



**Electric Vehicle (EV)  
Inventory & Preliminary New Location Study**

*Draft*

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Appendix A: Federal Public EV Charging Station Fundings Sources for Urban Area

Appendix B: Federal Public EV Charging Station Funding Sources for Rural Area

# Introduction

This document is a starting point for a discussion on EV readiness in the Morgantown Monogalia area, providing a preliminary understanding of the current status and the need for electric vehicle charging stations. It also provides the fundamentals of EV charging stations and related federal regulations.

- Section one - EV Charging Infrastructure Basic - covers EV education, charging infrastructure, strategic location selections, and federal standards.
- Section two - Status and Need Assessment - delves into the current status of EVs and charging ports in Monongalia County, presenting data on existing infrastructure while forecasting future needs using US DOT and US DOE tools.
- Section three - Preliminary Recommendations - identifies potential locations for new charging ports to meet the rising demand for electric mobility.

In a commitment to inclusive planning, the document underscores the incorporation of public input, positioning it as a collaborative resource for ongoing research or project development in the MMMPO area.

# EV Charging Infrastructure Basics

## Vehicles and Charging Ports

### Vehicle Type

Currently, there are three types of electric vehicles on the market. This Readiness Plan focuses on BEVs and PHEVs.

#### **Battery Electric Vehicles (EBVs)**

- Run on electricity only and are recharged from an external power source.
- EBVs include battery electric buses (BEBs) and electric school buses (ESBs).
- It is also referred to as an “all-electric vehicle”.

#### **Plug-in Hybrid Electric Vehicles (PHEVs)**

- Run on electricity and are recharged from an external power source.
- Incorporate a smaller internal combustion engine that can recharge the battery. When electricity is unavailable, PHEVs can run on gasoline alone.

#### **Fuel Cell Electric Vehicles (FCEVs)**

- Use the electrochemical process to convert hydrogen into electricity.
- Not for recharging its battery from an external source.

### Charging Port Type

#### **Level 1**

- Common residential 120V alternating current (AC) outlet
- 40-50 hours to charge a light-duty BEV
- 5-6 hours to charge a PHEV
- Typical location: Home

#### **Level 2**

- 240V (in residential applications) or 208V (in commercial applications)
- 4-10 hours to charge a light-duty BEV
- 1-2 hours to charge a PHEV
- Typical location: Home, Workplace, and Public

#### **DCFC (Direct Current Fast Charging)**

- Common for heavy-traffic corridors
- 20 minutes - 1 hour to charge a light-duty BEV (80%)
- 5 - 30 minutes to charge a light-duty PHEV (80%)

- Most PHEVs currently on the market are not capable of using DCFCs.
- Typical location: Public

## Electric Bus Basics

Electric buses, including BEBs and ESBs, run on electricity only and require recharging their onboard battery packs from an external power source. A type of BEB, ESBs tend to have smaller battery packs as they often operate on shorter routes with a midday break during school hours for charging.

There are three types of charging ports for BEBs. They can be installed at the storage facility or on-route.

- **Plug-in charging:** Slowest option (AC/DC, 40-350 kW), ideal for overnight depot charging due to long charge times. Faster options are emerging.
- **Wireless inductive charging:** Uses floor pads and magnetic fields (50-250 kW), offers convenience but is less common.
- **Overhead conductive (pantograph) charging:** Fastest option (165-600 kW), connects via a pantograph for quick stops at depots (5-20 min). Also used for in-motion charging (IMC) trolleybuses on limited routes.

Key considerations:

- Charging speed varies depending on technology and power level.
- Depot charging is common for slow to medium-speed options.
- Faster options like pantograph or high-power plug-in are ideal for route charging.
- Consider battery size, route lengths, and charging needs when choosing infrastructure.

## Location Selections

### General Considerations

The following are major factors to consider when choosing locations for public EV charging locations.

- Land availability and cost: Finding suitable land with the necessary infrastructure can be challenging in some areas. Ideal locations often have the following characteristics:
  - Areas or locations with underserved communities
  - Proximity to public transportation and travel corridors
  - Proximity to local public services
  - Proximity to local businesses
  - Proximity to nearby multifamily housing

- Availability of parking
- Electric grid capacity: Upgrading the grid may be necessary to support the increased demand for electricity from EV charging stations.
- Community needs and preferences: Engaging with the community is crucial to ensure that EV charging stations are placed in locations that are most beneficial to residents.
- Equity Considerations (see section below)

## Level 2 Stations

Workplace parking lots: Employers are increasingly installing Level 2 chargers to attract and retain employee who drive EVs.

Retail centers: Shopping malls, grocery stores, and other businesses with long dwell times are ideal locations for Level 2 chargers, as customers can top up their batteries while shopping or running errands.

Apartment complexes: To cater to residents who don't have access to home charging, apartment complexes are installing Level 2 chargers in designated parking areas.  
Community centers and libraries: Public buildings with ample parking can offer Level 2 charging as a convenience to residents.

Curbside parking: On-street parking spaces with Level 2 chargers can be a good option in dense urban areas where off-street parking is limited.

Rest stops and travel plazas: Level 2 chargers at rest stops and travel plazas can help address range anxiety for EV drivers on long trips.

## DCFC Stations

High-traffic corridors: Busy roads and highways are ideal locations for DCFC stations, as they can help reduce range anxiety for EV drivers on short trips.

Convenience stores and gas stations: Convenience stores and gas stations with ample parking can attract customers by offering DCFC stations.

Public transportation hubs: Train stations, bus terminals, and airports can offer DCFC stations for travelers who need a quick charge before their trip.

## Equity Considerations

Project benefits and costs should be fairly distributed across the community, especially considering low-income, minority, and disabled populations. Equity concerns that might arise include a project's affordability, accessibility, reliability, location, safety, and related employment and economic opportunities.

According to National Electric Vehicle Infrastructure Standards and Requirements, disadvantaged communities (DACs) mean

*Census tracts or communities with common conditions identified by the U.S. Department of Transportation and the U.S. Department of Energy that consider appropriate data, indices, and screening tools to determine whether a specific community is disadvantaged based on a combination of variables that may include, but are not limited to, the following: low income, high and/or persistent poverty; high unemployment and underemployment; racial and ethnic residential segregation, particularly where the segregation stems from discrimination by government entities; linguistic isolation; high housing cost burden and substandard housing; distressed neighborhoods; high transportation cost burden and/or low transportation access; disproportionate environmental stressor burden and high cumulative impacts; limited water and sanitation access and affordability; disproportionate impacts from climate change; high energy cost burden and low energy access; jobs lost through the energy transition; and limited access to healthcare.*

*(23 CFR 680.104 "Disadvantaged communities (DACs)")*

### Equity Data

USDOT Equitable Transportation Community (ETC) Explorer

<https://experience.arcgis.com/experience/0920984aa80a4362b8778d779b090723/page/ETC-Explorer---Homepage/>

USDOT Electric Vehicle Charging Justice40 Map

<https://anl.maps.arcgis.com/apps/webappviewer/index.html?id=33f3e1fc30bf476099923224a1c1b3ee>

The White House Council on Environmental Quality: Climate and Economic Justice Screen Tool

<https://screeningtool.geoplatform.gov/en/#11.4/39.6257/-79.9679>

## Federal Standards and Requirements

The Federal Highway Administration (FHWA) issued new national standards for federally funded EV chargers in February 2023. These new standards aim to ensure that charging is a predictable and reliable experience for EV drivers. This section includes the part of the requirements that are most relevant to EV charging station planning at the community level. For full information on the standards and requirements, please consult 23 CFR Part 680 National Electric Vehicle Infrastructure Standards and Requirements.

Except where noted, these regulations apply to all NEVI Formula Program projects as well as projects for the construction of publicly accessible EV chargers that are funded with funds made available under Title 23, United States Code, including any EV charging infrastructure project funded with Federal funds that is treated as a project on a Federal-aid highway.

### Number of charging ports

When including DCFCs located along and designed to serve users of designated AFCs, charging stations must have at **least four** network-connected DCFC charging ports and be capable of simultaneously charging at least four EVs.

In other locations, EV charging stations must have at **least four network-connected (either DCFC or AC Level 2 or a combination of DCFC and AC Level 2)** charging ports and be capable of simultaneously charging at least four EVs.

*More information in 23 CFR 680.106(b)*

### Power level

DCFC charging ports must support output voltages between 250 volts DC and 920 volts DC. DCFCs located along and designed to serve users of designated AFCs must have a continuous power delivery rating of at least 150 kilowatts (kW) and supply power according to an EV's power delivery request up to 150 kW, simultaneously from each charging port at a charging station. These corridor-serving DCFC charging stations may conduct power sharing so long as each charging port continues to meet an EV's request for power up to 150 kW.

Each AC Level 2 charging port must have a continuous power delivery rating of at least 6 kW and the charging station must be capable of providing at least 6 kW per port simultaneously across all AC ports. AC Level 2 chargers may conduct power sharing and/or participate in smart charge management programs so long as each charging port continues to meet an EV's demand for power up to 6 kW unless the EV charging customer consents to accepting a lower power level.



*More information in 23 CFR 680.106(d)*

## Availability

Charging stations located along and designed to serve users of designated Alternative Fuel Corridors must be available for use and sited at locations physically accessible to the public 24 hours per day, 7 days per week, year-round. Charging stations not located along or not designed to serve users of designated Alternative Fuel Corridors must be available for use and accessible to the public at least as frequently as the business operating hours of the site host.

*More information in 23 CFR 680.106(e)*

## Security

States or other direct recipients must implement physical strategies to protect the charging station including

- Lighting;
- Siting and station design to ensure visibility from onlookers;
- Driver and vehicle safety;
- Video surveillance;
- Emergency call boxes;
- Fire prevention;
- Charger locks;
- Strategies to prevent tampering and illegal surveillance of payment devices.

*More information in 23 CFR 680.106(h)*

## Community Engagement

States must include in the State EV Infrastructure Deployment Plan a description of the community engagement activities conducted as part of the development and approval of their most recently submitted State EV Infrastructure Deployment Plan, including engagement with disadvantaged communities (DACs). This only applies to the NEVI Formula Program projects

*More information in 23 CFR 680.112(d)*

## Other Federal Laws

The American with Disabilities Act of 1990 (ADA), and its implementing regulations, apply to EV charger projects. (23 CFR 680.118(c))

The Uniform Relocation Assistance and Real Property Acquisition Act applies to EV charger projects. (23 CFR 680.118(g))

The National Environmental Policy Act of 1969 (NEPA) applies to EV charger projects. (23 CFR 680.118.(h))

# Status and Need Assessment

## Current Stations

Current EV charging stations in the Morgantown Monogalia MPO area:

Location Name	Type	Ports	Network	Access	Address
City of Morgantown Farmers Market	Level 2	1	None	Public, 24/7	415 Spruce St
University Motor	Level 2	2	ChargePoint	Public, 24/7	58 Don Knotts Blvd
University Motor	DC Fast	1	ChargePoint	Public, 24/7	58 Don Knotts Blvd
Subaru of Morgantown	Level 2	1	Blink	Public, 24/7	1730 Mileground Road
Sheetz-Tesla Supercharger	DC Fast	8	Tesla Supercharger	Public, 24/7	1901 Earl L Core Road
Hampton Inn & Suites Morgantown / University Town Centre	Level 2	2	None	Hotel customer use only	325 Granville Square
Black Bear Village	Level 2	3	Blink	Public, 24/7	380 Richard Harrison Way
Triple S Harley-Davidson	DC Fast	1	ChargePoint	Public, 24/7	7300 Willie G Ave Westover, WV 26501
Premier Chevrolet Buick GMC	Level 2	2	None	Public / Business Hours	5392 University Town Centre Dr
Sheetz - Tesla Supercharger	DC Fast	8	Tesla Supercharger	Public, 24/7	21 Asturias Lane

Data source: US DOE Alternative Fuels Data Center:  
<https://afdc.energy.gov/stations/#/find/nearest?fuel=ELEC>

## EV Registration Estimation

Estimation of EV registered by year in West Virginia and neighboring states.

	EV Registered by Year per 10,000 People					Average Annual Increase
	2018	2019	2020	2021	2022	
West Virginia	1	2	3	6	11	83%
Pennsylvania	6	9	13	21	37	58%
Ohio	5	9	12	18	29	56%
Virginia	12	18	24	36	65	53%
<b>Four State Average</b>	<b>6</b>	<b>10</b>	<b>13</b>	<b>20</b>	<b>36</b>	<b>63%</b>

Source: U.S. DOE Alternative Fuels Data Center - TransAlta

Considering that the MPO area is relatively urban compared with the rest of West Virginia and that urban areas generally tend to have higher EV ownership rates compared to rural areas due to factors like charging infrastructure, shorter commutes, and higher environmental awareness, this readiness plan used the **four state average number for the number of EV registered by year per 10,000 people in the Morgantown Monongalia area.**

Estimation of EV registered by year in the MPO area.

	EV Registered by Year					Total
	2018	2019	2020	2021	2022	
Per 10,000 population	6	10	13	20	36	
Actual EV*	60	95	130	203	355	843

\*Population in the Morgantown Monongalia MPO Area  $\approx$  100,000

Estimation of the number of EVs in the MPO area

Vehicles added from 2018 to 2022  $\approx$  850

Vehicles added before 2018  $\approx$  300

Vehicles added in 2023  $\approx$  450

Vehicles purchased in out-of-state  $\approx$  400

Total EV in the MPO area  $\approx$  2,000

## Current Need

The following needs assessment was calculated by using the Electric Vehicle Infrastructure Projection Tool (EVI-Pro) Lite provided by the U.S. Department of Energy Alternative Fuels Data Center. More information about the tool can be found at <https://afdc.energy.gov/evi-pro-lite>

### Assumption

Parameter	Value
EVs to support	2,000 (existing condition as of 2023) 10,884 (2030)
Vehicle Mix (system default)	<ul style="list-style-type: none"> <li>● PEV Sedans: 25%</li> <li>● PEV C/SUVs: 47%</li> <li>● PEV Pickups: 25%</li> <li>● PEV Vans: 3%</li> </ul>
How much support do you want to provide for plug-in hybrid electric vehicles(PHEVs)?	Partial support: Calculate using half of the full support assumption.
Home Charging Access	99% (assumed)

### Results - Level 2 Ports

<b>65 Public Level 2 Charging Ports</b>		
# of Ports	Location Type	Description
6	Retail	Ports collocated with shopping (e.g., groceries, clothes, appliances) or dining amenities
4	Recreation Center	Ports collocated with recreational (e.g., parks, movies, bars, museums) or exercise activities
8	Healthcare Facility	Ports located at healthcare facilities such as hospitals, clinics, dental, or therapy
4	Education Facility	Ports located at educational facilities such as schools and universities
3	Community Center	Ports located at religious and community gathering centers
3	Transportation Facility	Ports located at transport hubs including park-and-rides, railway stations, and airports
29	Neighborhood	Publicly accessible ports located curbside near

		where people live
8	Office	Publicly accessible ports collocated with offices or business parks

#### Results - DC Fast Charging Ports

<b>10 Public Level 2 Charging Ports</b>		
# of Ports	Location Type	Description
5	Retail - 150 kW	Ports collocated with shopping (e.g., groceries, clothes, appliances) or dining amenities
1	Retail - 250 kW	Same above
3	Recreation Center - 150 kW	Ports collocated with recreational (e.g., parks, movies, bars, museums) or exercise activities
1	Recreation Center - 250 kW	Same above

## Future Need (2030)

Based on the National Renewable Energy Laboratory (NREL) national electric vehicle infrastructure needs assessment, 12% of light-duty vehicles on the road could be plug-in electric vehicles by 2030. Applied to Morgantown that would mean **10,884** vehicles are plug-in electric vehicles. (source: U.S. Department of Energy Alternative Fuels Data Center - Electric Vehicle Infrastructure Projection Tool)

#### Results - Level 2 Ports

<b>253 Public Level 2 Charging Ports</b>		
# of Ports	Location Type	Description
30	Retail	Ports collocated with shopping (e.g., groceries, clothes, appliances) or dining amenities
13	Recreation Center	Ports collocated with recreational (e.g., parks, movies, bars, museums) or exercise activities
22	Healthcare Facility	Ports located at healthcare facilities such as hospitals, clinics, dental, or therapy
13	Education Facility	Ports located at educational facilities such as schools and universities

10	Community Center	Ports located at religious and community gathering centers
19	Transportation Facility	Ports located at transport hubs including park-and-rides, railway stations, and airports
109	Neighborhood	Publicly accessible ports located curbside near where people live
37	Office	Publicly accessible ports collocated with offices or business parks

Results - DC Fast Charging Ports

<b>10 Public Level 2 Charging Ports</b>		
# of Ports	Location Type	Description
6	Retail - 150 kW	Ports collocated with shopping (e.g., groceries, clothes, appliances) or dining amenities
3	Retail - 250 kW	Same above
5	Retail - 350+ kW	Same above
4	Recreation Center - 150 kW	Ports collocated with recreational (e.g., parks, movies, bars, museums) or exercise activities
2	Recreation Center - 250 kW	Same above
3	Recreation Center - 350+ kW	Same above

## Deficiency Analysis

The following table compares the current stations and the results of the needs analysis (current and future) from the sections above.

Location Type		Current Condition		Current Need		Future Needs (2030)	
		Port Type	Port # (Deficiency)	Level 2	DC Fast	Level 2	DC Fast
Public	Retail	–	0 (6)	6	6	30	14
	Recreation Center	–	0 (4)	4	5	13	9
	Healthcare Facility	–	0 (8)	8	–	22	–
	Education Facility	–	0 (4)	4	–	13	–
	Community Center	Level 2	1 (2)	3	–	10	–
	Transportation Facility	–	0 (3)	3	–	19	–
	Neighborhood	–	0 (29)	29	–	109	–
	Office	–	0 (8)	8	–	37	–
Other	Gas station	DC Fast	16	–	–	–	–
	Car / Motorcycle Dealer	Level 2	5	–	–	–	–
		DC Fast	2	–	–	–	–
	Multi-Unit Dwelling	Level 2	5	–	–	–	–



# Preliminary Recommendations

## Focus Areas (Non-Neighborhood)

Location Type	Location Description (map ID)	Charger Types (# of Ports )
Retail	University Towncenter (1)	Level 2 (20) DC Fast (10)
	SuncrestTowncenter (2)	Level 2 (10) DC Fast (4)
Recreation / Community Center	Marilla Park (3)	Level 2 (8) DC Fast (2)
	Hazel Ruby McQuain Park (4)	Level 2 (4) DC Fast (2)
	Start City Riverfront Park (5)	Level 2 (4) DC Fast (2)
	Westover City Park (6)	Level 2 (4) DC Fast (2)
	Caperton Trail Park (7)	Level 2 (4)
Healthcare Facility	Ruby Memorial Hospital (8)	Level 2 (10)
	Mon Health Medical Center (9)	Level 2 (10)
	WVU Medicine - University Towncenter (10)	Level 2 (4)
Education Facility	WVU Parking Falling Run Rd/University Ave Area (11)	Level 2 (4)
	WVU Parking Colisuem (12)	Level 2 (8)
	WVU Rec Center (13)	Level 2 (4)
Transportation	Morgantown Airport (14)	Level 2 (4)
	Mountain Line Westover Terminal / Westover Park and Ride (15)	Level 2 (4)
	I-68/US43 Park and Ride (N/A)	Level 2 (4)

	Brookhaven Park and Right (16)	Level 2 (4)
	WVU Parking PRT-Mountain Station (17)	Level 2 (8)
Office	Spruce Street Garage (18)	Level 2 (6)
	University Ave Garage (19)	Level 2 (6)
	City Fayette St Parking (20)	Level 2 (4)
	Mountainlair Garage (21)	Level 2 (6)
	Mon County Schools Admin Office (22)	Level 2 (4)
	Downtown Farmers Market (23)	Level 2 (4)
	WVU Medical School Campus Area (24)	Level 2 (10)

## Focus Areas (Neighborhood)

### Equity Priority Location

The following areas are identified as high-priority locations for EV infrastructure investment in terms of equity and economic justice. The tools used to identify those locations are USDOT Equitable Transportation Community (ETC) Explorer, USDOT Electric Vehicle Charging Justice40 Map, and the White House Council on Environmental Quality - Climate and Economic Justice Screen Tool.

Location Name (map ID)	Primary Streets
Woodburn (A)	Snider St, Monongalia Ave, Richwood Ave
Sabraton (B)	Richwood Ave
Main Street - Granville (C)	Main Street
Morgan Height - Westover (D)	Riverview Ave, Columbus St, Fairmont Dr
Sunnyside (E)	Grant Ave, McLane Ave
Mountaineer Middle School area (F)	Cornell Ave, Price St

# Community Preference Locations

The following areas are not identified as the equity and economic justice priority locations, but they are identified as community preference locations considering the population density, housing types, and adjacent land use.

Location Name (map ID)	Primary Streets
Star City (G)	Stafford St, Congress Ave
North Hills (H)	Pineview Dr, Headlee Ave
Apartments in Valley View Area (I)	Valley View Ave
Apartments in Van Voorhis Area (J)	Van Voorhis Rd
First Ward (K)	West Virginia Ave, Madigan Ave, Mississippi St
Triangle - Westover (L)	Holland Ave, Dunkard Ave
Greenmont (M)	Coburn Ave, Kingwood St
South Park (N)	Park St, Grand St, Wilson Ave

# Recommendation Map

