Congressional Research Service
Informing the legislative debate since 1914

EV Charging Infrastructure: Frequently Asked Questions

January 14, 2025

Congressional Research Service
https://crsreports.congress.gov
R48351

CRS REPORT
Prepared for Members and
Committees of Congress

Congressional Research Service
Informing the legislative debate since 1914

SUMMARY

R48351

January 14, 2025

Melissa N. Diaz
Analyst in Energy Policy

EV Charging Infrastructure: Frequently Asked Questions

This report addresses frequently asked questions related to expanding plug-in electric vehicle (EV) charging infrastructure.

The first set of questions examines the current availability of EV charging infrastructure and the projected needs of the charging network by 2030.

The second set of questions provides an overview of two major federal programs—the National Electric Vehicle Infrastructure (NEVI) Formula Program and the Charging and Fueling Infrastructure (CFI) Grant Program—that provide funding for the deployment of EV charging infrastructure.

The final set of questions examines some of the challenges facing the expansion of the EV charging network and discusses what's considered next in the funding process.

The report also includes a list of additional CRS resources that provide information on EVs and EV charging infrastructure.

Contents

Introduction 1
Current Status and Projected Needs 2
What is the current state of EV charging infrastructure in the United States? 2
How much charging infrastructure will be needed in the United States? 2
Federal Programs 3
How does NEVI expand EV infrastructure? 3
How does CFI expand EV infrastructure? 4
What are alternative fuel corridors (AFCs)? 4
What other federal initiatives expand EV charging infrastructure? 4
The Future of the EV Charging Network 5
What are some of the challenges facing expansion of EV charging infrastructure? 5
What's next? 6
Additional Resources 6

Tables

Table 1. Typical Refueling Components 1

Contacts

Author Information 6

Introduction

Building out a national charging network for plug-in electric vehicles (EVs) is part of broader efforts to mitigate the environmental impact of greenhouse gas emissions (GHGs). The use of low- or zero-emission vehicles—such as those powered by electricity or hydrogen—has the potential to reduce overall GHGs from the transportation sector, which accounts for 28% of overall GHGs in the United States.[1]

In November 2021, President Biden signed into law the Infrastructure Investment and Jobs Act (IIJA; P.L. 117-58), which established two new grant programs under the Federal Highway Administration (FHWA) to support building out a national charging network. The IIJA allocates a combined $7.5 billion over five years (FY2022-FY2026) for the National Electric Vehicle Infrastructure (NEVI) Formula Program and the Charging and Fueling Infrastructure (CFI) Grant Program. Investment from these programs supports public or publicly accessible charging infrastructure, which is available to any driver. Public charging is being deployed in communities and along highways.

The national charging network also depends on private or privately accessible charging infrastructure, such as residential and workplace charging infrastructure, access to which is determined by the owner or operator. While most charging occurs in the residential setting, due to its convenience and lower cost, strategic deployment of public charging infrastructure is available to drivers with and without residential access to charging.

The three basic components of EV charging, or electric refueling, are the refueling site, the hardware dispensing electric charge, and the connector that plugs into the vehicle from the hardware (**Table 1**); these bear similarities to the components of gasoline refueling for internal combustion engine vehicles.

Table 1. Typical Refueling Components

	Gasoline Refueling	EV Charging
Refueling Site	Gas station	Charging station
Dispensing Hardware	Fuel pump	Charging port
Filler Hardware for Fuel Receptacle	Fuel nozzle	Charging connector

Source: CRS.

[1] Transportation sources of GHGs include emissions from two- and three-wheelers, light-duty vehicles, buses and minibuses, heavy trucks, shipping, and aviation. Data are for 2022. Emissions from electric power accounted for the second largest portion (25%), and emissions from industry accounted for the third largest portion (23%). The remaining 24% of U.S. greenhouse gas emissions were contributed by the agriculture, commercial, and residential sectors, plus emissions from U.S. territories. Environmental Protection Agency (EPA), *Inventory of U.S. Greenhouse Gas Emissions and Sinks*, updated April 11, 2024, https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks.

Current Status and Projected Needs

What is the current state of EV charging infrastructure in the United States?

Overall, availability of public charging infrastructure has increased since 2014, the earliest year for which comprehensive data are available.[2] Between 2020 and 2023, the number of charging stations more than doubled from 28,851 to 64,641, and the number of individual charging ports (also referred to as "chargers") increased by three-quarters from 96,521 to 168,388.[3] In January 2025, 75,107 public charging stations were available across the United States, with a total of 207,227 charging ports.[4] Because of their faster charging speeds, Level 2 and direct current fast ("DC fast") charging ports are preferred for federally funded public charging infrastructure.[5] Public charging ports were 75% Level 2 and 25% DC fast.[6]

How much charging infrastructure will be needed in the United States?

The number of charging stations or ports that might be needed depends largely on estimates of future EV ownership, in addition to assumptions about charging patterns and charger usage. In 2023, approximately 4.9 million EVs were registered in the United States.[7] A 2023 study from the National Renewable Energy Laboratory (NREL) estimated that the number of EVs in 2030 could be between 30 million and 42 million.[8] Using the mid-adoption scenario of 33 million EVs in 2030, NREL estimated a total investment of $53 billion to $127 billion would be needed to deploy more than 28 million public and private charging ports to support the future EV fleet.[9] The deployed infrastructure could include 26.8 million private Level 1 and Level 2 ports at residences and workplaces and 1.2 million public Level 2 and DC fast ports in communities and along highways.[10] An earlier study, from the International Council on Clean Transportation (ICCT),

[2] Prior to 2014, the number of charging stations was estimated rather than counted. U.S. Department of Energy (DOE), Alternative Fuels Data Center (AFDC), "U.S. Public Electric Vehicle Charging Infrastructure," chart, updated March 2024, https://afdc.energy.gov/data/10972.

[3] AFDC, "U.S. Public Electric Vehicle Charging Infrastructure."

[4] Includes available and temporarily unavailable stations. Includes Level 1, Level 2, and direct current fast ("DC fast) charging levels. DOE, AFDC, *Alternative Fueling Station Locator*, accessed January 3, 2025, https://afdc.energy.gov/stations#/analyze?fuel=ELEC&status=E&status=T&country=US&tab=station&ev_levels=all.

[5] Level 2 charging equipment supplies 240 volts of alternating current (AC) electricity, and Level 3, or DC fast, equipment supplies 400 volts or more of DC electricity. U.S. Department of Transportation (DOT), "Charger Types and Speeds," updated June 22, 2023, https://www.transportation.gov/rural/ev/toolkit/ev-basics/charging-speeds.

[6] CRS calculation based on AFDC data. Charging ports included 155,162 Level 2 and 51,193 DC fast. AFDC, *Alternative Fueling Station Locator*.

[7] Includes approximate registration counts for battery-electric (3,555,900) and plug-in hybrid electric (1,307,200) vehicles. DOE, AFDC, "2023 Light-Duty Vehicle Registration Counts by State and Fuel Type," accessed October 23, 2024, https://afdc.energy.gov/vehicle-registration.

[8] National Renewable Energy Laboratory (NREL), *The 2030 National Charging Network: Estimating U.S. Light-Duty Demand for Electric Vehicle Charging Infrastructure*, June 2023, p. 15, https://www.nrel.gov/docs/fy23osti/85654.pdf.

[9] NREL, *The 2030 National Charging Network*, p. 36.

[10] NREL, *The 2030 National Charging Network*, p. 35.

estimated an investment of $48 billion to deploy 19.4 million charging ports—1.1 million public ports and 18.3 million private ports—to support a fleet of 26 million EVs by 2030.[11]

Federal Programs

How does NEVI expand EV infrastructure?

The IIJA allocates $5 billion over five years for the NEVI program to provide funding to all states, the District of Columbia, and Puerto Rico to deploy EV charging infrastructure.[12] FHWA distributes funds annually on a formula basis. To receive funding, states must submit state plans annually for how NEVI funds would be used.[13] States must deploy EV charging infrastructure along designated alternative fuel corridors (see "What are alternative fuel corridors (AFCs)?" below). Once FHWA certifies that all AFCs in a state are fully built out, remaining funds may be used to deploy community charging infrastructure along public roads and in other publicly accessible locations. For FY2024, FHWA approved all state plans and distributed $885 million.[14]

In December 2023, Ohio opened the United States' first NEVI-funded charging station.[15] Since then, NEVI-funded charging stations have opened in Hawaii, Kentucky, Maine, Michigan, New York, Pennsylvania, Rhode Island, Texas, Utah, Vermont, and Wisconsin.[16] By the end of 2024, 12 states had installed 44 public charging stations with NEVI funds. With an 80% federal cost share, the NEVI program may be expected to fund a larger number of chargers than if it funded 100% of the cost of the chargers. NEVI may fund at least 33,000 charging ports, according to an ICCT estimate.[17]

[11] CRS calculation of total investment based on estimated total investment required for nonresidential (public and workplace) charging infrastructure and residential (single-family homes and multiunit dwellings) charging infrastructure. The International Council on Clean Transportation (ICCT), *Charging Up America: Assessing the Growing Need for U.S. Charging Infrastructure Through 2030*, July 2021, pp. 24-25, https://theicct.org/wp-content/uploads/2021/12/charging-up-america-jul2021.pdf. CRS calculation of charging ports based on 2030 estimates grouped by public (public Level 2 and DC fast chargers) or private (private home, multiunit dwelling, and workplace chargers). ICCT, *Charging Up America*, "Table 1. Summary of Key Analysis Results by Year," p. 16.

[12] Division J, Title VIII, Highway Infrastructure Program heading, paragraph (2) of the Infrastructure Investment and Jobs Act (IIJA), P.L. 117-58.

[13] Joint Office of Energy and Transportation (Joint Office), "State Plans for Electric Vehicle Charging," accessed October 15, 2024, https://driveelectric.gov/state-plans.

[14] Joint Office, "State Plans for Electric Vehicle Charging."

[15] Joint Office, "First Public EV Charging Station Funded by NEVI Open in America," published December 13, 2023, https://driveelectric.gov/news/first-nevi-funded-stations-open.

[16] EV States Clearinghouse, "National Electric Vehicle Infrastructure (NEVI) Awards Dashboard," accessed January 6, 2025, https://evstates.org/awards-dashboard/.

[17] ICCT estimated 8,276 DC fast ports and 25,486 Level 2 ports at a cost of $2.1 billion based on estimates provided by state plans submitted to the Federal Highway Administration (FHWA); $1.5 million per charging station was assumed where cost information was not provided. For most state plans, estimates were limited to build-out along alternative fuel corridors (AFCs). ICCT estimated that $2.9 billion in remaining funds—which states may use to deploy community charging infrastructure once all AFCs are built out—may provide for an additional 6,794 DC fast ports and 182,537 Level 2 ports. ICCT, *Assessment of U.S. Electric Vehicle Charging Needs and Announced Deployments Through 2023*, March 2023, pp. 12-15, https://theicct.org/publication/assessment-of-us-ev-charging-needs-and-announced-deployment-through-2032-mar24/.

How does CFI expand EV infrastructure?

The IIJA allocates $2.5 billion for the CFI program to provide grants to strategically deploy public alternative fuel infrastructure: EV charging infrastructure and hydrogen, propane, and natural gas fueling infrastructure.[18] CFI funding is split evenly between two types of grants:

1. **Charging and Alternative Fuel Corridor Grants.** Also called the "Corridor Program," this grant program provides $1.25 billion for projects that install alternative fuel infrastructure along designated AFCs.
2. **Community Charging and Alternative Fueling Grants.** Also called the "Community Program," this grant program provides $1.25 billion for projects that install alternative fuel infrastructure in publicly accessible locations, such as schools, parks, and public parking lots. Priority is to be given to projects in rural areas, low- and moderate-income neighborhoods, and areas with limited access to dedicated parking (e.g., lower rates of private parking or higher rates of multiunit housing).

The first two rounds of grants awarded a total of $1.1 billion to 98 projects across 37 states, the District of Columbia, and Puerto Rico.[19] Nearly all of the projects—95 out of 98—support EV charging infrastructure and are expected to result in approximately 16,700 new charging ports.[20]

What are alternative fuel corridors (AFCs)?

AFCs are segments of major highways designated by FHWA for strategic build-out of infrastructure for vehicles powered by electricity, hydrogen, propane, and natural gas.[21] On an annual basis, FHWA solicits nominations from state and local officials and works with industry groups and other federal officials to designate and classify AFCs.[22] FHWA classifies an AFC as either "corridor ready"—the highway segment provides sufficient fueling stations for the applicable fuel—or "corridor pending"—the highway segment does not provide sufficient fueling stations for the applicable fuel. For EV charging infrastructure, a corridor-ready classification means the distance between charging stations is no greater than 50 miles and charging stations are within 1 mile of the highway.

What other federal initiatives expand EV charging infrastructure?

The Alternative Fuel Vehicle Refueling Property Credit (established in P.L. 109-58; extended and modified by P.L. 117-169, the law commonly referred to as the Inflation Reduction Act of 2022 [IRA]) provides a tax credit for qualifying alternative fuel property—including EV charging

[18] P.L. 117-58, §11401.

[19] Round 1A awarded $623 million to 47 projects, and Round 1B awarded $521 million to 51 projects. FHWA, "CFI Round 1A FY 2022 and 2023 Grant Award Recipients," updated August 26, 2024, https://www.fhwa.dot.gov/environment/cfi/grant_recipients/round_1a/; FHWA, "CFI Round 1B Grant Award Recipients," updated August 26, 2024, https://www.fhwa.dot.gov/environment/cfi/grant_recipients/round_1b/.

[20] Joint Office, "Biden-Harris Administration Bolsters Electric Vehicle Future with More Than $600 Million in New Funding," January 11, 2024, https://driveelectric.gov/news/new-cfi-funding; FHWA, "American Communities Plug into over Half a Billion in New Funding to Advance EV Future," published August 27, 2024, https://driveelectric.gov/news/cfi-grant-awardees.

[21] 23 U.S.C. §151.

[22] FHWA, "Alternative Fuel Corridors," updated October 2, 2024, https://www.fhwa.dot.gov/environment/alternative_fuel_corridors/.

ports—installed at a business or residence.[23] Starting in 2023, qualifying alternative fuel property must be located within low-income or nonurban census tracts.

The IIJA also allocates $5 billion (for the period FY2022-FY2026) for the Clean School Bus Program to provide grants for replacing existing school buses with alternative fuel school buses and acquiring necessary infrastructure, including EV charging infrastructure.[24] This competitive grant program is administered by the Environmental Protection Agency.[25]

From the NEVI allocation, 10% is set aside for grants to states and localities that require additional assistance to deploy EV charging infrastructure.[26] One example is the Electric Vehicle Charger Reliability and Accessibility Accelerator Program, which provides grants for repairing or replacing broken or nonoperational EV charging infrastructure. For FY2022 and FY2023, this program awarded 24 grants totaling $148.8 million.[27]

A number of other federal initiatives may provide support for eligible projects that deploy EV charging infrastructure. For additional information, see CRS Report R47675, *Federal Policies to Expand Electric Vehicle Charging Infrastructure*, by Melissa N. Diaz and Corrie E. Clark.

The Future of the EV Charging Network

What are some of the challenges facing expansion of EV charging infrastructure?

Existing EV charging infrastructure faces operational challenges primarily related to providing a seamless charging experience. Operational challenges include ensuring charging equipment reliability, providing access to accurate information regarding a charging station's operational status, and making available straightforward pricing information with a variety of payment options.

With ongoing build-out, the challenges relate to selecting locations and equipment types that meet a variety of needs, such as geographic distribution along highways for long-distance drivers and equitable distribution to serve rural and historically underserved areas. Build-out projects may also face delays related to the ongoing expansion of manufacturing capacity for EV charging infrastructure.

The NREL and ICCT studies estimate that deploying EV charging infrastructure over the next few years to meet the anticipated needs of 2030 would require substantial public and private investment. In addition, greater coordination efforts may be required to administer these funds and other resources.

[23] P.L. 117-169, §13404.

[24] P.L. 117-58, §71101.

[25] EPA, "Clean School Bus Program Rebates," updated January 13, 2025, https://www.epa.gov/cleanschoolbus/clean-school-bus-program-rebates.

[26] Division J, Title VIII, Highway Infrastructure Program heading, paragraph (2), of the IIJA.

[27] FHWA, "Electric Vehicle Charger Reliability and Accessibility Accelerator Program Grant Recipients," updated January 24, 2024, https://www.fhwa.dot.gov/environment/nevi/evc_raa/ev-charger-raa-prog-grant.cfm.

What's next?

FHWA anticipates distributing remaining NEVI funds to states through FY2026.[28] The application window for the second round of CFI grants closed in September 2024; up to $800 million is available for charging and fueling infrastructure projects.

Additional Resources

CRS Report R47034, *Energy and Minerals Provisions in the Infrastructure Investment and Jobs Act (P.L. 117-58)*, coordinated by Brent D. Yacobucci

CRS In Focus IF12600, *Clean Vehicle Tax Credits*, by Donald J. Marples and Nicholas E. Buffie

Author Information

Melissa N. Diaz
Analyst in Energy Policy

Disclaimer

[28] FHWA, "5-Year National Electric Vehicle Infrastructure Funding by State," modified September 13, 2022, https://www.fhwa.dot.gov/bipartisan-infrastructure-law/evs_5year_nevi_funding_by_state.cfm.