Electric Vehicle Charging Infrastructure Trends from the Alternative Fueling Station Locator: First Quarter 2022

Abby Brown,[1] Jeff Cappellucci,[1] Alexis Schayowitz,[2] Emily White,[2] Alexia Heinrich,[2] and Emma Cost[2]

1 National Renewable Energy Laboratory
2 ICF Inc.

NREL is a national laboratory of the U.S. Department of Energy
Office of Energy Efficiency & Renewable Energy
Operated by the Alliance for Sustainable Energy, LLC

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Technical Report
NREL/TP-5400-82987
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Michael Scarpino…………………………The Volpe Center, U.S. Department of Transportation

List of Acronyms

AFDC	Alternative Fuels Data Center
AHS	American Housing Survey
AMPUP	AmpUp network
API	application program interface
BIL	Bipartisan Infrastructure Law
BN	Blink network
CCS	Combined Charging System
CHARGELAB	ChargeLab network
CPN	ChargePoint network
DC	direct current
E85	ethanol blend containing 51% to 83% ethanol, depending on geography and season
EA	Electrify America network
EV	electric vehicle, including all-electric and plug-in hybrid electric vehicles
EVC	EV Connect network
EVCS	EV Charging Solutions network
EVGATEWAY	evGateway network
EVN	EVgo network
EVSE	electric vehicle supply equipment
EVSP	electric vehicle service provider
FCN	Francis Energy network
FLO	FLO network
FPLEV	FPL EVolution network
GRN	Greenlots network
HD	heavy duty
L1	Level 1 charger
L2	Level 2 charger
LD	light duty
LIVINGSTON	Livingston Energy Group network
MD	medium duty
NEVI	National Electric Vehicle Infrastructure
NON	non-networked
NREL	National Renewable Energy Laboratory
OC	OpConnect network
OCPI	Open Charge Point Interface
POWERFLEX	PowerFlex network
Q1	quarter 1, or first quarter of the calendar year
Q2	quarter 2, or second quarter of the calendar year
Q3	quarter 3, or third quarter of the calendar year
Q4	quarter 4, or fourth quarter of the calendar year
RIVIAN_WAYPOINTS	Rivian Waypoints network
SCN	SemaConnect network
SWTCH	SWTCH Energy network
TESLA	Tesla Supercharger network

TESLAD	Tesla Destination network
VLTA	Volta network
WEB	Webasto network
ZEFNET	ZEF Energy network

Executive Summary

The U.S. Department of Energy's Alternative Fueling Station Locator contains information on public and private nonresidential alternative fueling stations in the United States and Canada and currently tracks ethanol (E85), biodiesel, compressed natural gas, electric vehicle (EV) charging, hydrogen, liquefied natural gas, and propane stations. In particular, EV charging continues to experience rapidly changing technology and growing infrastructure. This report provides a snapshot of the state of EV charging infrastructure in the United States in the first calendar quarter of 2022 (Q1 2022). Using data from the Station Locator, this report breaks down the growth of public and private charging infrastructure by charging level, network, and location. Additionally, this report measures the current state of charging infrastructure compared with two different 2030 infrastructure requirement scenarios. This information is intended to help transportation planners, policymakers, researchers, infrastructure developers, and others understand the rapidly changing landscape of EV charging infrastructure. This is the ninth report in a series. Reports from previous quarters can be found in the Alternative Fuels Data Center (AFDC) and National Renewable Energy Laboratory (NREL) publication databases, as well as the AFDC Charging Infrastructure Trends page (https://afdc.energy.gov/fuels/electricity_infrastructure_trends.html).

In Q1 2022, there was a 1.2% increase in the number of electric vehicle supply equipment (EVSE) ports in the Station Locator, including a 1.3% increase in public EVSE ports and a 0.7% increase in private EVSE ports. Both public and private direct-current (DC) fast EVSE ports grew by the largest percentage (6.0% and 2.4%, respectively) in Q1 when compared with Level 1 and Level 2 EVSE ports. The Mid-Atlantic region of the Clean Cities Coalition Network had the largest increase in public charging infrastructure in Q1 (7.6%), though California, which has one-third of the country's public charging infrastructure, continues to lead the country in the number of available public EVSE ports.

This report uses three different benchmarks to assess the current state of public charging infrastructure with future requirements to support a growing fleet of light-duty EVs. First, the Joseph R. Biden administration has established a goal of building a national public charging network of 500,000 EVSE ports by 2030. To meet this goal by 2030, approximately 12,390 public EVSE port installations will need to be deployed each quarter for the next 8 years, requiring a significant increase from the 4,674 public EVSE ports that have been installed each quarter, on average, since the start of 2020. Second, NREL's 2017 *National Plug-In Electric Vehicle Infrastructure Analysis* estimated that the United States would require 27,500 DC fast and 601,000 Level 2 public and workplace EVSE ports to support a scenario in which 15 million light-duty EVs are on the road by 2030 (Wood et al. 2017). Based on this analysis, 83.8% and 16.9% of the required DC fast and Level 2 EVSE ports, respectively, have been installed as of Q1. Third, Atlas Public Policy's 2021 *U.S. Passenger Vehicle Electrification Infrastructure Assessment* estimated that an additional 252,000 DC fast and 244,000 Level 2 public and workplace EVSE ports would be required by 2030 to support a scenario in which 100% of passenger vehicle sales are electric by 2035 (McKenzie and Nigro 2021). Based on this assessment, the number of DC fast and Level 2 EVSE ports is 8.5% and 27.9%, respectively, of the way toward meeting 2030 infrastructure requirements. It is important to note, however, that the majority (57.6%) of public DC fast EVSE ports in the Station Locator are on the Tesla network and are therefore only readily accessible to Tesla drivers.

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1 Overview of the Station Locator

The U.S. Department of Energy's Alternative Fuels Data Center (AFDC) launched in 1991 in response to the Alternative Motor Fuels Act of 1988 and the Clean Air Act Amendments of 1990 (Alternative Fuels Data Center 2022a). Originally, it served as a hard copy resource for alternative fuel performance data; it became an internet resource in 1995. Since then, the AFDC has evolved dramatically into a robust online resource that provides a broad range of information on alternative fuels and advanced transportation technologies, including fueling and charging station data. In 2017, the National Renewable Energy Laboratory (NREL) partnered with National Resources Canada to expand the data set to include the location of alternative fuel stations across Canada as the Electric Charging and Alternative Fueling Stations Locator, or *Localisateur de stations de recharge et de stations de ravitaillement en carburants de remplacement* (Levene et al. 2019). The Station Locator database now includes information on public and private nonresidential alternative fueling stations in the United States and Canada. The database currently tracks ethanol (E85), biodiesel, compressed natural gas, electric vehicle (EV) charging, hydrogen, liquefied natural gas, and propane stations.

Although historical data for all fuel types in the Station Locator are available, it is especially important to take an in-depth look at EV charging due to rapidly changing technology and growing infrastructure. This trend is likely to continue given the Joseph R. Biden administration's goal of building a national EV charging network of 500,000 EV chargers by 2030 and the newly available funds from the Bipartisan Infrastructure Law (BIL) to support this goal. Using Station Locator data, this report explores the growth of both public and private EV charging infrastructure in the United States for the first calendar quarter of 2022 (Q1 2022). This is the ninth report in a series. Reports from previous quarters can be found in the AFDC and NREL publication databases, as well as the AFDC Charging Infrastructure Trends page (https://afdc.energy.gov/fuels/electricity_infrastructure_trends.html).

1.1 EV Charging Data Sources

NREL and its data collection contractor and collaborator, ICF, use a variety of methods to gather and verify EV charging data in the Station Locator. Electric vehicle service providers (EVSPs), responsible for managing a network of EV charging stations (Figure 1), share data directly with the Station Locator team and are the largest data source for EV charging in the Station Locator. In addition, data are collected through industry outreach efforts, contributions from Clean Cities coordinators, and other manual methods.

Non-Networked Stations

Non-networked EV charging stations are not connected to the internet and provide basic charging functionality without advanced communications capabilities. Because of this, non-networked charging is generally free or offered as an amenity for those who pay for parking or to access a business.

Networked Stations

Networked EV charging stations are connected to the internet via a cable or wireless technology and can communicate with the back-end computer system of an EVSP. Being connected to a network lets station owners or site hosts manage who can access stations and control how much it costs drivers to charge their vehicle. An EVSP typically manages a group of networked EVSE, otherwise known as a network, and may use its communication capabilities to communicate directly with drivers, other EVSPs, or utilities; monitor and share real-time station status; broadcast location information; collect and store usage data; control access; or facilitate payment. For a group of networked EVSE to be considered a network, it cannot be considered part of another network and it must have a dedictaed platform that allows users to locate EV charging stations as well as initiate and pay for charging events.

Figure 1. Non-networked vs. networked EV charging stations

1.1.1 Data From Charging Network APIs

Prior to 2014, NREL manually collected all EV charging data, including EV charging stations managed by EVSPs. In 2014, to keep up with the rapid growth of charging infrastructure, NREL began incorporating daily updates on networked charging station data directly from EVSPs, when available. NREL does this by accessing the network's application program interface (API) and importing each network's API data into the database. Using APIs ensures the efficiency, accuracy, and completeness of the data are maintained.

Figure 2 shows a timeline of the integration of the network APIs into the Station Locator data management process. Open Charge Point Interface (OCPI)-based APIs that have been integrated into the Station Locator are also shown in Figure 2. See Section 1.2 for more information on the OCPI protocol.

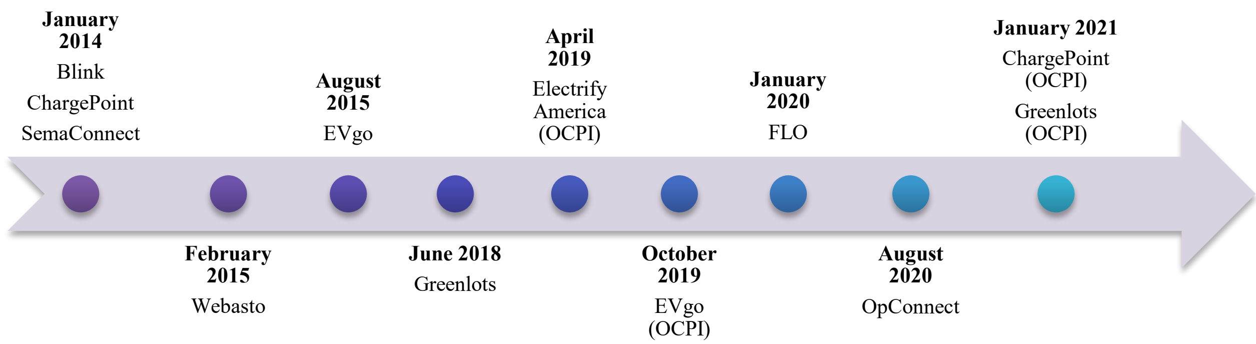

Figure 2. Timeline of API integrations in the Station Locator

As of March 2022, there were 50,123 public and private charging stations in the database, which are available on the Station Locator or accessible via API or data download (Alternative Fuels Data Center 2022b). Of those, approximately 72% are automatically updated daily via EVSP-provided APIs, whereas the rest are managed and updated manually.

The Station Locator team is working with additional EVSPs to access and integrate existing APIs or provide them with best practices on developing an API if they have not yet automated their data sharing. This will help ensure station data are as current and accurate as possible, while also increasing the efficiency of the EV charging data update process.

1.1.2 Manually Collected Data

For non-networked (i.e., not connected to the internet) stations, data sources include trade media, Clean Cities coordinators, a "Submit New Station" form on the Station Locator website, EV charging station manufacturers, electric utilities, original equipment manufacturers, state and municipal governments, private companies, and others. The Station Locator team regularly monitors news outlets for press releases on new EV charging station openings and seeks out more information, as appropriate, to confirm and add the EV charging data to the Station Locator.

The Station Locator team also receives semiregular data in the form of spreadsheets from EVSPs that have networked stations but do not currently have an API available. These EVSPs include, but are not limited to, EV Connect, Tesla, and Volta. In Q1, the Station Locator team received an updated list of stations from Volta. Additionally, the team receives regular updates from Chargeway that include stations on all networks. The team is greatly appreciative of our partners' continued collaboration and willingness to share regular data updates.

Finally, Clean Cities coalitions (see Section 2.1.3) proactively provide information on station updates and additions throughout the year. Coalitions also serve as a valuable on-the-ground resource for stations that ICF is not able to confirm through normal station confirmation processes. Unconfirmed stations are sent to coalitions throughout the year for confirmation; if the coalition is not able to provide any additional information, the station is subsequently removed from the Station Locator.

It is important to state these reports reflect a snapshot of the number of available electric vehicle supply equipment (EVSE) ports in the Station Locator at the end of each quarter. Therefore, notable changes may be attributed to the manual data collection process, as new manually added EVSE ports are counted in the quarter in which they are added to the Station Locator as opposed to when the infrastructure was installed. Additionally, stations that are temporarily out of service are not included in these reports.

1.2 EV Charging Data Fields

Current charging infrastructure in the Station Locator are classified into the following categories:

- **Public:** A broad category that includes EV charging located in publicly accessible areas or along highway corridors. Public EV charging infrastructure is generally accessible to any EV driver, though this includes some stations with certain qualifications, such as stations that are made available to the public after business hours, stations that require payment through a specific application, or stations reserved for patrons of a business.

- **Workplace:** EV charging intended to provide charging to employees during the workday. Workplace charging infrastructure is accessible only to employees of a business and is therefore classified as private in the Station Locator.
- **Commercial/Fleet:** EV charging intended to provide charging for electric fleet vehicles, including municipal/private fleets, car sharing, and transportation network companies. Fleet charging infrastructure is classified as private in the Station Locator.

The Station Locator does not maintain data on single-family residential charging and has minimal, yet expanding, data on charging at multifamily buildings. EV charging infrastructure at multifamily buildings is also classified as private in the Station Locator. See Section 2.2.3 for additional details.

In 2019, the Station Locator team began transitioning its counting logic to align with the hierarchy defined in the OCPI protocol: locations, EVSE ports, and connectors (EVRoaming Foundation 2020), as shown in Figure 3 and described below. With this transition, the Station Locator is now counting the number of EVSE ports at a station location, rather than the number of connectors as previously counted.

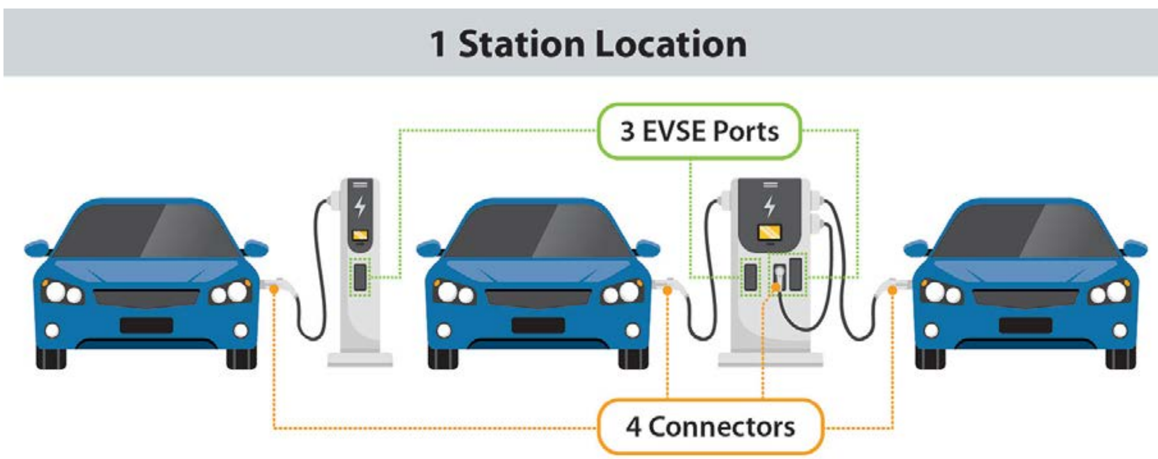

Figure 3. EV charging infrastructure hierarchy.

Source: Alternative Fuels Data Center (2022d)

The following fuel-specific fields are tracked in the Station Locator for EV charging stations (Alternative Fuels Data Center 2022c):

- EV charger information:
  - Station location: A site with one or more EVSE ports located at the same address.
  - EVSE port count: The number of outlets or ports available to charge a vehicle (i.e., the number of vehicles that can simultaneously charge at a charging station).
  - EVSE port type:

    - Level 1 (L1): 120 V; 1 hour of charging = 5 miles of range[1]
    - Level 2 (L2): 240 V; 1 hour of charging = 25 miles of range[2]
    - Direct-current (DC) fast: 480+ V; 30 minutes of charging = 100-200+ miles of range[3]
  - Connectors (number and type): What is plugged into a vehicle to charge it. Multiple connectors and connector types can be available on one EVSE port, but only one vehicle will charge at a time.
    - NEMA: for Level 1 chargers[4]
    - J1772: for Level 1 and Level 2 chargers
    - Combined Charging System (CCS): for DC fast chargers for most vehicle models
    - CHAdeMO: for DC fast chargers for select vehicle models
    - Tesla: for all charging levels for Tesla vehicles
  - Network
  - Manufacturer
  - Power output (kW)
- Open date
- Workplace
- Pricing
- On-site renewable electricity source.

These fields and the associated definitions are used in the analysis that follows.

2 Electric Vehicle Charging Infrastructure Trends

The purpose of this report is to identify EV charging infrastructure trends for Q1 of 2022. However, as previously mentioned, the Station Locator has been collecting data on alternative fueling stations since the 1990s and therefore has historical EV charging station data for several years that can serve as a baseline for more analysis. See the first report in this series for the growth of EVSE ports and EV charging stations in the Station Locator over the last 10 years (Brown et al. 2020).

In Q1, the number of EVSE ports in the Station Locator grew by 1.2%, or 1,590 EVSE ports. Public EVSE ports grew by 1.3%, or 1,452 ports, and account for the majority of EVSE ports in

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[1] This assumes a power output of 1.9 kW. The actual range per hour of charging depends on the power capacity of the EVSE port and the efficiency of the vehicle being charged.
[2] This assumes a power output of 6.6 kW. The actual range per hour of charging depends on the power capacity of the EVSE port and the efficiency of the vehicle being charged.
[3] The power output of DC fast EVSE ports varies greatly. The actual range per hour of charging depends on the power capacity of the EVSE port and the efficiency of the vehicle being charged.
[4] Most, if not all, EVs will come with a Level 1 cordset, so no additional charging equipment is required. On one end of the cord is a standard NEMA connector (for example, a NEMA 5-15, which is a common three-prong household plug), and on the other end is an SAE J1772 standard connector (often referred to simply as J1772). The J1772 connector plugs into the car's J1772 charge port, and the NEMA connector plugs into a standard NEMA wall outlet.

the Station Locator (Figure 4). Private EVSE ports increased by 0.7%, or 138 EVSE ports (Figure 4).

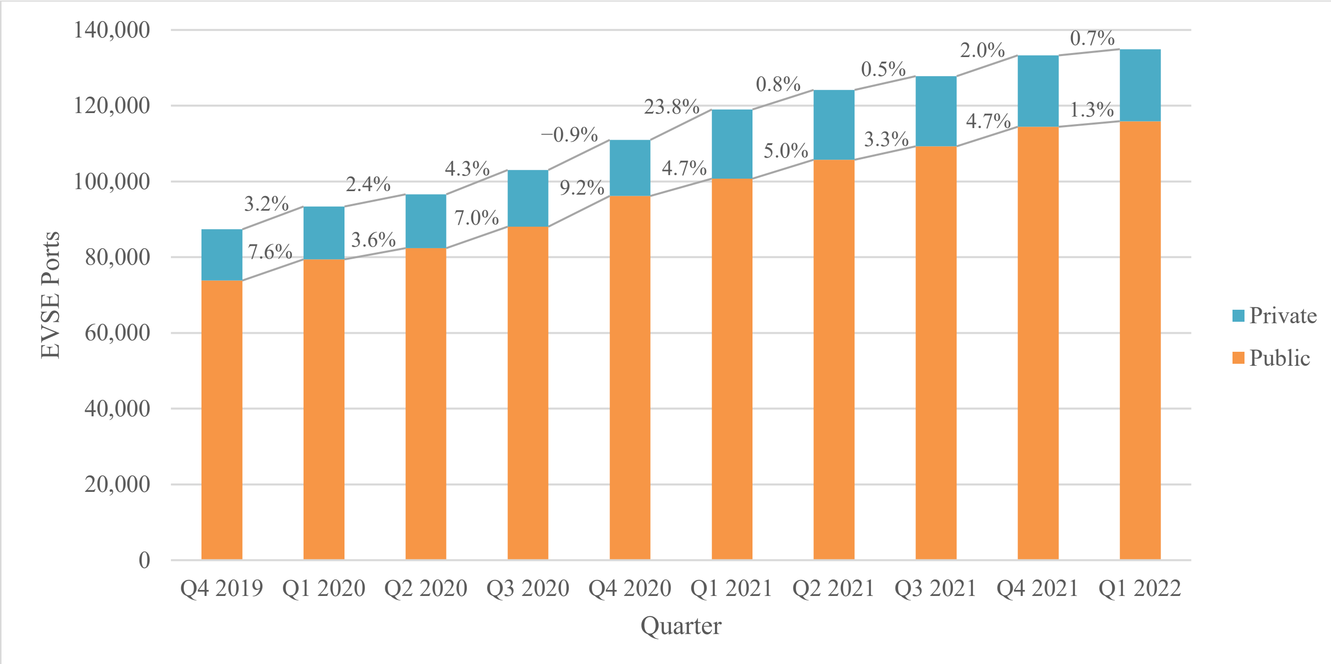

Figure 4. Quarterly growth of EVSE ports by access

Note: The percentages in this figure indicate the percent growth between each quarter.

The following sections break down the growth of public and private EVSE ports further to highlight what types of EV infrastructure grew in Q1 and where EV infrastructure has grown geographically. Because the number of EVSE ports represents the number of vehicles that can charge simultaneously at an EV charging station, the remainder of this report will focus on EVSE port growth.

2.1 Public Charging Trends

As previously mentioned, public EV charging refers to EV charging stations that are available to all EV drivers and located in publicly accessible locations, such as commercial locations or along highway corridors. In Q1, the number of public EVSE ports in the Station Locator increased by 1,590, bringing the total number of public EVSE ports in the Station Locator to 115,903 and representing a 1.3% increase since Q4 2021. The following sections break down the growth of public EVSE ports by charging level, network, region, and state.

2.1.1 By Charging Level

As shown in Figure 5, the majority of public EVSE ports in the Station Locator are Level 2, followed by DC fast and Level 1. However, DC fast EVSE ports increased by the greatest percentage (6.0%) in Q1 (Figure 5). Similar to Q4, Level 1 EVSE ports decreased by 8.6% (Figure 5). The decrease in Level 1 EVSE ports and the minimal growth of Level 2 EVSE ports can be largely attributed to decreases on ChargePoint's network.

Additionally, AT&T phased out its 3G cellular network in Q1, meaning that many older, networked EVSE ports may have lost their networking capabilities and been removed from the Station Locator as a result (this is applicable only to EVSE ports imported via APIs; see Section 1.1.1). The Station Locator team confirmed that this also impacted some of Blink's older infrastructure and is actively working to understand how this may have impacted other networks as well. The Station Locator team will provide additional information in future reports.

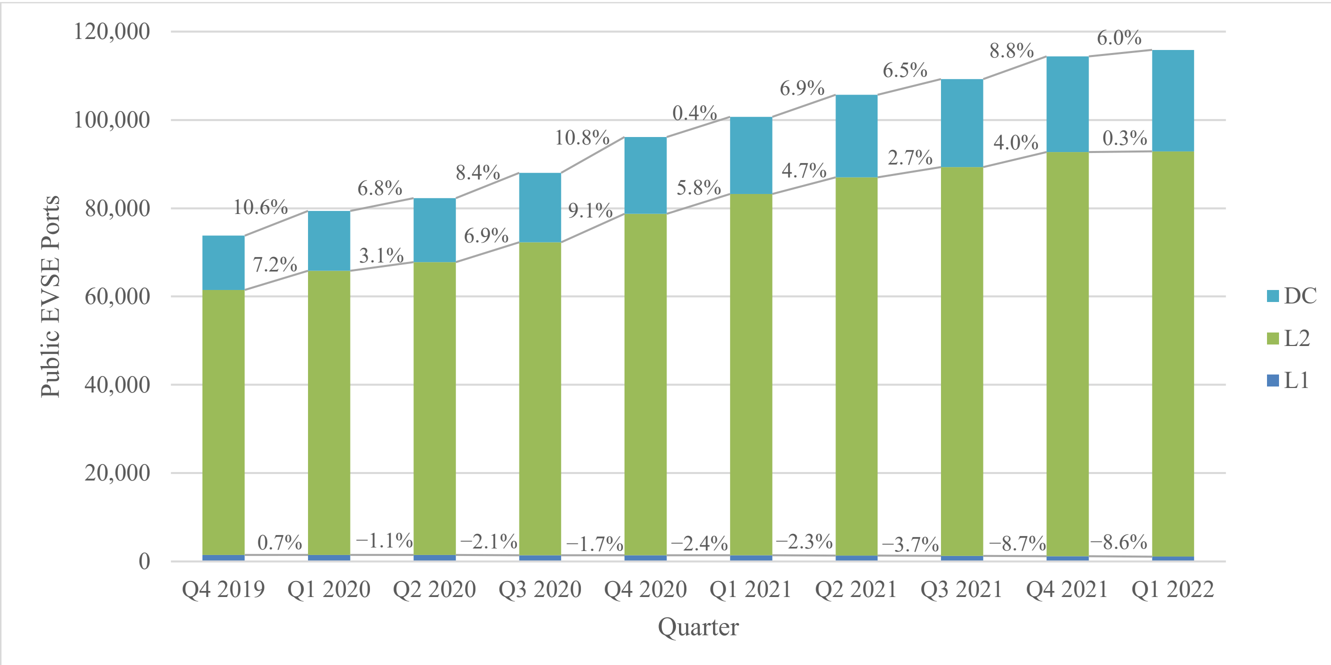

Figure 5. Quarterly growth of public EVSE ports by charging level

Note: Figure excludes legacy EVSE ports that are not classified by charging level and are no longer manufactured. As of Q1, there were 42 public legacy EVSE ports in the Station Locator. Additionally, the percentages in this figure indicate the percent growth between each quarter.

When compared with Level 1 and Level 2 chargers, DC fast chargers have the highest power output and therefore provide the most charge in the least amount of time. Building out the country's network of public DC fast chargers is critical to supporting EV adoption in the United States, and it is therefore important to highlight trends in the growth of DC fast EVSE ports in the Station Locator. Whereas the power output for Level 1 chargers is about 1 kW and Level 2 chargers can operate at up to 19 kW, DC fast chargers have a typical power output of 50 kW, and DC fast chargers with higher levels of power output are increasingly available. Extreme fast charging infrastructure, which has a power output of 350 kW or more, was introduced in 2018. The number of DC fast EVSE ports with these higher power levels remain a minority in the Station Locator, yet are steadily increasing, as seen in Figure 6.

It is important to point out that of the 22,977 public DC fast EVSE ports in the Station Locator, power output data are currently only available for 51.8%; Figure 6 is therefore based on power output data for 11,902 DC fast EVSE ports. Additionally, if a DC fast EVSE port has two connectors with different power outputs, only the maximum power output is counted in Figure 6. NREL is in the process of integrating updated OCPI-based APIs to streamline the collection of power output data and create a more complete data set, as well as making power data publicly available for CCS and CHAdeMO connectors.

As shown in Figure 6, the number of EVSE ports with a power output between 51 kW and 149 kW grew by the largest percentage in Q1 (158.0%). Some networks temporarily reduce the power output of their DC fast chargers while maintenance or upgrades are being performed, which is the primary driver behind the increase in EVSE ports with a power output between 51 KW and 149 kW and decrease in EVSE ports with a power output between 150 and 249 kW. This occurred on ChargePoint's network in Q1: approximately 1,000 EVSE ports were derated from 155 kW, 175 kW, or 200 kW down to 50 kW or 62 kW. These reports represent a snapshot of the available EVSE ports in the Station Locator at the end of each quarter, and because these power adjustments are captured in the Station Locator, the Station Locator team expects to continue to see fluctuations like this.

Additionally, the large increase in EVSE ports with a power output between 250 and 349 kW is due to new Tesla Supercharger installations with a power output of 250 kW. For an explanation of the changes seen in Q1 2021, see the Q1 2021 report (Brown et al. 2021).

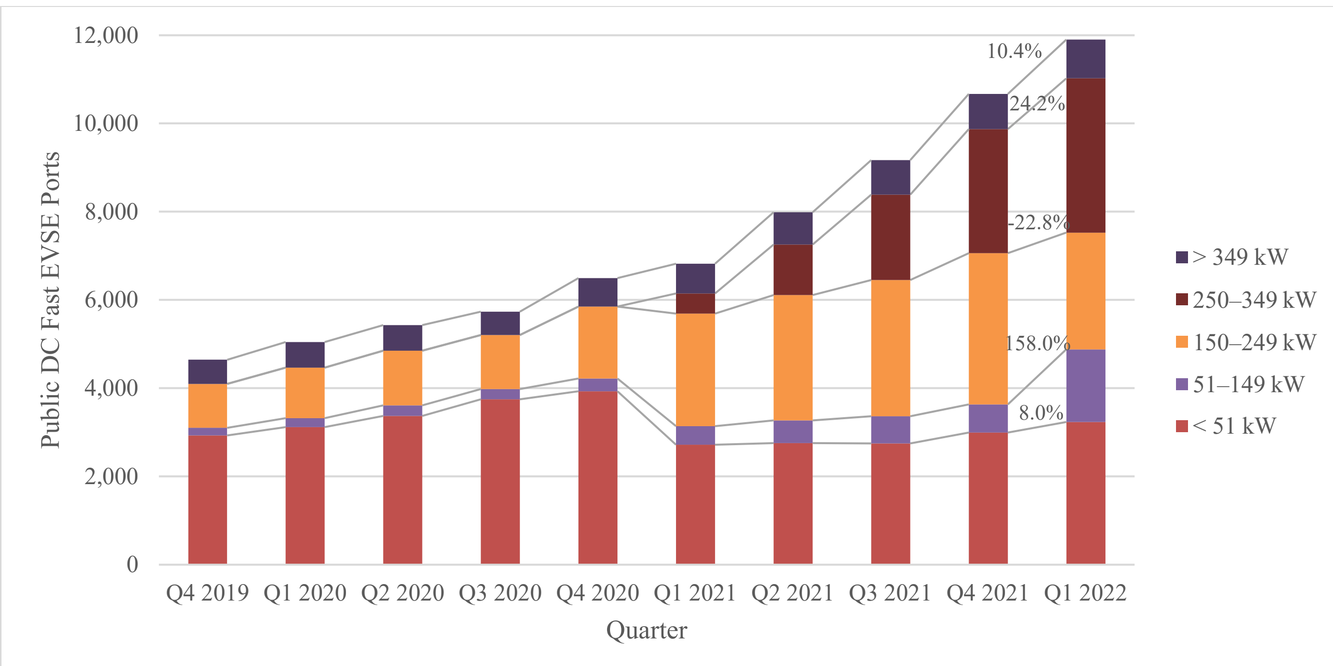

Figure 6. Quarterly growth of public DC fast EVSE ports by power output

Note: The percentages in this figure indicate the percent growth between each quarter.

Finally, there are currently three types of connectors available for DC fast chargers: CHAdeMO, CCS, and Tesla. As noted in Section 1.2, not all EVs are compatible with each connector type. Most EV models entering the market today can charge using the CCS connector, while the all-electric Nissan LEAF and Mitsubishi Outlander plug-in hybrid electric vehicles are the only models still being produced in the United States with the CHAdeMO connector standard. Only Tesla vehicles can charge with the Tesla connector. Although Tesla vehicles do not have a CHAdeMO charge port and do not come with a CHAdeMO adapter, Tesla does sell an adapter that allows Tesla vehicles to charge at DC fast chargers that have a CHAdeMO connector. Additionally, Tesla is in the process of making a CCS adapter for Tesla vehicles.

As of December 31, 2020, 50% of registered EVs in the United States were compatible with the CCS connector, 42.5% of registered EVs were Teslas, and 7.5% of registered EVs were compatible with the CHAdeMO connector (Experian Information Solutions 2021). Of the 27,615 DC fast connectors in the Station Locator as of Q1, Tesla connectors made up 48.1% (Figure 7). However, the number of CCS connectors grew by the largest percentage in Q1 (8.3%), and now make up 30.4% of DC connectors in the Station Locator. Finally, despite CHAdeMO-compatible vehicles only making up 7.5% of registered EVs, the number of CHAdeMO connectors in the Station Locator continues to grow (6.6%) and made up 21.5% of DC fast connectors in Q1. One possible reason for the continued growth of CHAdeMO connectors is that, historically, some grant programs have required that public DC fast stations have both CHAdeMO and CCS connectors available to be eligible for funding.

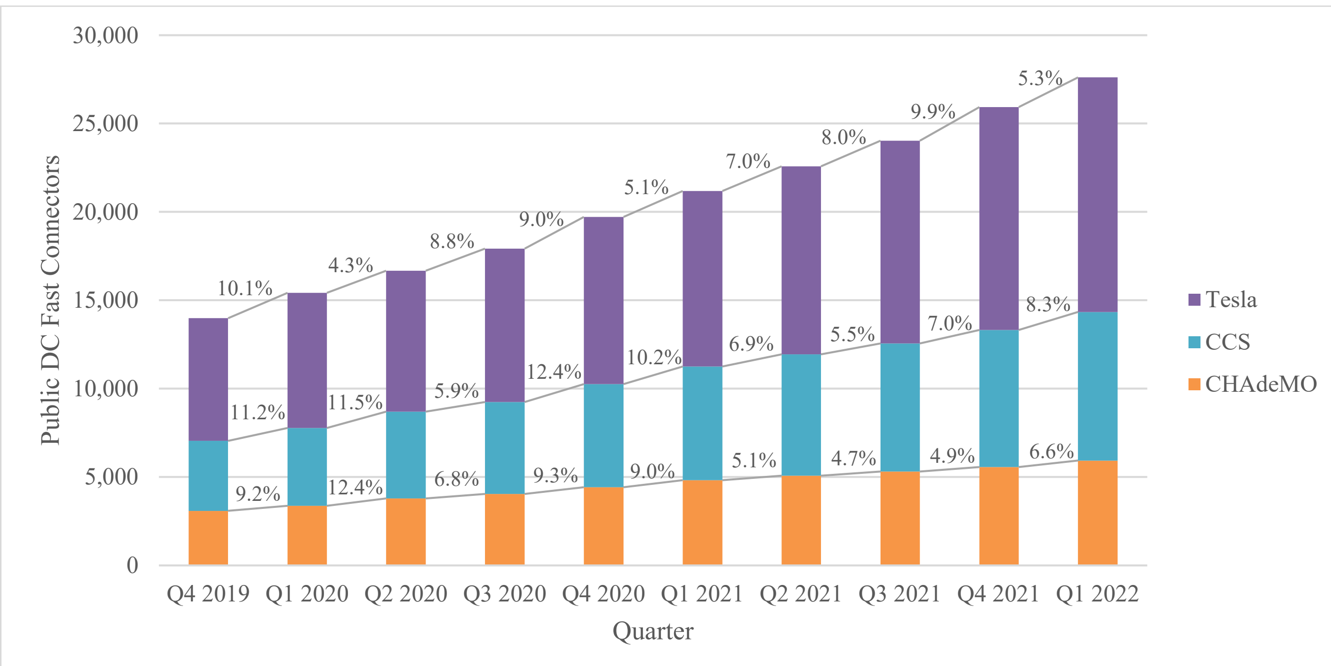

Figure 7. Quarterly growth of public DC fast connectors by type

Note: The percentages in this figure indicate the percent growth between each quarter.

2.1.2 By Network

As discussed in Section 1.1, the Station Locator team works with most major EVSPs to collect EV charging infrastructure data for the Station Locator. Currently, the Station Locator includes stations on the 24 networks listed below, 9 of which update on a nightly basis. Two of these networks, Rivian and SWTCH Energy, are new to the Station Locator as of Q1. In addition, the Station Locator contains non-networked (NON) station data, which includes stations that were previously networked.

- AmpUp (AMPUP)
- Blink (BN)
- ChargeLab (CHARGELAB)
- ChargePoint (CPN)

- Electrify America (EA)
- EV Connect (EVC)
- EV Charging Solutions (EVCS)
- evGateway (EVGATEWAY)
- EVgo (EVN)
- Francis Energy (FCN)
- FLO (FLO)
- FPL EVolution (FPLEV)
- Greenlots (GRN)
- Livingston Energy Group (LIVINGSTON)
- OpConnect (OC)
- PowerFlex (POWERFLEX)
- Rivian Waypoints (RIVIAN_WAYPOINTS)
- SemaConnect (SCN)
- SWTCH Energy (SWTCH)
- Tesla Supercharger (TESLA)
- Tesla Destination (TESLAD)
- Volta (VLTA)
- Webasto (WEB)
- ZEF Energy (ZEFNET)

As of the end of Q1, the ChargePoint network accounted for the largest number of public EVSE ports (41.1%) in the Station Locator, and Level 2 EVSE ports constituted the majority of ChargePoint's network (Figure 8). This holds true for many of the networks in the Station Locator, except for the Electrify America, EVgo, Francis Energy, FPL EVolution, and Tesla Supercharger networks. These networks are predominantly, if not completely, made up of DC fast chargers. Of the networks with DC fast chargers, Tesla Supercharger has the largest share of public DC fast EVSE ports (57.6%), followed by Electrify America (14.4%) and EVgo (8.0%) (Figure 9).

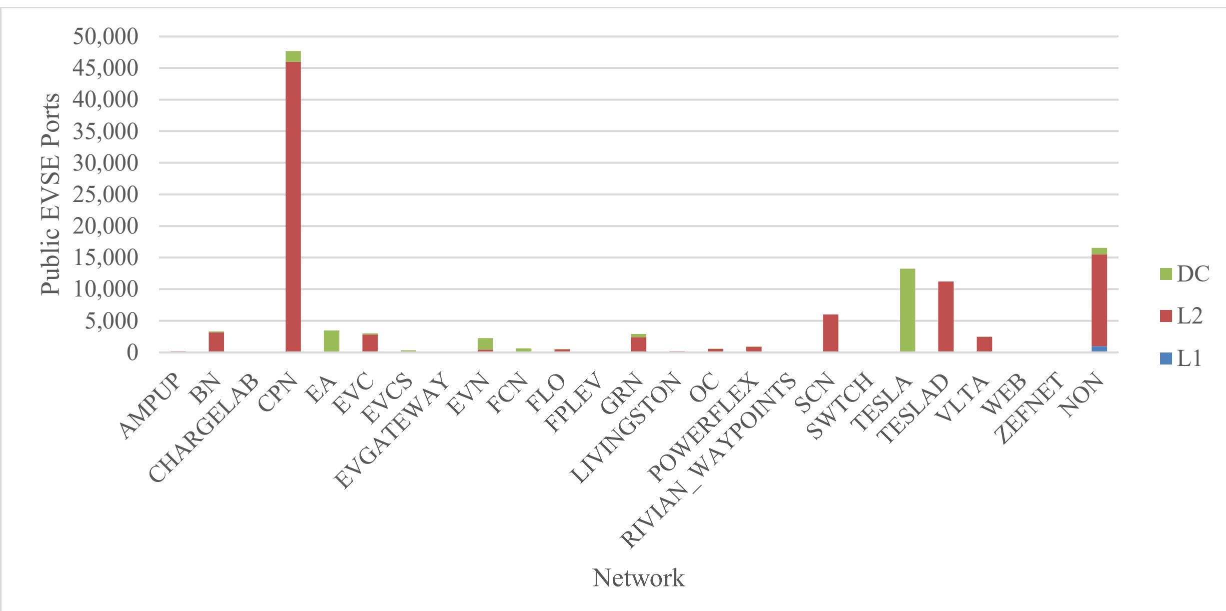

Figure 8. Breakdown of public EVSE ports by network and charging level in Q1 2022

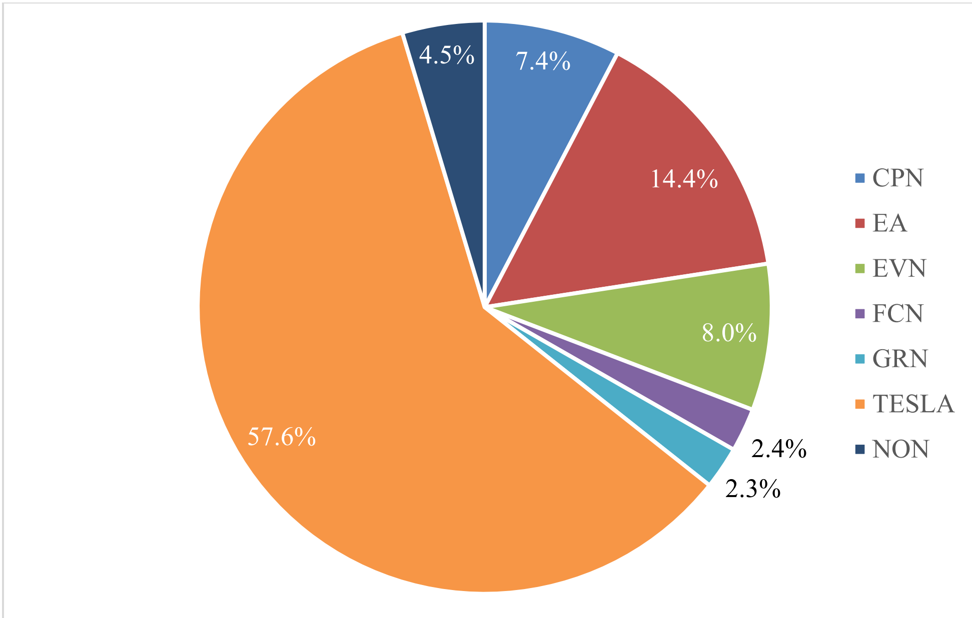

Figure 9. Breakdown of public DC fast EVSE ports by network in Q1 2022

Note: Figure excludes networks that make up less than 1% of public DC fast EVSE ports.

Figure 10 shows the growth of each network in Q1, and Table 1 includes the percent growth of each network over the last four quarters. The number of public EVSE ports for the majority of networks increased in Q1, much of which was a result of large updates that the Station Locator team received in Q1. FPL EVolution grew by 760%, the largest percent increase in Q1, representing a total increase of 76 EVSE ports, from 10 to 86. This increase is a result of an update shared by the network that included EVSE ports installed throughout 2021. PowerFlex had the next largest percent increase (42.8%), representing an increase of 270 Level 2 EVSE ports. This increase was primarily driven by an update received from Los Angeles County. The number of EVSE on the ZEF Energy network increased by 16.7%; however, this reflects an increase of only 2 EVSE ports, from 12 to 14. Finally, Volta increased by 13.4% as a result of an update shared by the network. This update included primarily Level 2 EVSE ports and included installations from throughout 2021. While these four networks increased by the largest percentages, non-networked EVSE had the largest absolute growth, adding 690 EVSE ports in Q1.

The number of EVSE ports on the OpConnect, ChargePoint, and Blink networks all decreased in Q1. The 7.0% decrease on OpConnect's network reflects a reduction of 47 EVSE ports, almost all of which were Level 2. While OpConnect added EVSE ports in new states, including Arizona, Florida, and Minnesota, the majority of the decrease occurred in California and Oregon. The 2.6% decrease in ChargePoint EVSE is due to closures of old Level 1 and Level 2 EVSE ports, including 95 Level 1 EVSE ports and 1,207 Level 2 EVSE ports. ChargePoint has indicated that it is in the process of either replacing older models of their stations or otherwise decommissioning them as they are no longer compatible with their network. The 0.5% reduction in Blink EVSE ports reflects a decrease of 5 Level 2 EVSE ports and 10 DC fast EVSE ports. Blink recently announced partnerships with both GM dealerships and Bridgestone retail locations to install Level 2 stations at several locations, so the Station Locator team expects to see the Blink network grow in future quarters (Doll 2022a; 2022b). Finally, as discussed in

Section 2.1.1, decreases seen on individual networks may be a result of the phase out of AT&T's 3G network.

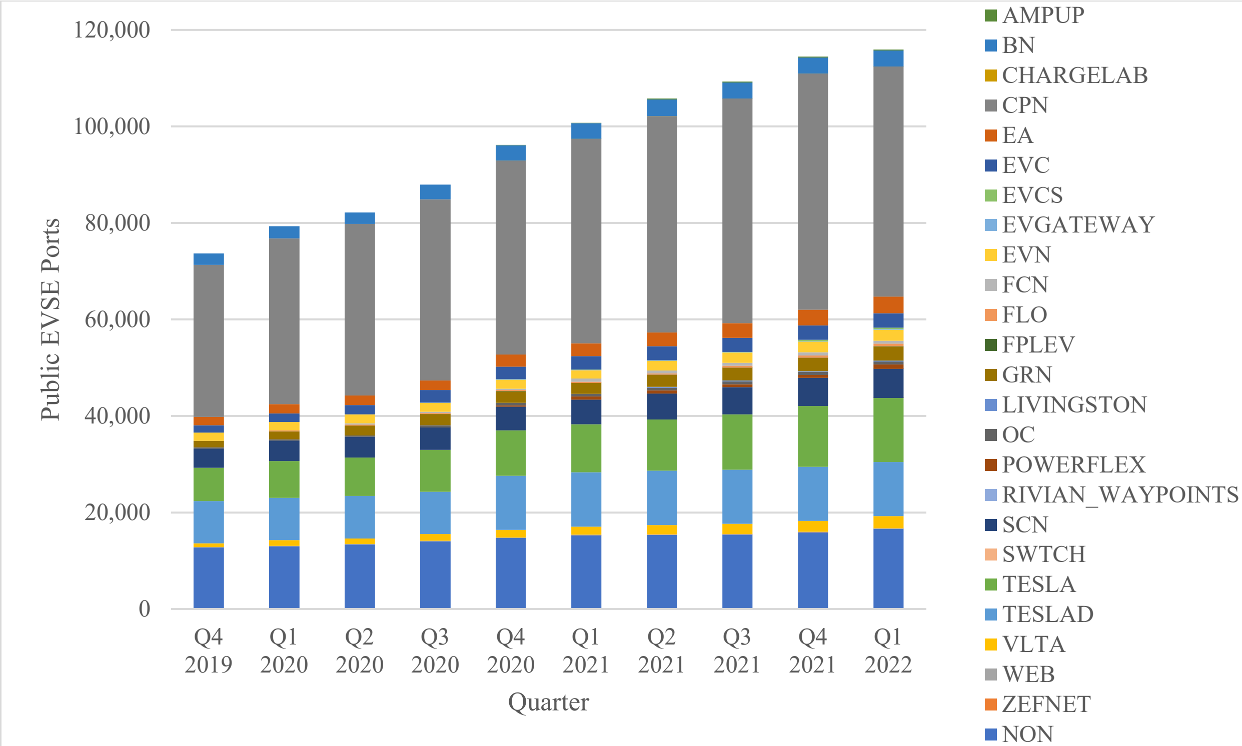

Figure 10. Quarterly growth of public EVSE ports by network

Table 1. Growth of Public EVSE Ports by Network Over the Last Four Quarters

Network	Q2 2021 Growth	Q3 2021 Growth	Q4 2021 Growth	Q1 2022 Growth
AMPUP	154.5%	0.0%	3.6%	2.3%
BN	5.0%	−2.8%	−1.1%	−0.5%
CHARGELAB	0.0%	0.0%	0.0%	0.0%
CPN	5.8%	3.9%	5.1%	−2.6%
EA	9.0%	4.0%	8.1%	6.0%
EVC	5.1%	0.9%	1.6%	1.2%
EVCS	0.0%	19.2%	409.7%	3.2%
EVGATEWAY	0.0%	34.2%	12.2%	8.2%
EVN	12.4%	4.6%	5.2%	3.2%
FCN	0.0%	0.0%	0.5%	0.0%
FLO	5.6%	33.8%	20.3%	11.6%
FPLEV	0.0%	0.0%	0.0%	760.0%
GRN	10.9%	6.0%	5.1%	5.8%
LIVINGSTON	N/A	0.0%	0.0%	0.0%
OC	0.4%	12.0%	1.5%	−7.0%
POWERFLEX	0.0%	0.0%	0.0%	42.8%
RIVIAN_WAYPOINTS	N/A	N/A	N/A	N/A
SCN	4.5%	4.3%	3.2%	3.6%
SWTCH	N/A	N/A	N/A	N/A
TESLA	7.0%	7.7%	9.9%	5.3%
TESLAD	0.1%	0.0%	0.0%	0.0%
VLTA	12.2%	9.5%	5.8%	13.4%
WEB	0.0%	0.0%	0.0%	0.0%
ZEFNET	0.0%	0.0%	0.0%	16.7%
NON	0.7%	0.4%	3.1%	4.3%
Total	5.0%	3.3%	4.7%	1.3%

2.1.3 By Region

The Clean Cities Coalition Network is broken down into seven regions (Figure 11), which were used to analyze the regional growth of public EV charging infrastructure across the country (Clean Cities Coalition Network 2022a). See the Q1 2020 report for more information about the Clean Cities Coalition Network (Brown et al. 2020).

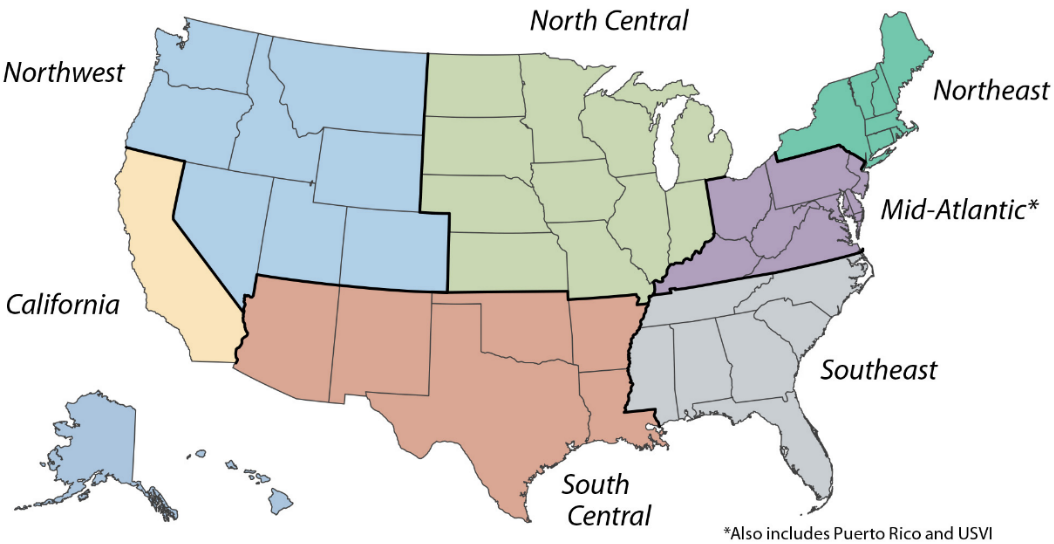

Figure 11. Clean Cities regions.

Source: Clean Cities Coalition Network (2022b)

As shown in Figure 12, the California region continues to have the largest share of the country's public EVSE ports (33.5%). However, similar to Q4 2021, the Mid-Atlantic region grew by the largest percentage in Q1 (4.1%) (Figure 12). Across every region, DC fast EVSE ports grew at a faster rate than Level 2 EVSE ports in Q1, with the Southeast region seeing the largest percentage growth in DC fast EVSE (Table 2). As previously discussed, the decrease in Level 2 EVSE ports in the California and Southeast regions can be attributed to ChargePoint and OpConnect.

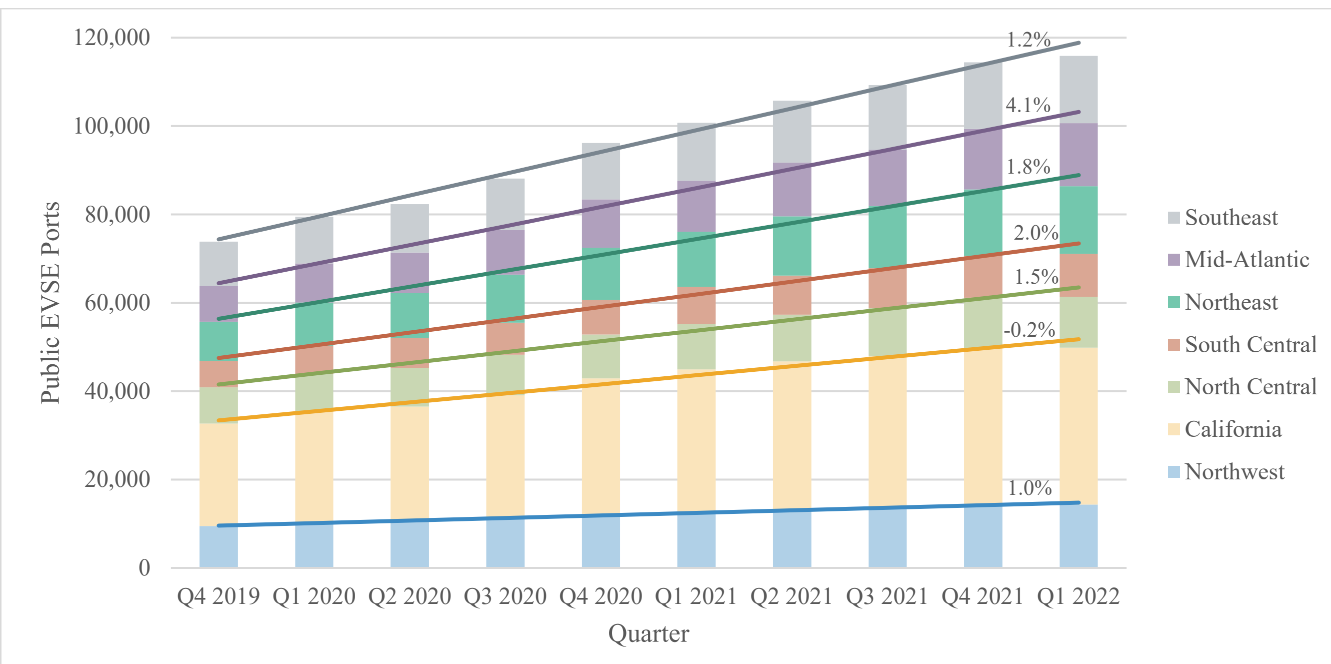

Figure 12. Quarterly growth of public EVSE ports by Clean Cities region

Note: The percentages in this figure indicate the percent growth between each quarter.

Table 2. Growth of Public Level 2 and DC Fast EVSE Ports by Clean Cities Region in Q1 2022

Clean Cities Region	Level 2 EVSE Port Growth	DC Fast EVSE Port Growth
California	−1.3%	5.3%
Mid-Atlantic	3.8%	5.7%
North Central	0.7%	5.8%
Northeast	0.9%	7.6%
Northwest	0.4%	3.9%
Southeast	−0.6%	9.2%
South Central	0.8%	5.7%

2.1.4 By State

To track the growth of EVSE ports by state, the Station Locator team calculated the number of public EVSE ports per 100 light-duty EV registrations in each state. The team chose this metric to compare charging infrastructure development across states on a basis that accounts for differing EV deployments by state. Washington, D.C., is considered a state for the purpose of this analysis, and the vehicle registration data are based on Experian's registration information as of December 31, 2021 (Experian Information Solutions 2022a).

In Q1, the five states that had the largest percent growth of EVSE ports per 100 EVs were Nevada, Maine, Ohio, New Hampshire, and Kentucky (Table 3). The growth in Nevada is primarily driven by Level 2 EVSE ports on ChargePoint's network and non-networked Level 2 EVSE ports in Las Vegas and Reno. Nevada currently ranks 33rd among states in terms of the total number of EVSE ports per 100 EVs, but the Station Locator team expects to see continued growth in Nevada over the next 3 years due to NV Energy's new Economic Recovery Transportation Electrification Plan. Through this plan, which the Public Utilities Commission of Nevada approved at the end of 2021, NV Energy will invest approximately $100 million to install over 1,000 EVSE ports in its service territory through 2024 (NV Energy 2022). New installations will be deployed at highway rest stops, urban areas, public buildings, transit bus depots, and recreation and tourism destinations. Over 40% of funding is earmarked for underserved communities and over 20% of funding is allocated to outdoor recreation and tourism.

Table 3. Top Five States With the Largest Growth of EVSE Ports per 100 EVs in Q1 2022[5]

State	EVSE Ports per 100 EVs in Q4 2021	EVSE Ports per 100 EVs in Q1 2022	Growth of EVSE Ports per 100 EVs in Q1 2022
Nevada	5.4	6.1	12.6%
Maine	8.2	9.0	10.0%
Ohio	5.8	6.3	7.7%
New Hampshire	4.4	4.7	7.5%
Kentucky	6.8	7.4	7.3%

[5] See the Appendix for the growth of EVSE ports per 100 EVs in all states in Q1 and the total number of EV registrations by state.

2.1.5 By Housing Density

To better understand where EV charging infrastructure is being deployed, the Station Locator team analyzed the growth of EVSE ports in urban, suburban, and rural areas across the United States. The Station Locator team used the U.S. Department of Housing and Urban Development's Urbanization Perceptions Small Area Index for this analysis. The Index classifies census tracts as urban, suburban, or rural based on how American Housing Survey (AHS) respondents described their neighborhood (U.S. Department of Housing and Urban Development Office of Policy Development and Research 2022). Based on the survey, approximately 27% of census tracts are urban, 52% are suburban, and 21% are rural. However, urban census tracts take up only approximately 1.3% of the United States' land area, whereas suburban and rural tracts take up 6.2% and 92.6%, respectively.

As shown in Figure 13, public EVSE ports are predominantly located in suburban tracts, followed by urban and rural tracts. However, both Level 2 EVSE ports and DC fast EVSE ports grew by the largest percentage in rural tracts in Q1. Compared with Level 1 and Level 2 EVSE ports, DC fast EVSE ports grew by the largest percentage in all neighborhood types, and rural neighborhoods saw the largest percent increase in DC fast EVSE ports in Q1 (5.7%). Future reports will provide additional insight into this growth, including whether this growth is attributable to DC fast infrastructure development along highway corridors.

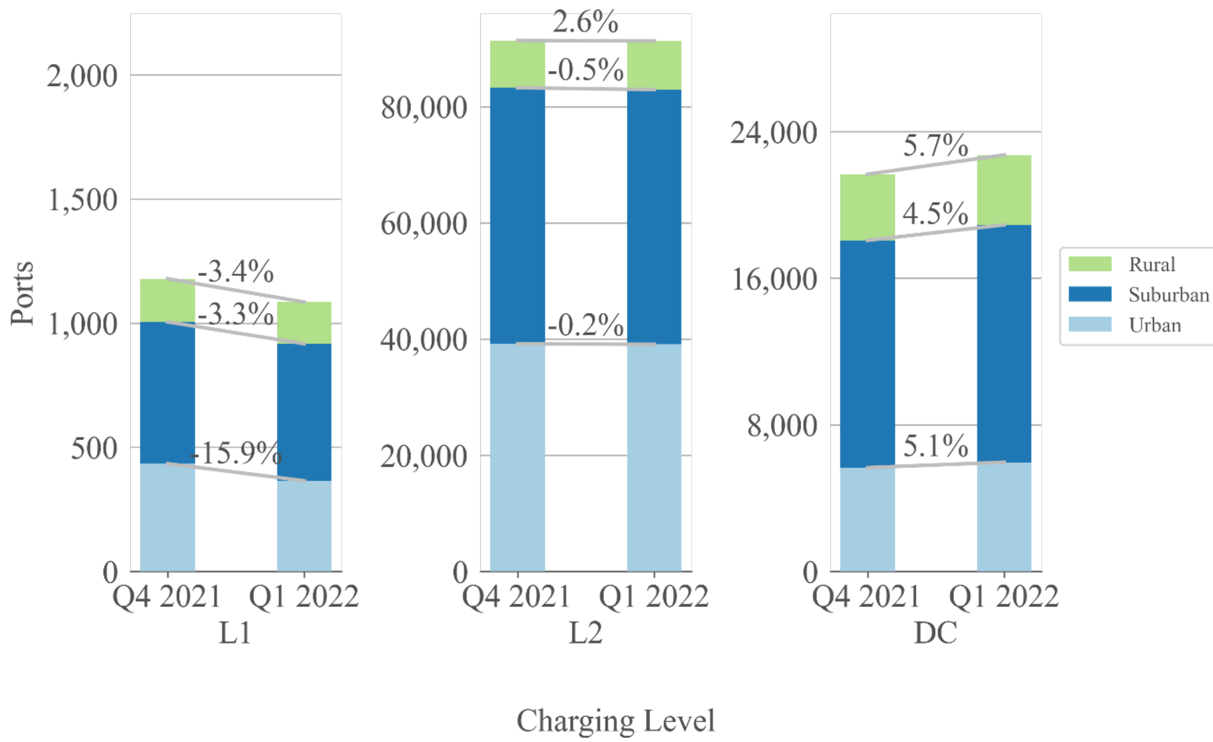

Figure 13. Q1 2022 growth of public EVSE ports by neighborhood type and charging level

Note: These graphs are not to scale.

2.2 Private Charging Trends

Private EV charging refers to EV charging stations that are available only to certain drivers for specific purposes, such as charging for transit fleets or employee-only charging at workplaces. Although the Station Locator team proactively seeks out new station openings to include, the opening of private workplace chargers may not necessarily be shared publicly. The Station Locator team therefore relies on Clean Cities coalitions, industry partners, and Station Locator users to share this information. Due to the challenge in collecting these data, private, nonresidential charging stations are likely underrepresented in the Station Locator; however, the Station Locator team is continually working to improve the data collection in these areas.

In Q1, the number of private EVSE ports in the Station Locator increased by 140, bringing the total number to 19,015 and representing a 0.7% increase since Q4 2021. The following sections break down the growth of private EVSE ports by level, as well as by three specific types: workplace, multifamily building, and fleet charging.

2.2.1 By Charging Level

As shown in Figure 14, the majority of private EVSE ports in the Station Locator are Level 2. However, in Q1, private DC fast EVSE ports grew by the largest percentage (2.4%), representing the addition of 7 EVSE ports (Figure 14).

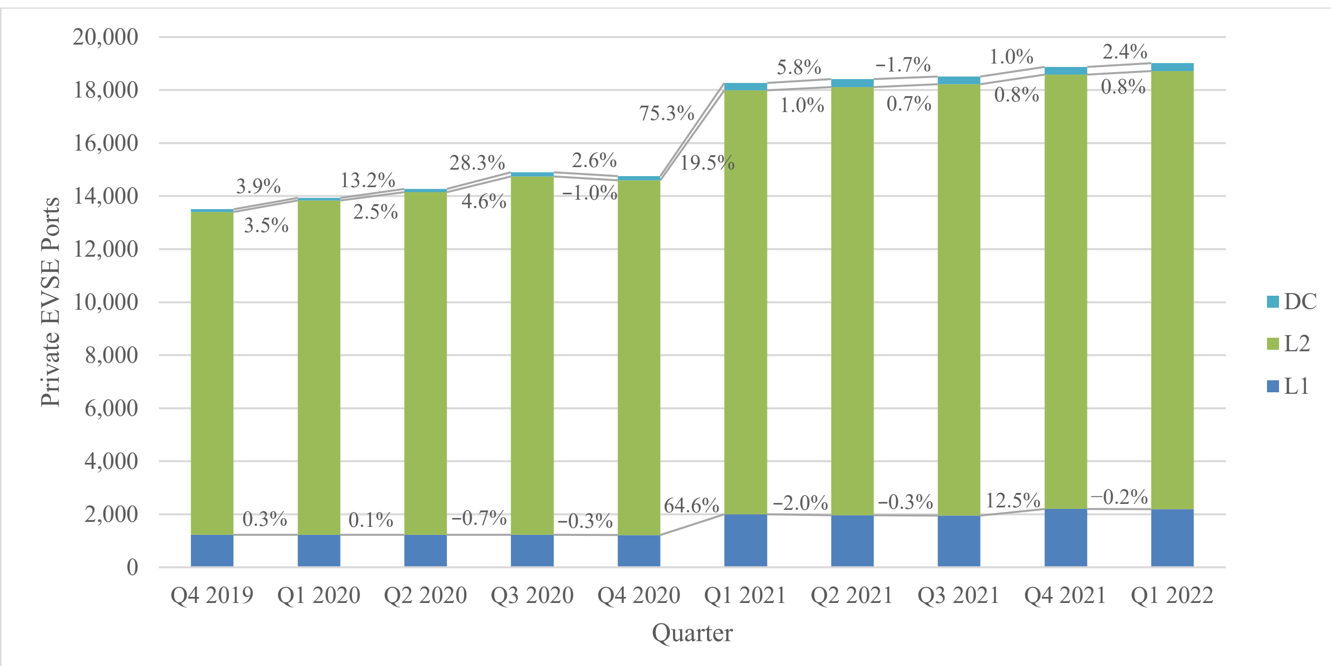

Figure 14. Quarterly growth of private EVSE ports by charging level

Note: Figure excludes legacy EVSE ports that are not classified by charging level and are no longer manufactured. As of Q1, there were 4 private legacy EVSE ports in the Station Locator. Additionally, the percentages in this figure indicate the percent growth between each quarter.

2.2.2 Workplace Charging

Workplace EV charging infrastructure includes charging stations that are private and designated for employee use only. The majority of private workplace EVSE ports in the Station Locator are

Level 2 (Figure 15), which is to be expected because employees use workplace chargers while they are parked at work for an extended period and therefore do not necessarily need rapid charging.

By the end of Q1, there were 10,165 workplace EVSE ports in the Station Locator. The number of Level 2 EVSE grew by 0.6%, representing the addition of 55 EVSE ports in Q1. There was no growth in the number DC fast EVSE ports, and a slight decrease in Level 1 EVSE ports (Figure 15). Roughly half of the workplace EVSE ports added in Q1 were non-networked or PowerFlex Level 2 EVSE that the Station Locator team received in the previously mentioned update from Los Angeles County.

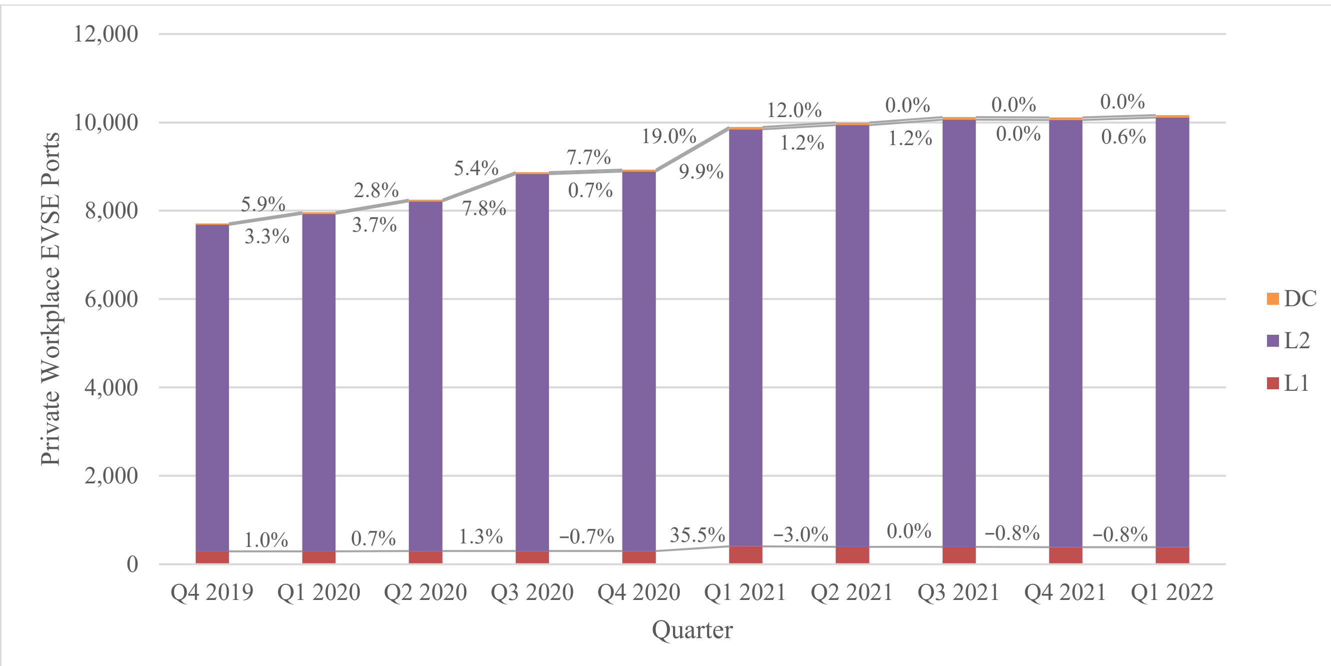

Figure 15. Quarterly growth of private workplace EVSE ports by charging level

Note: The percentages in this figure indicate the percent growth between each quarter.

2.2.3 Multifamily Building Charging

The Station Locator team continues to focus efforts on capturing private charging infrastructure installed at multifamily buildings that are available for resident use only. In Q1, there was an increase of 4.5% in EVSE ports at multifamily buildings, bringing the total number of EVSE ports to 1,014 compared with 970 in Q4 2021 (Figure 16). The EVSE ports added in Q1 were primarily non-networked and SemaConnect Level 2 EVSE in Texas and California. As shown in Figure 16, multifamily building EVSE ports in the Station Locator are either Level 1 or Level 2.

As with private workplace EVSE, the relatively small growth in Q1 can likely be attributed to the difficulty of collecting this information, as several states and utilities offer incentives to install charging infrastructure at multi-family housing. The Station Locator team continues its concerted efforts to collect this data and expects the number of these EVSE ports to grow in future quarters.

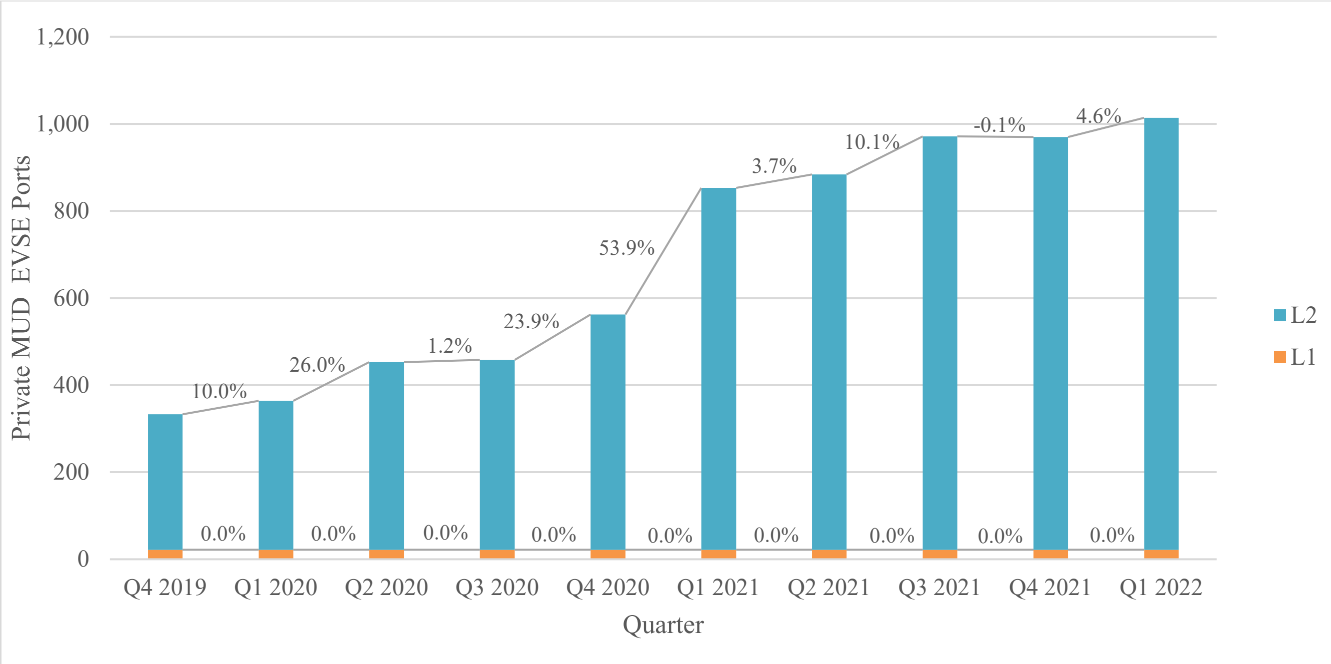

Figure 16. Quarterly growth of private multifamily building EVSE ports by charging level

2.2.4 Fleet Charging

In 2020, the Station Locator team began collecting data on whether stations are dedicated fleet charging stations, and if so, what types of vehicles charge at the station based on the Federal Highway Administration weight class (i.e., light-duty [LD], medium-duty [MD], or heavy-duty [HD] vehicles). As of Q1, the team has collected this information for 88.2% of private EVSE ports in the Station Locator, of which 45.8% are being used for fleet charging purposes. Note that some fleet EVSE ports are also used by employees and are therefore counted in Section 2.2.2 as well.

Figure 17 shows the breakdown of these EVSE ports by fleet type and charging level. The fleet type indicates the largest vehicle type that uses the station as of Q1 based on the types of vehicles in the fleet, though smaller vehicle types may charge at the station as well. The majority of EVs on the road are LD vehicles, such as sedans, sport utility vehicles (SUVs), and pickup trucks; unsurprisingly, the majority of fleet charging EVSE ports are used to charge LD vehicles (Figure 17). Additionally, the majority of fleet charging EVSE ports are Level 2 (Figure 17).

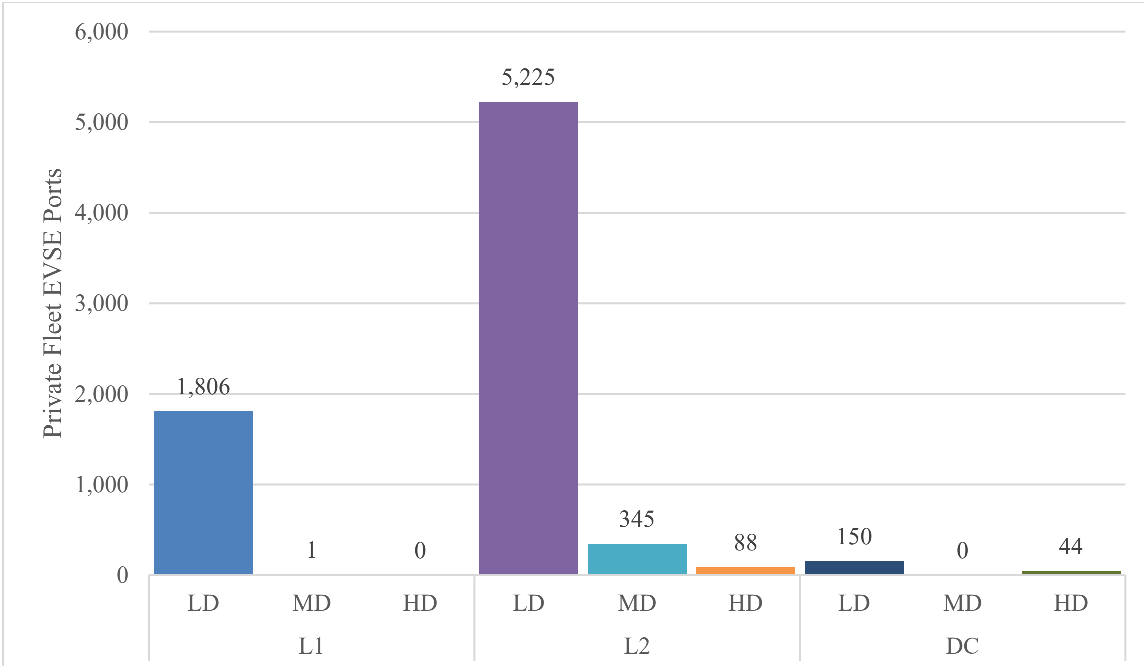

Figure 17. Breakdown of private fleet EVSE ports by charging level and fleet type in Q1 2022

The Station Locator team continues to expand its private fleet data collection efforts, especially for fleets that are installing charging infrastructure for MD and HD vehicles such as school bus fleets and public transit fleets. Additionally, the Station Locator team is tracking the development of MD and HD charging infrastructure and will collect additional data, such as new connector types, as the technology evolves and is deployed.

3 Projecting Future Charging Infrastructure Needs

The Biden administration set an early goal of building a network of 500,000 public EVSE ports in the United States by 2030.[6] To put this goal into context, the number of public EVSE ports in the Station Locator has grown by an average of 4,674 EVSE ports per quarter over the last 2 years. In order to reach 500,000 EVSE ports by 2030, approximately 12,390 public EVSE port installations will be required each quarter for the next 8 years, indicating that the pace of installations will need to increase significantly. As of Q1, the number of public EVSE port installations was 23.2% of the way toward the goal.

The Bipartisan Infrastructure Law (BIL, H.R. 3684), which President Biden signed into law on November 15, 2021, formally established the National Electric Vehicle Infrastructure (NEVI) Formula Program and the Discretionary Grant Program for Charging and Fueling Infrastructure (The White House 2022). These programs will provide states with $7.5 billion (collectively) in funds to begin building the network of 500,000 public EVSE ports, though it will not necessarily

[6] The goal includes installing 500,000 public charging stations by 2030 but does not specifically outline whether a charging station means a location or an EVSE port, as defined in Section 1.2. For the purposes of this report, it was assumed that charging station refers to a single-port charger, and therefore 500,000 EVSE ports. Further, it is unclear whether this goal means that 500,000 additional EVSE ports will be funded by 2030, or enough EVSE ports will be funded so that the total number of EVSE ports in the United States reaches 500,000 by 2030. This report assumes the latter.

fund all the infrastructure required to meet the Biden administration's goal. This goal does not differentiate between DC fast and Level 2 EVSE ports and these programs do not dictate how many DC fast versus Level 2 EVSE ports will be funded. However, the NEVI Formula Program will initially be focused on building out charging infrastructure along the interstate highway system with DC fast EVSE ports, and the Discretionary Grant Program is expected to fund both DC fast and Level 2 EVSE ports (Federal Highway Administration 2022a).

Two studies with different EV projection scenarios offer insight into how much public and workplace charging would be required in the United States to support a growing fleet of light-duty EVs. The first study, NREL's 2017 *National Plug-In Electric Vehicle Infrastructure Analysis*, estimates that a total of 27,500 DC fast EVSE ports and 601,000 Level 2 EVSE ports would be required across the United States to support 15 million light-duty EVs by 2030 (Wood et al. 2017). This equates to 1.8 DC fast EVSE ports per 1,000 EVs and 40.1 Level 2 EVSE ports per 1,000 EVs. The second study, Atlas Public Policy's 2021 *U.S. Passenger Vehicle Electrification Infrastructure Assessment*, assumes that 100% of passenger vehicle sales will be electric by 2035, which would result in approximately 57.5 million light-duty EVs by 2030 (McKenzie and Nigro 2021). To support these EVs, this study estimates that an additional 252,000 DC fast EVSE ports and 244,000 Level 2 EVSE ports would be required. Using the number of installations as of Q1 2021 as a baseline, this results in approximately 269,558 DC fast EVSE ports and 335,266 Level 2 EVSE ports by 2030, and equates to 4.7 DC fast EVSE ports per 1,000 EVs and 5.8 Level 2 EVSE ports per 1,000 EVs. For a more detailed discussion of these studies and the different assumptions used to arrive at their respective infrastructure projections, see the Q3 2021 report (Brown et al. 2022).

As of Q1, there were 23,033 public and workplace DC fast EVSE ports and 101,527 public and workplace Level 2 EVSE ports available in the United States (Figure 18). Based on NREL's analysis, the number of DC fast and Level 2 EVSE ports installed is 83.8% and 16.9%, respectively, of the way toward meeting projected 2030 infrastructure requirements to support 15 million EVs (Figure 18). Based on Atlas' assessment, the number of DC fast and Level 2 EVSE ports is 8.5% and 30.3%, respectively, of the way toward meeting projected 2030 infrastructure requirements to support 57.5 million EVs (Figure 18). As with previous quarters, it is important to note that 57.6% of public DC fast EVSE ports in the Station Locator are on the Tesla Supercharger network and are therefore only readily accessible to Tesla drivers.[7] Additionally, as of March 31, 2022, 46% of EVs on the road were Teslas (Experian Information Solutions 2022b). When public Tesla EVSE ports are excluded, the number of DC fast and Level 2 EVSE ports currently installed decreases to 35.6% and 15.0%, respectively, of the way toward meeting NREL's projected infrastructure requirements, and 3.8% and 27.9%, respectively, toward meeting Atlas' projected infrastructure requirements.

[7] Tesla has suggested in some comments that it may open its network to non-Tesla drivers in exchange for Federal funding (Loveday 2022).

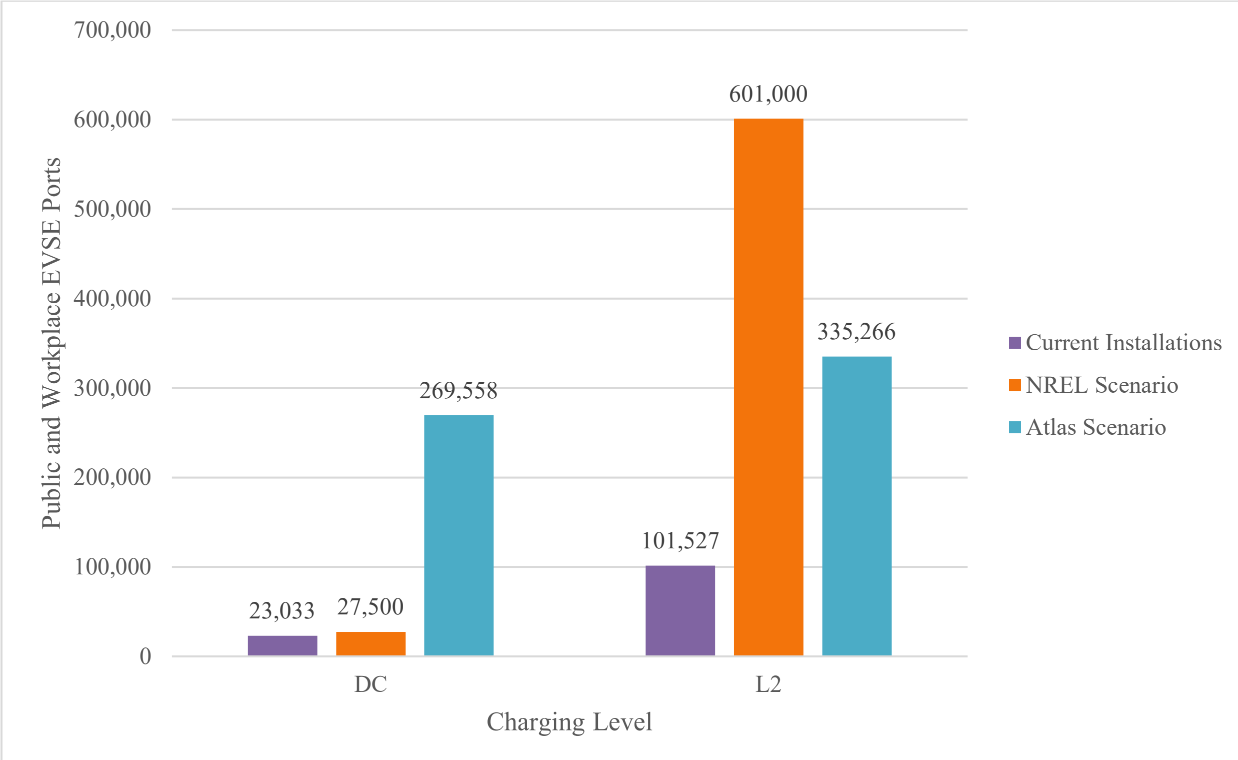

Figure 18. Current availability of public and workplace charging versus two scenarios of 2030 infrastructure requirements in the United States

There were approximately 2.4 million EVs on the road in the United States as of March 31, 2022 (Experian Information Solutions 2022b). The ratios of DC fast and Level 2 public and workplace EVSE ports per 1,000 EVs in Q1 were 9.5 and 41.7, respectively (Table 4). These ratios decrease to 4.0 and 37.1, respectively, when Tesla EVSE ports are excluded. Using NREL and Atlas' estimated ratios of the number of DC fast and Level 2 EVSE ports per 1,000 EVs as a proxy for how much infrastructure is sufficient to meet charging needs in 2030, Table 4 suggests that, as of Q1, public and workplace DC fast and Level 2 EVSE ports are keeping up with current charging needs in terms of the amount of infrastructure currently available. However, this comparison does not speak to whether the geographic distribution of EVSE ports matches where there is charging demand. Additionally, it is notable that roughly 16% of the 15 million light-duty EVs in NREL's analysis and roughly 4% of the 57.5 million light-duty EVs in Atlas' assessment were on the road as of Q1, resulting in a relatively high ratio of EVSE ports to EVs. As the number of EVs on the road continues to grow, this ratio will decrease unless the infrastructure growth is able to keep pace.

Table 4. Current Public and Workplace EVSE per 1,000 EVs Versus Two Scenarios of 2030 Infrastructure Requirements in the United States

Port Level	EVSE per 1,000 EVs in Q1 2022	NREL – EVSE per 1,000 EVs Needed in 2030 To Support 15 Million EVs	Atlas – EVSE per 1,000 EVs Needed in 2030 To Support 57.5 Million EVs
DC Fast	9.5	1.8	4.7
Level 2	41.7	40.1	5.8

4 Developments That Could Impact Future Quarters

2022 is off to a promising start for EV charging infrastructure development. As discussed in the Q4 2021 report, President Biden signed the BIL, which includes funding for the NEVI Formula Grant Program (Brown et al. 2022). Under this program, each state is required to submit an EV Infrastructure Deployment Plan that details how each state intends to use its apportioned funds in accordance with guidance released by the Federal Highway Administration. The guidance was released on February 10, 2022, and outlines the program background, funding eligibilities, and program guidance for the buildout of EV charging infrastructure. Each state is required to develop a plan by August 1, 2022, and will be notified if their plan is approved by September 30, 2022. Notable required sections of the plan include public engagement efforts, existing and future conditions analysis, equity and labor force considerations, and cybersecurity (Federal Highway Administration 2022b). Some states, including Maryland and Texas, have already created websites with public engagement surveys to help inform their respective plans.

In conjunction with state guidance on the NEVI Formula Grant Program, the Federal Highway Administration announced the opening of Round 6 of Alternative Fuel Corridor nominations in Q1. Previously, for a National Highway System segment to be designated as corridor-ready for EV charging, each DC fast charging station was required to have both CCS and CHAdeMO connectors available but was not required to have a minimum power output (Federal Highway Administration 2020). The Federal Highway Administration changed these criteria in Round 6 to require that each DC fast charging station has at least four EVSE ports with CCS connectors and a minimum power output of 150 kW (Federal Highway Administration 2022c). As discussed in Section 2.1.1, vehicles that are compatible with the CHAdeMO standard make up the smallest portion of light-duty EV registrations, and there are only two vehicle models currently manufactured in the United States that are compatible with the CHAdeMO standard. Although CHAdeMO installations continue to grow, these new criteria will encourage faster growth in CCS installations, as well as installation of higher-powered chargers. Additionally, corridor-ready segments must have at least two DC fast charging stations no more than 50 miles from each other and no more than 1 mile from an interstate exit.

During Q1, the U.S. Department of Transportation introduced the Rural EV Toolkit to help build out rural charging infrastructure as part of the Biden administration's infrastructure plans (U.S. Department of Transportation 2022). The toolkit is designed to help rural communities scope, plan, and fund charging infrastructure. As the federal government continues to focus on expanding infrastructure in rural communities, we may see growth in new areas in future years.

Q1 saw another example of the Biden administration's BIL in action with funding announcements for the largest investment for buses and bus facilities through the Federal Transit Administration's Low or No Emission Grant Program and Grants for Buses and Bus Facilities Program (Federal Transit Administration 2022). As transit agencies and school districts acquire electric buses and electric transit vehicles, we can expect to see additional DC fast charging stations built throughout the United States.

State and local governments are continuing to institute policies and establish goals to support increased EV adoption as well. Notably, a growing number of cities are requiring commercial buildings and multifamily housing complexes to make parking spaces available to accommodate EV charging infrastructure. More than 30 municipalities have passed these requirements, which will add more charging for communities (Plautz 2022). The state of Washington passed Senate Bill 5689, adopting an EV deployment goal that all LD vehicles sold in Washington must be EVs by 2030 (Alternative Fuels Data Center 2022e). This is the most aggressive EV deployment goal set by any state. Additionally, the city of Boston announced a goal to fully electrify its school bus fleet by 2030 (City of Boston 2022).

Outside of government deployment efforts, Q1 saw major announcements from Hertz and Consumers Energy. First, Hertz announced plans to purchase 65,000 EVs from Polestar, and expects that it will have these vehicles available for its business, leisure, and ride-share customers to rent by the end of 2022 (Hertz 2022). Polestar EVs will join Hertz's growing fleet of rental EVs; in Q4 2021, Hertz announced that it was purchasing 100,000 Teslas, which are now available to customers in select cities (Boudette and Chokshi 2021). Public charging infrastructure will be key to enabling customers to rent EVs, which may help to spur demand for public charging. Second, Consumers Energy plans to build 200 additional charging stations in Michigan—including 100 DC fast charging stations (Consumers Energy 2022). The Station Locator team will work with relevant stakeholders to ensure that these stations are captured in the Station Locator.

Finally, the Station Locator data collection and management processes will continue to impact future EVSE port counts as well. As noted in Section 1.1.1, since 2019, the Station Locator team has been transitioning its counting logic to align with the hierarchy defined in the OCPI protocol: station locations, EVSE ports, and connectors (EVRoaming Foundation 2020). With this transition, the Station Locator is now counting the number of EVSE ports at a station location rather than the number of connectors, as previously counted. For example, a charging location with one EVSE port and two connectors was previously counted twice but is now only counted once using the OCPI protocol's counting logic. As of Q1, all manually collected data, as well as EVSE ports on the ChargePoint, Electrify America, EVgo, and Greenlots networks, are counted according to the OCPI logic. Additionally, NREL is continuously working with EVSPs to add new APIs to the Station Locator, and is currently working with EV Connect, Rivian, and Volta to integrate their APIs. Finally, the Station Locator team is making a concerted effort to collect power data for all DC fast EVSE ports to support Round 6 of the Alternative Fuel Corridors nominations and may add new fields to the Station Locator to support other BIL funding initiatives. This new information will continue to make the Station Locator as useful as possible to stakeholders and allow for additional analysis for these reports

5 Conclusion

This report examines the expansion of EV infrastructure reflected in the Station Locator, including the growth of public EV charging by charging level, network, region, and state, and the growth of private EV charging by charging level and use type (i.e., workplace, multifamily building, and fleet) in Q1 2022. With such rapid growth and change in EV charging infrastructure, the information presented in this report is intended to help readers understand how and where the infrastructure is developing, where there may be areas of opportunity, and whether development is keeping pace with projected charging demand and national targets.

As of the end of Q1, Level 2 chargers accounted for the majority of both public and private EVSE ports in the Station Locator (79.2% and 86.9%, respectively). Overall, there was a 1.2% increase in the number of EVSE ports in the Station Locator, with DC fast EVSE ports contributing to the majority of that growth in absolute terms. California continues to lead the country in terms of the total number of public EVSE ports available (35,463), though public charging infrastructure grew by the largest percentage in the Mid-Atlantic region in Q1 (4.1%).

Based on NREL's 2017 analysis that estimated the number of public and workplace chargers required to support a scenario in which there are 15 million EVs on the road by 2030, the number of DC fast and Level 2 EVSE ports as of Q1 are 83.8% and 16.9%, respectively, of the projected 2030 needs (Wood et al. 2017). However, the majority (57.6%) of public DC fast EVSE ports in the Station Locator are on the Tesla network and are therefore only readily accessible to Tesla drivers. When Tesla EVSE ports are removed, this decreases to 35.6% and 15.0%, respectively, of the projected need. Based on Atlas' 2021 assessment that estimated the number of public and workplace chargers required in a scenario in which 100% of passenger vehicle sales are electric by 2035, the number of DC fast and Level 2 EVSE ports as of Q1 is 8.5% and 30.3%, respectively, of the projected 2030 needs (McKenzie and Nigro 2021). This decreases to 3.8% and 27.9%, respectively, when Tesla EVSE ports are removed.

When comparing the current rate of deployment of public charging infrastructure with the Biden administration's goal of installing 500,000 EVSE ports in the United States by 2030, it is clear that the pace of installations will need to significantly increase in order to meet the administration's goal. Since the start of 2020, an average of 4,674 public EVSE ports have been installed each quarter. To meet the Biden administration's goal by 2030, approximately 12,390 public EVSE port installations will be required each quarter for the next 8 years.

If there are additional metrics that readers are interested in seeing, please email suggestions to the authors at TechnicalResponse@icf.com.

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Appendix

Table A-1. Q1 2022 Growth of Public EVSE Ports per 100 EVs by State

State	EVSE Ports per 100 EVs in Q4 2021	EVSE Ports per 100 EVs in Q1 2022	Growth of EVSE Ports per 100 EVs in Q1 2022
AK	4.9	5.1	3.4%
AL	6.3	6.6	4.4%
AR	10.4	10.8	4.1%
AZ	3.8	4.1	6.6%
CA	4.0	4.0	-0.2%
CO	6.7	6.7	0.2%
CT	5.5	5.5	0.1%
DC	11.0	11.4	3.2%
DE	5.9	6.3	6.1%
FL	4.6	4.7	2.9%
GA	7.9	7.9	-1.1%
HI	4.1	4.0	-2.2%
IA	7.6	8.1	6.5%
ID	4.4	4.4	0.0%
IL	4.4	4.4	0.2%
IN	5.0	5.0	-0.6%
KS	12.1	12.1	0.0%
KY	6.8	7.4	7.3%
LA	6.6	6.7	0.9%
MA	8.7	8.9	2.1%
MD	7.1	7.3	3.1%
ME	8.2	9.0	10.0%
MI	4.9	5.0	3.3%
MN	5.3	5.4	1.6%
MO	12.2	12.2	0.0%
MS	11.7	12.0	2.5%
MT	7.7	8.1	6.3%
NC	6.3	6.3	0.5%
ND	17.6	18.2	3.0%
NE	7.7	8.1	4.4%
NH	4.4	4.7	7.5%
NJ	2.6	2.6	2.0%

State	EVSE Ports per 100 EVs in Q4 2021	EVSE Ports per 100 EVs in Q1 2022	Growth of EVSE Ports per 100 EVs in Q1 2022
NM	5.9	6.3	6.6%
NV	5.4	6.1	12.6%
NY	7.1	7.1	0.5%
OH	5.8	6.3	7.7%
OK	7.2	7.2	0.2%
OR	4.5	4.6	0.4%
PA	5.7	5.9	3.4%
RI	10.8	11.5	7.1%
SC	6.5	6.7	2.6%
SD	11.4	12.1	5.8%
TN	7.5	7.5	-0.8%
TX	4.7	4.7	-0.1%
UT	8.0	7.9	-2.1%
VA	5.9	6.1	4.1%
VT	13.0	13.2	1.2%
WA	4.2	4.2	0.3%
WI	5.3	5.5	2.8%
WV	13.4	13.7	2.2%
WY	18.4	18.6	1.2%

Table A- 2. Registered Light-Duty EVs by State, December 31, 2021 (Experian Information Solutions 2022c)

State	Registered EVs
AK	1,809
AL	8,010
AR	4,228
AZ	56,214
CA	878,361
CO	53,150
CT	22,559
DC	6,233
DE	5,013
FL	127,821
GA	47,622
HI	18,674
IA	7,295
ID	5,972
IL	54,789
IN	17,817
KS	7,760
KY	7,360
LA	5,131
MA	52,622
MD	42,785
ME	7,196
MI	34,664
MN	23,900
MO	17,254
MS	2,422
MT	2,704
NC	38,717
ND	765
NE	4,670
NH	7,549
NJ	66,297
NM	6,980
NV	23,715

State	Registered EVs
NY	96,420
OH	34,297
OK	14,020
OR	47,213
PA	44,571
RI	4,956
SC	12,116
SD	1,357
TN	18,449
TX	111,517
UT	23,949
VA	46,487
VT	6,598
WA	91,101
WI	17,004
WV	2,045
WY	928
Total	2,241,086