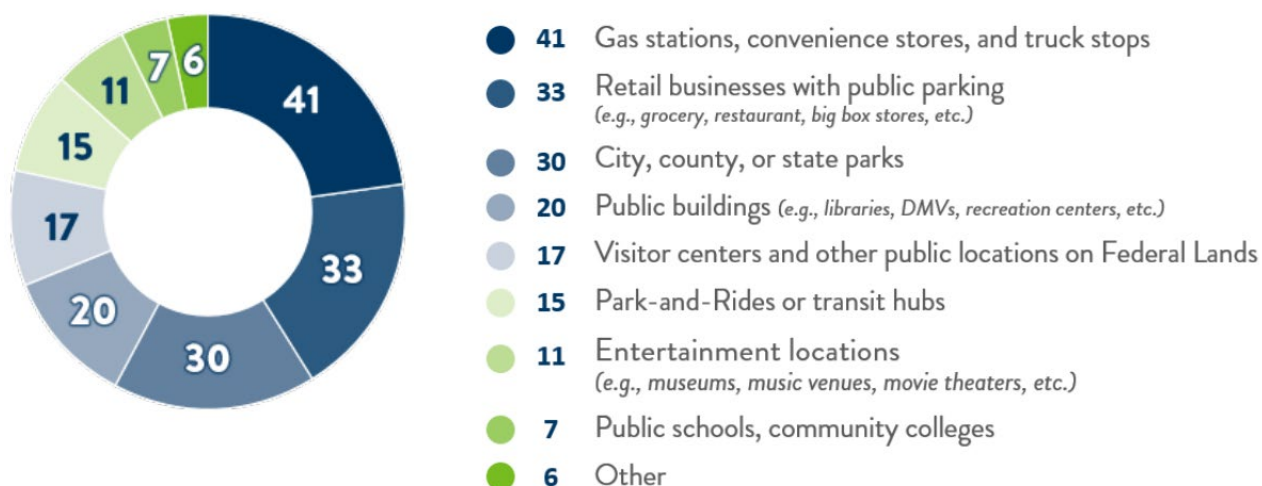
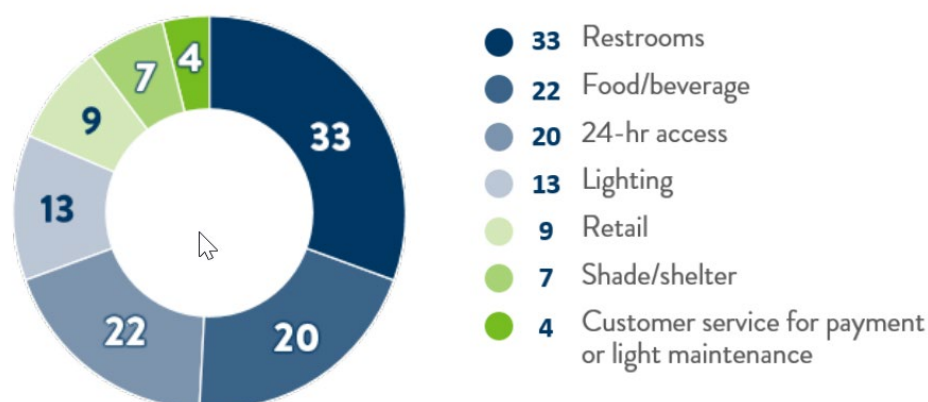




Figure 2: What Location Types and Site Amenities Would You Like to See?



2023 Update – Community Engagement Outcomes Report

The first annual update to this plan in 2023 included significant public and partner engagement. Engagement activities included regular meetings of the EV Subgroup, two virtual partner workshops, 38 targeted partner meetings, five regional community conversations, two focus groups in Justice40 communities², a website providing basic information about the NEVI program and engagement opportunities and a survey that collected over 1,000 responses.

Key takeaways related to public expectations for charging include:

- A strong desire for the EV charging experience to mimic the gas station experience.
- All regional conversations suggested a mix of DCFC and Level 2 chargers is desired. The exact mix would depend on location and type of travel served (e.g., tourism, recreation, daily trips, long distance travel) with preference for DCFCs of some capacity at each location. Stations are desired in the larger cities along most highways.
- There are seasonal and regional variations related to tourism. This may include a need to plan for periods of high demand in rural areas during peak seasons of tourism.
- In much of Minnesota, there is limited local adoption of EVs and questions about usage. Concerns were raised around reliability of stations and protection or shelter from the elements when trying to fuel in extreme weather conditions (e.g., snow, extreme heat).
- Casinos were noted to be good host locations, especially in rural areas due to the availability of 3-phase power, visitor amenities and 24/7 access.

² The Justice40 Initiative was a federal policy developed during the Biden administration aimed at ensuring that at least 40% of the overall benefits of federal investments in clean energy, transportation and other projects flow to disadvantaged communities.



CARBON REDUCTION STRATEGY

The Minnesota [Carbon Reduction Strategy](#) (CRS) identifies electrification as one of three key categories to reduce carbon emissions from surface transportation. The electrification category identifies several priority strategies and subsequent project types that include zero emission vehicles and electric vehicle charging infrastructure. MnDOT conducted public and partner engagement from May to September of 2023 to inform development of the CRS. The public expressed support for shorter walking distances and walkable communities, enhancing public transit and EVs. While there was limited input on public expectations for charging amenities, it was noted that Minnesota should consider ways for EVs to support a multimodal transportation system. Specifically, Minnesota should explore ways to co-locate EV chargers with public transit and infrastructure for people walking and bicycling.

3 PREVIOUS PUBLIC CHARGING INVESTMENTS

Minnesota's previous public charging investment efforts have focused on charging needs within two primary contexts: long-distance travel and community public charging. Previous state efforts supporting investment in charging stations along high potential usage, long-distance travel corridors include the NEVI Program and VW Settlement Funds. Under these two programs, charging stations offer DCFC (between 50-150 kW) with 1-4 charging ports depending on the program. Some stations also offer Level 2 charging as a backup. VW Settlement Funds have also supported community charging investments.

3.1 NEVI STATIONS

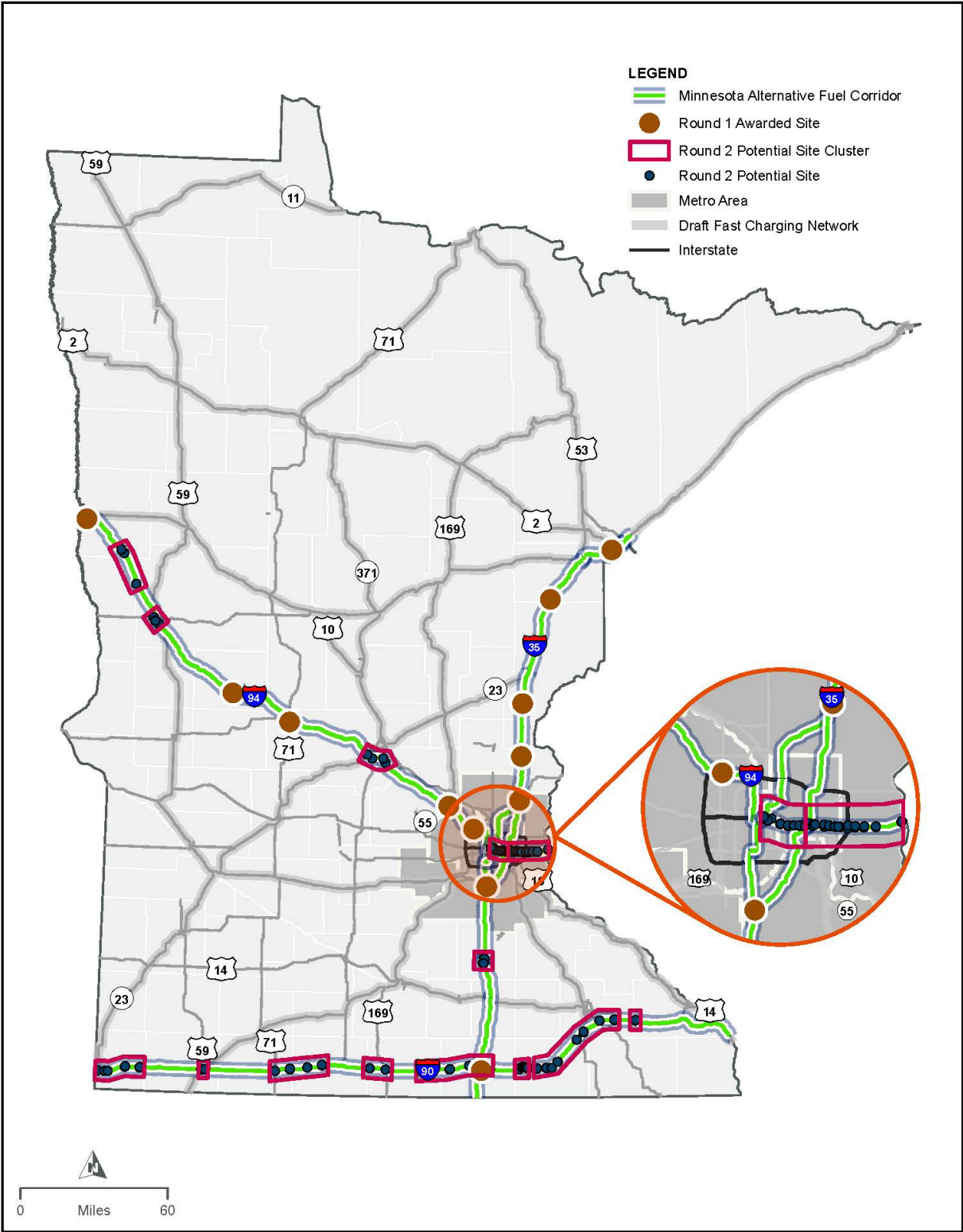
As detailed previously, the original NEVI Program guidance required federally funded DCFC stations to meet four basic criteria:

- Stations must be located, at minimum, every 50 miles along designated AFCs
- Stations must be located less than 1-mile drive distance from exits
- Stations must have a minimum of four ports and be capable of delivering 150 kW to each port simultaneously
- Stations must be open to the public 24/7 with no entry fee to access chargers

Figure 3 illustrates where investments are being made along Minnesota interstates.



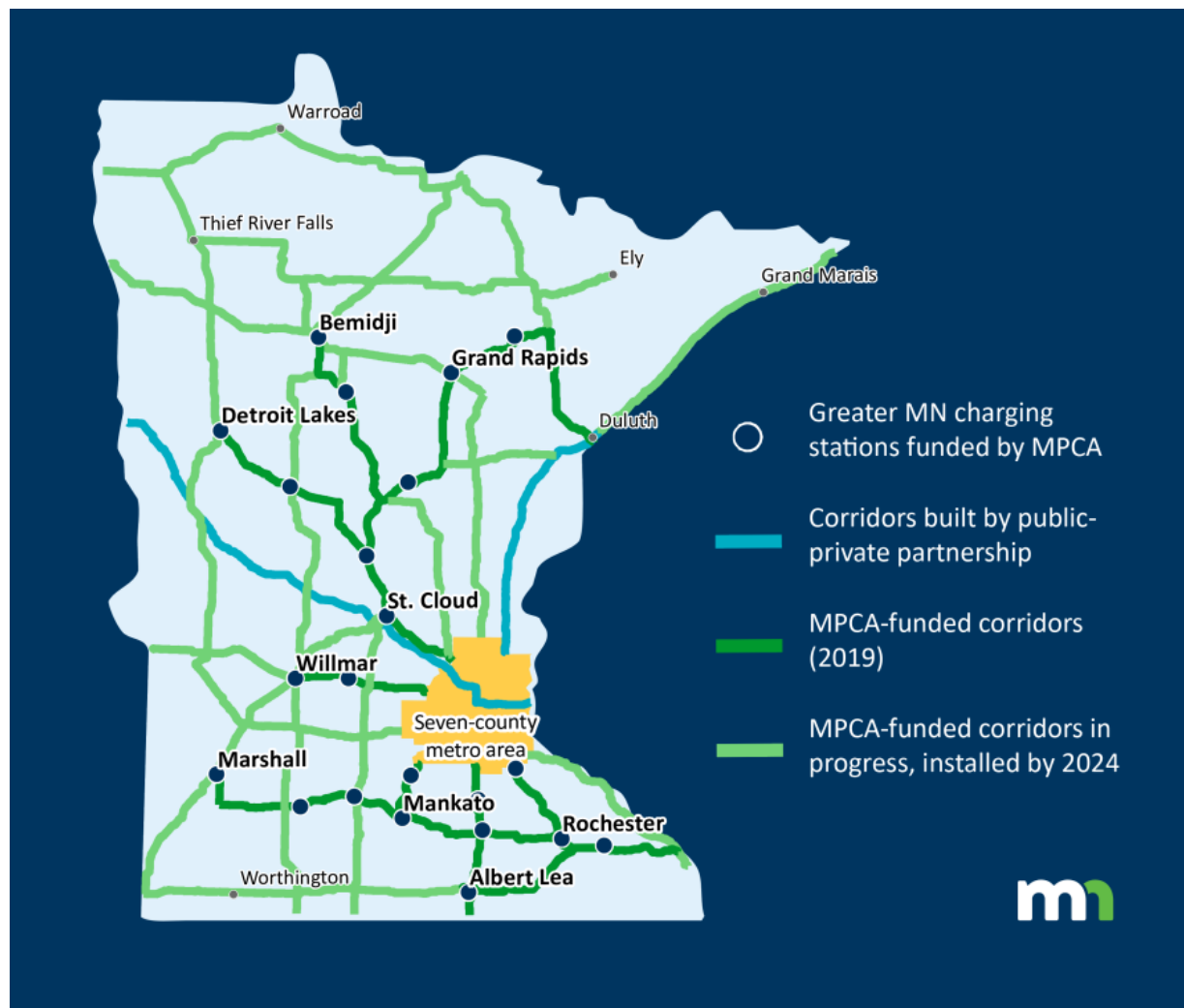
Figure 3: NEVI Station Locations, MnDOT, October 2024



3.2 VW SETTLEMENT STATIONS

DCFC stations funded with VW Settlement Funds are located along long-distance travel corridors and feature one 50 kW charger with a Level 2 backup station. Stations are also built with future capacity to install two additional 50 kW stations or one station up to 350 kW. **Figure 4** illustrates already funded DCFC sites and corridors where future investments are planned.

Figure 4: VW Settlement Station Locations



VW Settlement Funds have supported investments in Level 2 charging stations in 25 locations throughout Minnesota, mostly concentrated around Minneapolis and St. Paul with three charging stations in Duluth and three charging stations at casinos owned by the Leech Lake Band of Ojibwe. Level 2 charging stations feature dual-port chargers, which allow two vehicles to charge at the same time. Most stations are available 24/7 for public use.



4 EV CHARGING STATION GUIDELINES

Guidelines were developed for three charging station types: Long-Distance Charging Hubs, Destination Hubs and Amenity Charging. The draft Guidelines for each station type were presented for comment to Minnesota state agencies, utilities and Tribal Nations throughout focus group sessions held in July 2024.

State agency sessions were held on:

- July 2, 2024
- July 9, 2024
- July 18, 2024

Utility sessions were held on:

- July 15, 2024
- July 17, 2024

A Tribal Nations session was held on:

- July 23, 2024

4.1 LONG-DISTANCE CHARGING HUB

Long-Distance Charging Hubs are essential in supporting broader EV adoption. They are most often located along long-distance travel corridors or strategic urban locations where drivers can quickly recharge their vehicle in approximately 30 minutes. Long-Distance Hubs typically offer between 50-150 kW of power but can provide up to 350 kW of power. For example, the largest DCFC Hub in the U.S. (a Tesla Supercharger location in Harris Ranch, California), provides nearly 100 charging ports but DCFC hubs can offer as few as one or two ports for travelers.

DRAFT EV CHARGING STATION GUIDELINES

The initial draft of the Guidelines included three tiers of Long-Distance Charging Hubs and defined them as: high potential usage urban, medium potential usage urban and low potential usage rural. Hubs are classified as urban or rural based on U.S. Census delineations, which classify an area as urban if it contains at least 2,000 housing units or has a population of at least 5,000.

The medium potential usage urban tier roughly mirrored NEVI station requirements, while the high potential usage and low potential usage tiers provided an opportunity to either scale up or down the power level, number of ports and amenities at Long-Distance Hubs. Long-Distance Hubs are located



every 50 miles along interstates and principal arterials, such as freeways and expressways, which carry a high proportion of long-distance trips.

The amenities suggested at each tier were developed by considering standard amenities at Minnesota rest areas. The draft Guidelines proposed, at minimum, that Long-Distance Hubs should offer amenities consistent with Minnesota Class III rest areas, including restroom and picnic facilities. High and medium potential usage Long-Distance Hubs were proposed to offer amenities consistent with Minnesota Class I rest areas, including restrooms, drinking fountains, travel maps and 24/7 building access.

Table 1 details the draft Guidelines for Long-Distance Charging Hubs.

Table 1: Draft Long-Distance Hub EV Charging Station Guidelines

Element	Tier 1 – High Potential Usage Urban	Tier 2 – Medium Potential Usage Urban	Tier 3 – Low Potential Usage Rural
Distance	Every 50 miles along interstates and principal arterials	Every 50 miles along interstates and principal arterials	Every 50 miles along interstates and principal arterials
Location	Maximum of 1 mile drive distance from interstate exits and principal arterials	Maximum of 1 mile drive distance from interstate exits and principal arterials	Maximum of 5 miles drive distance from principal arterials
Power Level Per Port	150 kW	100-150 kW	50-100 kW
Power Level Per Station	900 kW – 1.2 MW	400-600 kW	100-200 kW
Charging Ports	6-8 ports	4 ports	2 ports
Charging Connectors	CCS, J3400	CCS, J3400	CCS, J3400
Amenities	Restroom facilities, food and drink, travel maps, 24/7 building access	Restroom facilities, food and drink, shaded area	Restroom facilities, drinking fountain, shaded area

Throughout focus group sessions held in July 2024, state agencies, utilities and Tribal Nations provided feedback on the draft Long-Distance EV Charging Station Guidelines. Focus group participants provided feedback on the proposed power level, station spacing, number of charging ports, amenities and locations for charging stations.

Power Level at Charging Stations

- Low potential usage sites, especially in rural areas, should offer high power DCFC (150 kW) due to there being less nearby amenities for travelers



- High potential usage sites, especially in urban areas, could have lower power DCFC as there are more nearby amenities to occupy travelers

Spacing/Distance of Charging Stations

- Medium and low potential usage DCFC Hubs could be located farther from roadways (2-5 miles)

Number of Charging Ports

- Higher number of ports (4-12 ports) at high potential usage DCFC Hubs was suggested
- Many participants noted the need to build stations that are ready for future expansion

Amenities

- Participants were interested in ensuring that charging provided, at minimum, amenities similar to what one would find at a gas station
- Restrooms and safety features (e.g., lighting, emergency call button) are considered essential basic amenities
- Food & drink and play areas for children and pets were popular suggestions
- Participants noted the need to consider cell phone service and internet strength at more remote sites
- Charging sites should offer a shade canopy over chargers or nearby shaded area
- Participants wanted to define a minimum charger uptime to promote confidence in the public that charging will be available when needed
- Charging stations need to have the ability to accept multiple payment types

Location

- Some participants were interested in identifying sites that could eventually help meet needs of medium- and heavy-duty (MHD) vehicles
- Participants noted the need to plan for tourism and identify locations which receive an influx of visitors during certain seasons
- Some charging stations will need to feature pull-through spaces for vehicles towing a boat, camper or trailer

REVISED EV CHARGING STATION GUIDELINES

Based on focus group feedback, the Long-Distance Charging Guidelines were revised and expanded, as detailed in [Table 2](#). Long-Distance Hubs are now organized into four subcategories: urban high and low potential usage, and rural high and low potential usage



Locations analyzed for EVINA were classified as urban or rural based on U.S. Census delineations, which classify an area as urban if it contains at least 2,000 housing units or has a population of at least 5,000. Locations were classified as high or low potential usage based on the number of long-distance trips on the adjacent roadway as measured through Replica data. [Replica](#) is a data platform that uses third-party data sources, such as mobile phone applications, to provide travel insights. Traffic on an average weekday was modeled to determine the number of long-distance trips. Trips longer than 150 miles with more than 50 miles remaining at the location of interest were considered long-distance trips. Locations with the highest number of long-distance trips (75th percentile or higher) were considered high potential usage and the remaining locations were considered low potential usage. Locations in the 75th percentile had at least 2,500 long-distance trips on the adjacent roadway.

The number of ports was increased across all types of Long-Distance Charging Hubs. The minimum power level per port was also revised to provide a higher power delivery at rural locations. Depending on the current level of EV adoption in Minnesota, Long-Distance Hubs at urban and rural high potential usage locations could be developed with only supporting electrical infrastructure for the maximum number of ports and installed EVSE for a lower number of ports. This would reduce upfront station costs, while ensuring future station upgrades do not require costly demolition work to add additional charging ports.

It was noted during multiple engagement sessions that travelers will need to become accustomed to more significant wait times when charging EVs and that sufficient amenities are needed to occupy travelers while waiting for their EV to charge. Standard amenities include restrooms, shaded rest areas and food and drink at most hubs. Amenities such as playgrounds and pet areas could be considered optional. In rural areas, casinos operated by Tribal Nations could be key partners in providing both the necessary electrical capacity for charging as well as nearby entertainment for travelers.



Table 2: Revised Long-Distance EV Charging Station Guidelines, Sept. 2024

Element	Urban	Urban	Rural	Rural
	High Potential Usage	Low Potential Usage	High Potential Usage	Low Potential Usage
Location	Every 50 miles along interstates and principal arterials	Every 50 miles along interstates and principal arterials	Every 50-75 miles along interstates and principal arterials ³	Every 50-75 miles along interstates and principal arterials
Distance	Max 1-mile drive distance from roadway	Max 2-mile drive distance from roadway	Max 2-mile drive distance from roadway	Max 5-mile drive distance from roadway
Minimum Power Level per Port	150 kW	150 kW	150 kW	150 kW
Power Level per Station	600 kW-1.2 MW	600-900 kW	1.2-1.8 MW	300-600 kW
Charging Ports	4-8 ports	4-6 ports	8-12 ports	2-4 ports
Charging Connectors	CCS, J3400	CCS, J3400	CCS, J3400	CCS, J3400
Safety	Emergency call button, lighting	Emergency call button, lighting	Emergency call button, lighting	Emergency call button, lighting
Standard Amenities	Restroom, food & drink, shaded area, WiFi	Restroom, food & drink, shaded area, WiFi	Restroom, food & drink, shaded area, WiFi	Restroom, water fountain, shaded area, WiFi
Additional Amenities	Pet area	Pet area	Playground, pet area, walking path	Playground, pet area, walking path
Parking configuration	Traditional stall parking or pull-through	Traditional stall parking or pull-through	Pull-through	Traditional stall parking or pull-through
Payment	Multiple payment options, including prepaid debit card and toll-free number	Multiple payment options, including prepaid debit card and toll-free number	Multiple payment options, including prepaid debit card and toll-free number	Multiple payment options, including prepaid debit card and toll-free number

Note: Charging station guidance may differ by specific funding sources. Refer to funding requirements as needed.

4.2 DESTINATION HUBS

Destination Hubs provide a cluster of chargers, most often Level 2 and can be integrated into both public and private parking areas. Destination Hubs may also include DCFC stations, but they may be lower power (50-100 kW) and offer a limited number of ports due to the higher cost of this station type.

³ In northern Minnesota (north of US-2), additional roadway classifications may need to be included to provide broad coverage for EVs. It's anticipated that additional roadways will be identified based on further analysis which considers vehicle traffic and roadway suitability, such as level of nearby urban development.



DRAFT EV CHARGING STATION GUIDELINES

The initial Guidelines split Destination Charging into two categories: Level 2 Charging Hubs and EV Mobility Hubs. Level 2 Charging Hubs are often located in parking garages or other large parking lots. Workplace charging is an example of a Level 2 Charging Hub and is the second most utilized method of charging after at-home charging. EV Mobility Hubs support multiple transportation modes, such as transit, rideshare vehicles, EVs and electric bicycles (e-bikes) and electric scooters (e-scooters). [Table 3](#) details the draft Guidelines for Destination Hubs.

Table 3: Draft Destination EV Charging Station Guidelines

Element	Level 2 Charging Hub	Level 2 Charging Hub	EV Mobility Hub
Location	Public Workplace Charging in Business/Office District	Community Charging Hub in disadvantaged community	Co-located with transit, rideshare and active transportation
Power Level per Port	Typically between 3.6-10 kW	Typically between 3.6-10 kW	Level 1: 3.5 kW Level 2: 7-10 kW DCFC: 50-150 kW
Charging Connectors	J1772, J3400	J1772, J3400	J1772, CCS, J3400
Amenities	Amenities accessible to private employees	May offer basic amenities (restroom, water fountain) or be near public amenities	Restroom facilities, water fountain. Typically located in urban areas with additional amenities available nearby

Based on focus group feedback, key takeaways on the draft Guidelines included:

- Participants would like to see both a higher power level and number of ports
- Safety features (lighting, emergency call button) are considered essential basic amenities
- Siting considerations could consider walking distance from charging stations to amenities, i.e., can you reach amenities within a 5-minute or 10-minute walk?
- Choose locations which benefit small and disadvantaged businesses
- Consider building stations that are “ready” for future expansion, as number of EVs increases, higher number of ports will be needed
- Signage at charging stations could advertise nearby amenities (park, hiking trail, local businesses)



REVISED EV CHARGING STATION GUIDELINES

The Guidelines for Destination Hubs were revised and expanded, as detailed in [Table 4](#). In the revised Guidelines, Destination Hubs are now split into four categories: Community and Recreation Hubs, Workplace Hubs, Mobility Hubs and Retail Hubs.

- **Community and Recreation Hubs** would offer EV charging at libraries, community centers, parks and other public areas. Community Hubs can also add charging stations where the private market will likely lag in development and support EV charging for Justice40 and other disadvantaged communities.
- **Workplace Hubs** offer charging opportunities that fit into the day-to-day travel pattern of EV owners and are ideal locations for Level 2 charging due to a vehicle’s lengthy dwell time (~8 hours).
- **Retail Hubs** would offer charging opportunities that fit into the day-to-day travel pattern of EV owners running errands or shopping.
- **Mobility Hubs** would support electrified transportation for a variety of modes, including personal EVs, rideshare EVs, transit, e-bikes and e-scooters. They offer multiple levels of charging, including DCFC for rideshare EVs, Level 2 charging for personal EVs and Level 1 charging for e-bikes and e-scooters, which utilizes a standard 120V outlet.

Destination Hubs can be sized as small, medium and large hubs to account for variation in the sizes of supporting businesses, workplaces and community centers, as well as variation in the popularity of retail and recreational locations. For example, a 50-person workplace may only offer four charging ports for employees, while a larger 500-person workplace may offer 30 or more ports. Destination Hubs would offer both J1772 and J3400 connectors to support Level 2 charging for a wider variety of EVs. For Tesla vehicles, the J3400 connector supports both Level 2 and DCFC charging, while most other EVs need to make use of J1772 for Level 2 charging and CCS1 for DCFC.

Table 4: Revised Destination EV Charging Station Guidelines, Sept. 2024

Element	Community and Recreation	Workplace	Retail	Mobility Hub
Location	Libraries, parks, community centers and other indoor/outdoor recreation areas	At individual workplace or central area supporting several workplaces	Shopping, dining and commercial areas	Co-located with transit, active transportation and rideshare
Power Level per Port	3.6-19 kW	3.6-19 kW	3.6-19 kW	Level 1: 1-3 kW Level 2: 3.6-19 kW DCFC: 50-100 kW



Charging Connectors	J1772, J3400	J1772, J3400	J1772, J3400	J1772, CCS, J3400
Safety	Lighting, emergency call button	Lighting, emergency call button	Lighting, emergency call button	Lighting, emergency call button
Standard Amenities	Located nearby basic amenities	Workplace amenities accessible to employees	Amenities offered by businesses	Restroom, water fountain, shaded area, WiFi
Payment	Private: determined by business Public: multiple options, including prepaid debit card and toll-free number	Determined by workplace	Private: determined by business Public: multiple options, including prepaid debit card and toll-free number	Multiple options, including prepaid debit card and toll-free number

Note: Charging station guidance may differ by specific funding sources. Refer to funding requirements as needed.

4.3 AMENITY CHARGING

Amenity Charging refers to small installations of Level 2 charging in public or private lots where minimal electrical upgrades are needed. It also includes curbside and pole-mounted Level 2 charging stations accessible from the street, either in residential or commercial areas. Curbside and pole-mounted stations on residential streets can mimic at-home charging by allowing EV owners to charge their vehicles while parked overnight.

DRAFT AMENITY EV CHARGING STATION GUIDELINES

The draft EV Charging Station Guidelines for Amenity Charging ([Table 5](#)) introduced considerations for both Curbside/Pole-Mounted Charging and Public/Private Lots.

Table 5: Draft Amenity EV Charging Station Guidelines

Element	Curbside or Pole-Mounted	Public and Private Lots
Power Level	Typically between 7-10 kW	Typically between 7-10 kW
Charging Connectors	J1772, J3400	J1772, J3400
Amenities	Typically located in an urban or suburban downtown with amenities available within walking distance	If located in a commercial lot, access to restroom facilities or food and drink may be provided by nearby businesses



Engagement revealed some skepticism from participants about the feasibility of widespread curbside or pole-mounted charging. These types of installations must navigate unique regulations in each municipality and can be costly if other street upgrades are not happening in tandem.

Other key takeaways from engagement include:

- Participants would like to see higher power when possible
- Lodging industry would be a good partner for overnight Level 2 charging

REVISED EV CHARGING STATION GUIDELINES

The revised Guidelines ([Table 6](#)) were updated to include these considerations for curbside and pole-mounted installations.



Table 6: Revised Amenity EV Charging Station Guidelines, Sept. 2024

Element	Curbside or Pole-Mounted	Commercial Lot	Residential Lot
Location	In city ROW, coordinated with other street upgrades	Private businesses, including retail and lodging	Multi-family housing
Power Level per Port	3.6-19 kW	3.6-19 kW	3.6-19 kW
Charging Connectors	J1772, J3400	J1772, J3400	J1772, J3400
Amenities	Typically located nearby private businesses	Provided by host business	No amenities: stations typically for resident or guest use only
Safety	Lighting	Lighting	Lighting
Payment	Determined by charging provider	Determined by business	Varies, may be wired directly to residential unit's electric meter or determined by charging provider

Note: Charging station guidance may differ by specific funding sources. Refer to funding requirements as needed.

4.4 ADDITIONAL CONSIDERATIONS FOR ALL STATION TYPES

While not included in the Guidelines, there are additional considerations that state agencies, municipalities, businesses or other implementers should keep in mind when installing charging stations.

CHARGER AND SITE DESIGN

- Developers should reach out to their local utility as early as possible. 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.
- Minimally intrusive charger designs for EVSE located in the right-of-way can help to minimize tripping hazards, such as chargers with retractable cords or chargers where drivers supply their own charging cord to connect to EVSE.
- Site design standards can be considered at the local level which describe how to integrate EVSE into parking lots, considering such factors as required landscaping and the location of EV spaces in the parking lot (i.e., located near entrance).
- Per ADA guidelines, 4% of provided EV charging spaces at any site (minimum of one EV charging space per site) should be accessible EV charging spaces.



- Site design will need to consider snow removal around charging stations during winter months. Charging stations should be integrated into the site in a way that allows snow removal with a shovel or plow. This may impact vehicle canopies.

SIGNAGE

- EV signage should clearly communicate the maximum amount of time allowed for charging (if applicable) and hours in which parking is limited to EVs only.
- Pavement markings can also complement EV signage and help direct drivers to EV charging stations.

RESILIENCY

- For public chargers, defining a minimum reliability standard which sets expectations for charger uptime can help ease range anxiety concerns or fears that an EV will not reliably allow one to reach their destination. Some funding sources for charging stations may have their own uptime requirements. Refer to individual guidance as needed. For example, charging stations that fall under 23 CFR 680 must meet 97% uptime requirements.
- Minnesota experiences periods of both extreme heat and cold throughout the year, which can affect the functionality of charging equipment. When selecting a charging station manufacturer, stations which are NEMA 4 rated guarantee station functionality between -22°F and 122°F.
- Adding solar panels and battery energy storage systems (BESS) to workplace charging sites can help decrease potential demand charges resulting from power usage during midday peaks, as well as support electricity generation from renewable sources.
- Deploying bidirectional chargers in strategic locations, such as public libraries, schools, or other buildings which may be used as shelters, can provide power to these sites during emergency events, such as extreme heat or cold. An EV with bidirectional capability, such as the Ford F150 Lightning, could return energy stored in its battery to power the building.

5 NEXT STEPS

Within EVINA, the Guidelines are being used to inform subsequent tasks, such as the Infrastructure Needs Assessment and Mapping Tool. A siting analysis was performed which identifies priority areas for Long-Distance Charging and details whether existing charging stations meet EV Charging Station Guidelines. For Destination and Amenity Charging, the Guidelines can be used to help identify how county, city and metropolitan planning organization (MPO) charging port projections can be distributed into various charging station types. The Guidelines could also help MnDOT



develop scoring criteria for future funding opportunities related to transportation electrification, as well as projected utility impacts and infrastructure costs at various charging station types.



ATTACHMENT A: STATUTES AND RULES IMPACTING EV CHARGING IN MINNESOTA

MINNESOTA STATUTE 160.08, SUBD. 7

No commercial establishment within right-of-way; exceptions. No commercial establishment, including but not limited to automotive service stations, for serving motor vehicle users shall be constructed or located within the right-of-way of, or on publicly owned or publicly leased land acquired or used for or in connection with, a controlled-access highway; except that (1) structures may be built within safety rest and travel information center areas; (2) space within state-owned buildings in those areas may be leased for the purpose of providing information to travelers through advertising as provided in section 160.276; (3) advertising signs may be erected within the right-of-way of interstate or controlled-access trunk highways by franchise agreements under section 160.80; (4) vending machines may be placed in rest areas, travel information centers, or weigh stations constructed or located within trunk highway rights-of-way; and (5) acknowledgment signs may be erected under sections 160.272 and 160.2735.⁴

MINNESOTA STATUTE 161.045, SUBD. 3

Limitations on spending. (a) A commissioner must not pay for any of the following with funds from the highway user tax distribution fund or the trunk highway fund:

...

(15) the installation, construction, expansion, or maintenance of public electric vehicle infrastructure;⁵

MINNESOTA STATUTE 325F.185

Any electric vehicle infrastructure installed in this state must without significant upgrading of the electric vehicle infrastructure:

⁴ [Sec. 160.08 MN Statutes](#)

⁵ [Sec. 161.045 MN Statutes](#)



- (1) allow for utilization of the electric vehicle infrastructure by any make, model, or type of electric vehicle;
- (2) be in compliance with section 326B.35 and standards set by the Society of Automotive Engineers; and
- (3) be capable of providing bidirectional charging, once electrical utilities achieve a cost-effective capability to draw electricity from electric vehicles connected to the utility grid.⁶

AMERICANS WITH DISABILITIES (ADA) ACT GUIDELINES

The following table lists the Electric Vehicle Supply Equipment (EVSE) installation guidance for compliance with Americans with Disabilities Act (ADA) guidelines provided.⁷

⁶ [Sec. 325F.185 MN Statutes](#)

⁷ [ADA Requirements for EV Charging Stations](#)



Number of spaces	4% (e.g., 1 in 25 spaces) but no less than one of electric vehicle (EV) charging spaces, in any given parking facility, must be accessible compliant. These spaces are accessible electric vehicle (EV) charging spaces, not ADA parking spaces.
Parking stall	Each space must be 11 feet minimum wide by 18 feet minimum long.
Maneuvering clearance width	Minimum 36 inches wide, hash-marked, at the top of the parking space between the charging station and the vehicle.
Accessible route slope/cross slope	Accessible Route Slope and Cross Slope Maximum 1:20 (5%) running slope and 1:48 (2%) cross slope; Accessible vehicle spaces 1:48 (2%) in all directions
Accessible ramps	A ramp or curb-cut must be accessible in order to establish an accessible route to and operation of charging station.
Side access aisle	Side access aisle of 60 inches minimum in width to allow space for wheelchair and equipment in and out of space. (When paired with an 11-foot-wide accessible parking stall this is both van and car accessible).
Reach range	The front and side of the EVSE must have 48 inches of space to allow reach to all operable parts from a wheelchair.
Accessible controls	Operable with one hand and not requiring tight grasping, pinching, twisting of the wrist or force more than 5 pounds
Cord Length / Cord Management system	Cord Length must be a minimum of 20 feet long. The EVSE must incorporate a cord management system or method to eliminate potential for cable entanglement, user injury or connector damage from lying on the ground.
Posted signage	“Accessible EV Charging Station” signs shall be centered at the head end of the parking space a maximum of 96 inches from the head of the spaces and be mounted 60 inches minimum and 66 inches maximum from the floor of the space. “Electric Vehicles only” stenciled graphics are required on each of the parking pad.



Additional items for ADA Compliance of Level 2 EV charging stations:

Facility Accessibility	Must be connected by a minimum of 48-inch-wide accessible route in proximity (not necessarily adjacent) to the entrance of the building. If station is for multiple buildings, access must be to the nearest accessible walkway. Mobility hubs and gas stations where the sole function is to fuel the vehicle, stand-alone parking lots and stand-alone parking structures do not need to have an accessible route
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Additional non-ADA requirements for all Electric Vehicle charging stations:

Posted signage	“Charging station Electric Vehicles Only” signs shall be centered at the head end of the parking space a maximum of 96 inches from the head of the spaces and be mounted 60 inches minimum and 66 inches maximum from the floor of the space. “Electric Vehicles only” stenciled graphics are required on each of the parking pads.
Bollards	Install bollards that are 3-feet to 4-feet in height to protect the station equipment from accidental impact (if stand-alone charging station).
Payment options/card readers	If the stations require payment, they must be Payment Card Industry compliant to allow direct use of a credit or debit card at the station itself. Stations may also offer additional payment methods including subscription methods, smart cards, or smart phone applications.
Other considerations	Ensure that bollards, wheel stops and curbs do not obstruct the approach and use of charging station.

Where compliance with the requirements of these guidelines is technically infeasible due to existing site constraints, installation of EV charging spaces shall provide accessibility to the maximum extent technically feasible.

MNDOT NEVI PROGRAM REQUIREMENTS FOR APPLICATIONS

All applicable requirements of Title 23 United States Code (USC) and 2 Code of Federal Regulations (CFR) Part 200 apply to the administration of these funds, which include, but are not limited to: 23 CFR 680, the Davis-Bacon Act, the Americans with Disabilities Act of 1990 (ADA), Title VI of the Civil Rights Act of 1964, the National Environmental Policy Act of 1969 (NEPA) and the Build America, Buy America (BABA) Act. The Grantee must also comply with all other



standards and requirements required by federal, state and local laws. In addition, Grantees must comply with technical requirements for [Round 1](#) and [Round 2](#).