Charger Types and Speeds

EVs can be charged using electric vehicle service equipment (EVSE) operating at different charging speeds.

Level 1

Level 1 equipment provides charging through a common residential 120-volt (120V) AC outlet. Level 1 chargers can take 40-50+ hours to charge a BEV to 80 percent from empty and 5-6 hours for a PHEV.

Level 2

Level 2 equipment offers higher-rate AC charging through 240V (in residential applications) or 208V (in commercial applications) electrical service, and is common for home, workplace, and public charging. Level 2 chargers can charge a BEV to 80 percent from empty in 4-10 hours and a PHEV in 1-2 hours.

Direct Current Fast Charging (DCFC)

Direct current fast charging (DCFC) equipment offers rapid charging along heavy-traffic corridors at installed stations. DCFC equipment can charge a BEV to 80 percent in just 20 minutes to 1 hour. Most PHEVs currently on the market do not work with fast chargers.

Level 2 and DCFC equipment has been deployed at various public locations including, for example, at grocery stores, theaters, or coffee shops. When selecting a charger type, consider its voltages, resulting charging and vehicle dwell times, and estimated up-front and ongoing costs.

The figure below shows typical Level 2 and DCFC charging stations[1] .

Resources for EV Infrastructure Planning
Environmental Statutes and Executive Orders
Glossary of Abbreviations
Works Cited
ROUTES Home

Related Links

- DOE: Overview of EV Chargers

Related Documents

- Rural EV Toolkit (PDF Version)

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Level 2 chargers (left) are common in home, workplace, and public settings and can charge a BEV from empty in 4-10 hours. Direct current fast chargers (right) are common as public chargers and along highway corridors and can charge a BEV to 80 percent in under an hour. (123RF and Washington State Department of Transportation photos)

EV Charging Minimum Standards Rule

FHWA, with support from the Joint Office of Energy & Transportation, unveiled 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 includes ensuring that drivers can easily find a charger, do not need multiple apps and/or accounts to charge, chargers work when drivers need them to, and are designed to be compatible in the future with forward-looking charging capabilities.

The rule establishes minimum technical standards for charging stations, including required number of charging ports, connector types, power level, availability, payment methods, uptime/reliability, EV charger infrastructure network connectivity, and interoperability, among other standards and requirements.

Overview of EV Chargers

The below table summarizes the typical power output, charging time, and locations for PHEVs and BEVs for the different charger types. For more information on the power requirements of different chargers, see the Utility Planning section of the toolkit.

Overview of EV chargers: power output, plug type, and charge time for light-duty vehicles. (Adapted from the Alternative Fuels Data Center)

	Level 1	Level 2	DC Fast Charging

8:30am-5:00pm ET, M-F

If you are deaf, hard of hearing, or have a speech disability, please dial 7-1-1 to access telecommunications relay services.

Connector Type[2]	J1772 connector 	J1772 connector 	CCS connector  CHAdeMO connector  Tesla connector 
Voltage[3]	120 V AC	208 - 240 V AC	400 V - 1000 V DC
Typical Power Output	1 kW	7 kW - 19 kW	50 - 350 kW
Estimated PHEV Charge Time from Empty[4]	5 - 6 hours	1 - 2 hours	N/A
Estimated BEV Charge Time from Empty[5]	40 - 50 hours	4 - 10 hours	20 minutes - 1 hour[6]
Estimated Electric Range per Hour of Charging	2 - 5 miles	10 - 20 miles	180 - 240 miles
Typical Locations	Home	Home, Workplace, and Public	Public

[1] *Note that charging speed is affected by many factors, including the charger manufacturer, condition, and age; air temperature; vehicle battery capacity; and vehicle age and condition..*

[2] *Different vehicles have different charge ports. For DCFC, the Combined Charging System (CCS) connector is based on an open international standard and is common on vehicles manufactured in North America and Europe; the CHArge de Move (CHAdeMO) connector is most common for Japanese manufactured vehicles. Tesla vehicles have a unique connector that works for all charging speeds, including at Tesla's "Supercharger" DCFC stations, while non-Tesla vehicles require adapters at these stations.*

[3] *AC = alternating current; DC = direct current.*

[4] *Assuming an 8-kWh battery; most plug-in hybrids do not work with fast chargers.*

[5] *Assuming a 60-kWh battery.*

[6] *To 80 percent charge. Charging speed slows as the battery gets closer to full to prevent damage to the battery. Therefore, it is more cost- and time-efficient for EV drivers to use direct current (DC) fast charging until the battery reaches 80 percent, and then continue on their trip. It can take about as long to charge the last 10 percent of an EV battery as the first 90 percent.*

Also in This Section

Electric Mobility Basics

- Vehicle Types
- Charger Types and Speeds
- Electric Micromobility Basics
- Electric Bus Basics

Next Section

Benefits and Implementation Challenges of Rural EV Electrification

- Benefits to Individuals
- Benefits to Communities
- Implementation Challenges and Evolving Solutions for Rural Communities
- Benefits and Implementation Challenges of Bus Electrification

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