Electric Vehicle Charging Infrastructure Trends from the Alternative Fueling Station Locator: Second Quarter 2023

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

1 National Renewable Energy Laboratory
2 ICF Inc.

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List of Acronyms

7CHARGE	7Charge network
AFDC	Alternative Fuels Data Center
AMPUP	AmpUp network
API	application programming interface
BN	Blink network
CCS	Combined Charging System; a connector type for DC fast charging
CHAdeMO	a connector type for DC fast charging
CHARGELAB	ChargeLab network
CHARGEUP	ChargeUp network
CHARGIE	Chargie network
CIRCLE_K	Circle K network
CPN	ChargePoint network
DAC	disadvantaged community
DC	direct current
DOE	U.S. Department of Energy
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
EVRANGE	EV Range network
EVSE	electric vehicle supply equipment
EVSP	electric vehicle service provider
FCN	Francis Energy network
FLASH	FLASH network
FLO	FLO network
FPLEV	FPL EVolution network
GRAVITI_ENERGY	Graviti Energy network
J1772	the connector type for Level 1 and Level 2 charging
L1	Level 1
L2	Level 2
LIVINGSTON	Livingston Energy Group network
NACS	North American Charging Standard
NEVI	National Electric Vehicle Infrastructure
NON	non-networked
NOODOE	Noodoe network
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
RED_E	Red E Charging network
RIVIAN_ADVENTURE	Rivian Adventure Network
RIVIAN_WAYPOINTS	Rivian Waypoints network
SCN	SemaConnect network
SHELL_RECHARGE	Shell Recharge network
SWTCH	SWTCH Energy network
TESLA	Tesla Supercharger network
TESLAD	Tesla Destination network
UNIVERSAL	Universal EV Chargers network
VLTA	Volta network
WEB	Webasto network
ZEFNET	ZEF Energy network
ZEV	zero-emission vehicle

Executive Summary

Electric vehicle (EV) charging infrastructure continues to rapidly change and grow. Using data from the U.S. Department of Energy's (DOE's) Alternative Fueling Station Locator (AFDC 2023b), this report provides a snapshot of the state of EV charging infrastructure in the United States in the second calendar quarter of 2023 (Q2 2023) by charging level, network, and location. Additionally, this report measures the current state of charging infrastructure compared with a federal infrastructure requirement scenario. 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 fourteenth 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 Q2 2023, the number of electric vehicle supply equipment (EVSE) ports in the Station Locator grew by 4.0%, or 6,478 EVSE ports. Public EVSE ports grew by 4.1%, or 5,807 EVSE ports, bringing the total number of public EVSE ports in the Station Locator to 141,714 and accounting for the majority of ports in the Station Locator (Figure ES-1). Private EVSE ports increased by 3.4%, or 671 ports. The Mid-Atlantic region had the largest increase in public charging infrastructure in Q2 (7.1%), though California, which has almost one-third (28.1%) of the country's public charging infrastructure, continues to lead the country in the number of public ports (see Section 2.1.3 for how regions are defined).

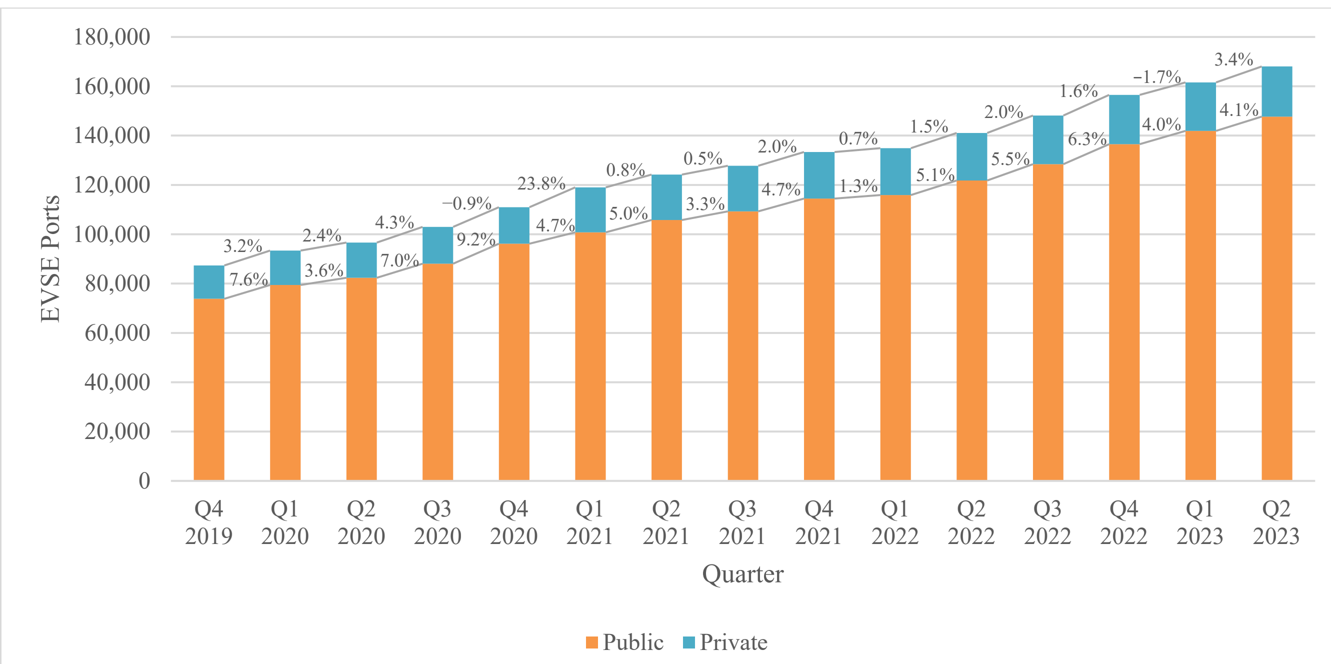

Figure ES-1. Quarterly growth of EVSE ports by access.

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

Of public EVSE ports, direct-current (DC) fast EVSE ports increased by the greatest percentage (6.1%) in Q2 (Figure ES-2).

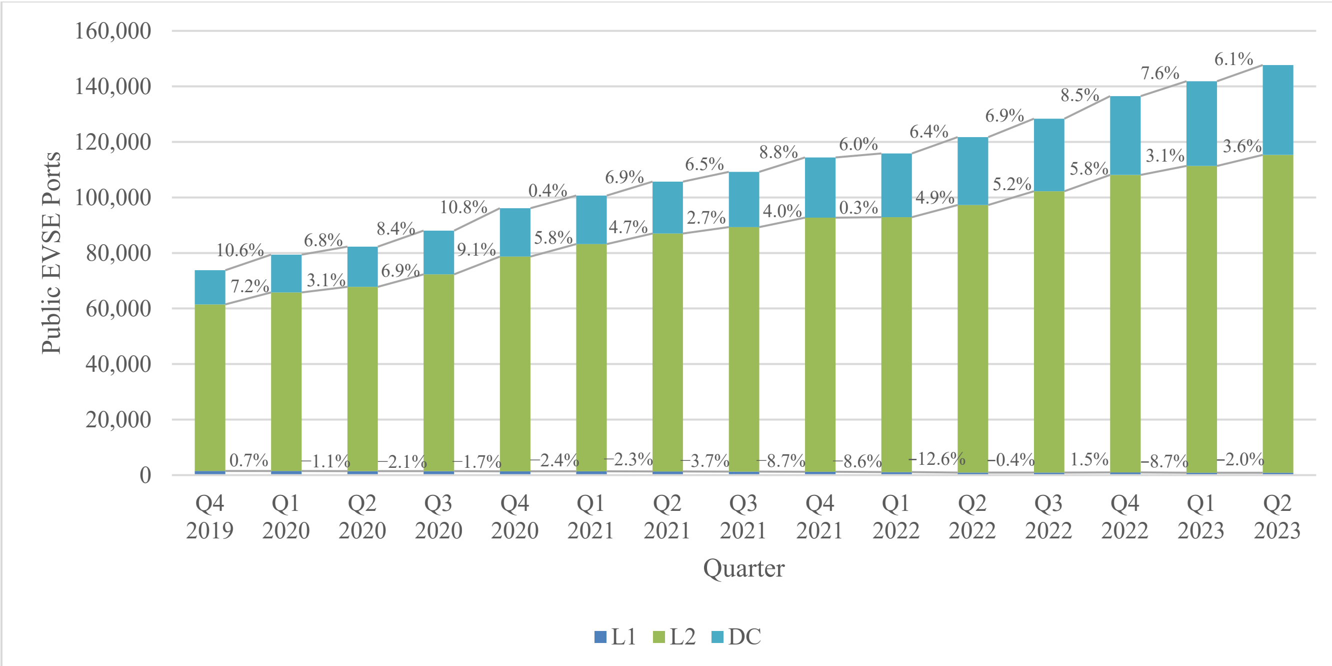

Figure ES-2. Quarterly growth of public EVSE ports by charging level.

Note: Figure excludes legacy EVSE ports that are not classified by charging level and are no longer manufactured. As of Q2, there were 27 public legacy EVSE ports in the Station Locator. Additionally, the percentages in this figure indicate the percent growth between each quarter.

DC fast EVSE ports have the highest power output and therefore provide the most charge in the least amount of time. One of the conclusions drawn from NREL's report *The 2030 National Charging Network: Estimating U.S. Light-Duty Demand for Electric Vehicle Charging Infrastructure* is that building out a network of reliable public DC fast chargers is a key component to building consumer confidence in EV ownership and supporting EV adoption in the United States (Wood et al. 2023). It is therefore important to highlight trends in the growth of DC fast EVSE ports in the Station Locator. The power output of DC fast EVSE ports ranges from 24 kW to 350 kW. DC fast EVSE ports with power outputs of 50 kW and 150 kW are common, though the number of DC fast EVSE ports at higher power levels is steadily increasing (Figure ES-3).

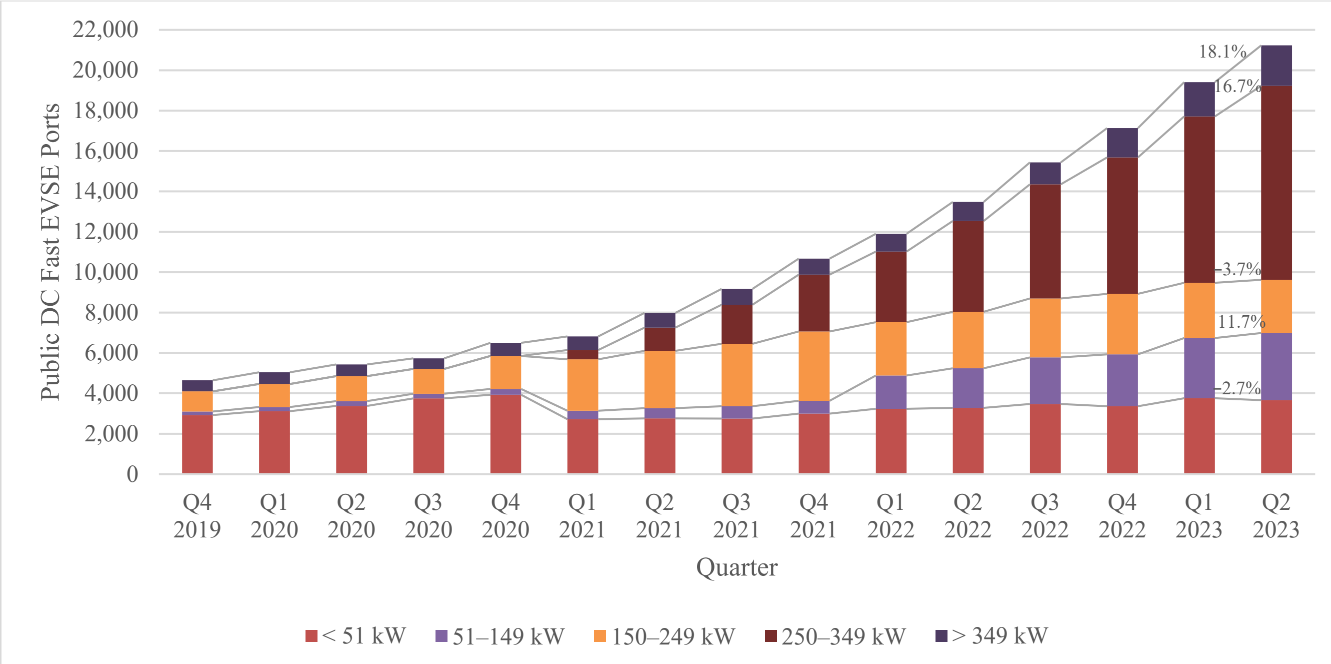

Figure ES-3. Quarterly growth of public DC fast EVSE ports by power output.

Note: The percentages in this figure indicate the percent growth between each quarter. For an explanation of the changes seen in Q1 2021, see the Q1 2021 report (Brown, Schayowitz, and Klotz 2021).

NREL's report *The 2030 National Charging Network* estimates the United States would require 182,000 DC fast EVSE ports with a power output of 150 kW or greater and 1,067,000 Level 2 public EVSE ports to support a baseline scenario of 33 million EVs on the road by 2030 (Wood et al. 2023). Based on data in the Station Locator, 7.8% of the estimated DC fast EVSE ports and 10.7% of the estimated Level 2 EVSE ports are currently available. However, it is important to note that 61.6% of public DC fast EVSE ports and 8.7% of public Level 2 EVSE ports in the Station Locator are on the Tesla Supercharger and Destination networks, respectively, and are therefore currently only readily accessible (i.e., without an adapter) to Tesla vehicles. When public EVSE ports on these networks are excluded, the number of DC fast and Level 2 EVSE ports currently installed decreases to 4,622 (2.5%) and 104,494 (9.8%), respectively.

It is important to state these reports reflect a snapshot of the number of available and temporarily unavailable (i.e., unavailable for use for an extended period due to maintenance) 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.

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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1 Importance of Tracking Electric Vehicle Charging Infrastructure Trends

The U.S. Department of Energy's (DOE'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 (AFDC 2023a). Originally, it served as a hard copy resource for alternative fuel performance data, and then 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 Fuelling 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 federal government's goal of building a national EV charging network of 500,000 electric vehicle supply equipment (EVSE) ports by 2030 and the newly available funds from the Bipartisan Infrastructure Law and Inflation Reduction Act 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 second calendar quarter of 2023 (Q2 2023). This is the fourteenth 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).

It is important to state these reports reflect a snapshot of the number of available and temporarily unavailable (i.e., unavailable for use for an extended period due to maintenance) 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.

1.1 EV Charging Data Fields

Current charging infrastructure in the Station Locator is 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 or stations that require payment through a specific application. Additionally, stations that are reserved for patrons of a business, such as guests of a hotel, visitors of a museum, or customers of a retail store, are classified as public restricted access.

- **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 housing. EV charging infrastructure at multifamily housing is also classified as private in the Station Locator. See Section 2.2.3 for additional details.

The Station Locator counting logic aligns with the hierarchy defined in the Open Charge Point Interface (OCPI) protocol: station locations, EVSE ports, and connectors (EVRoaming Foundation 2020), as shown in Figure 1 and described below. Therefore, the Station Locator counts the number of EVSE ports at each station location.

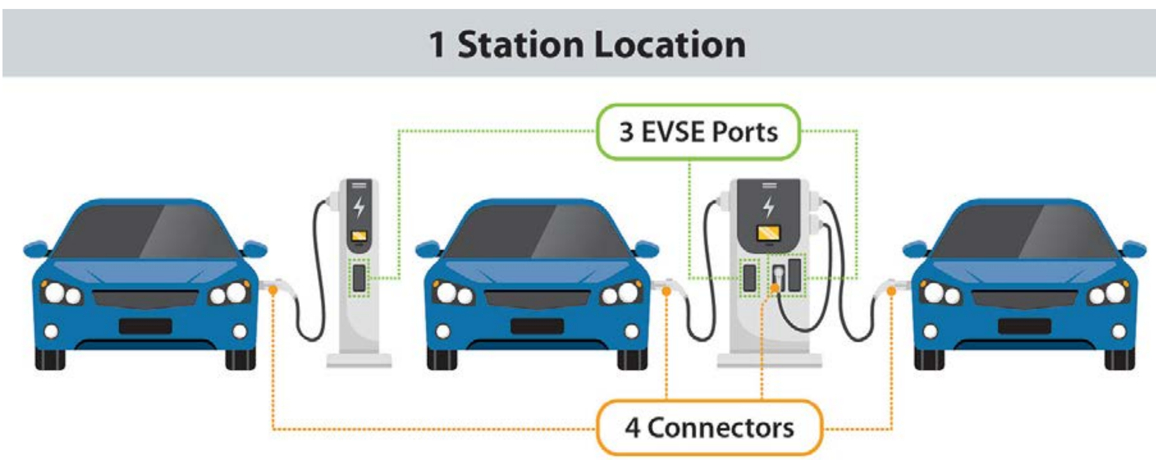

Figure 1. EV charging infrastructure hierarchy.

Source: AFDC (2023d)

The following fuel-specific fields are tracked in the Station Locator for EV charging stations (AFDC 2023c):

- EV charging 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 simultaneously charge vehicles. An EVSE port provides power to charge only one vehicle at a time even though it may have multiple connectors. The unit that houses EVSE ports is sometimes called a charging post, which can have one or more EVSE ports.
  - EVSE port type:

- Level 1 (L1): 120 V; 1 hour of charging = 5 miles of range[1]
  - Note: The Station Locator counts standard 120-V outlets as Level 1 EVSE ports only if the outlet is specifically designated for EV charging.
- 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 charging[4]
  - J1772: for Level 1 and Level 2 charging
  - Combined Charging System (CCS): for DC fast charging for most vehicle models[5]
  - CHAdeMO: for DC fast charging for select vehicle models
  - North American Charging Standard (NACS): for all charging levels for Tesla vehicles.[6]
- 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.

1.2 Projecting Future Charging Infrastructure Needs

"Executive Order 14037: Strengthening American Leadership in Clean Cars and Trucks," issued in August 2021, requires that 50% of all new passenger vehicles and light trucks sold in the United States be zero-emission vehicles (ZEVs), including EVs and fuel cell electric vehicles, by 2030 (Executive Office of the President 2021). The baseline scenario in NREL's report *The 2030 National Charging Network: Estimating U.S. Light-Duty Demand for Electric Vehicle Charging*

[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 an L1 cordset, so no additional charging equipment is required. On one end of the cord is a standard NEMA connector (e.g., 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.
[5] The CCS connector is a standard developed by SAE International, similar to the J1772 standard.
[6] The NACS connector was developed by Tesla and, as of July 2023, is currently under review by SAE as SAE J3400. Several other automotive manufacturers plan to make their model year 2025 EVs compatible with NACS, as discussed throughout this report.

Infrastructure projects that there will be 33 million EVs on the road by 2030 (Wood et al. 2023). The NREL report estimates that approximately 28 million EVSE ports—including 1.2 million public EVSE ports and 26.8 million private EVSE ports—will be required by 2030 to support this fleet. NREL arrived at these estimates using the EVI-Pro, EVI-RoadTrip, and EVI-OnDemand modeling tools, as well as assumptions on:

- Vehicle adoption
- Fleet composition (90% all-electric vehicles and 10% plug-in hybrid electric vehicles by 2030)
- Technology attributes
- Driving and charging behavior (90% of EVs have reliable access to residential charging by 2030, and therefore most charging occurs at home).

The remainder of this section focuses on how today's public charging infrastructure measures up against the needed public infrastructure in this baseline scenario.[7]

The 1.2 million public EVSE ports modeled by NREL include 182,000 DC fast EVSE ports with a power output of 150 kW or greater, and 1,067,000 Level 2 EVSE ports (Wood et al. 2023). As of Q2, there were 14,244 public DC fast EVSE ports with a power output of 150 kW or greater and 114,470 public Level 2 EVSE ports in the Station Locator.[8] Based on data in the Station Locator, 7.8% of the estimated DC fast EVSE ports and 10.7% of the estimated Level 2 EVSE ports are currently available. However, it is important to note that 61.6% of public DC fast EVSE ports and 8.7% of public Level 2 EVSE ports in the Station Locator are on the Tesla Supercharger and Destination networks, respectively, and are therefore currently only readily accessible (i.e., without an adapter) to Tesla vehicles.[9] When public EVSE ports on these networks are excluded, the number of DC fast and Level 2 EVSE ports currently installed is to 4,622 (2.5%) and 104,484 (9.8%), respectively (Figure 2).

[7] Wood et al.'s private infrastructure scenario includes EVSE ports at single-family residences, which, as noted in Section 1.1, are not tracked in the Station Locator. Further, as discussed in Section 2.2, private EV charging data in the Station Locator may be underrepresented. Given the Station Locator's robust public EV charging data set, this section focuses on Wood et al.'s public infrastructure scenario only.
[8] As discussed in Section 2.1.1, power output data are currently only available for 65.6% of public DC fast EVSE ports in the Station Locator. Therefore, the number of DC fast EVSE ports with a power output of 150 kW or greater is likely underrepresented.
[9] As of June 30, 2023, 48% of EVs on the road were Teslas (Experian Information Solutions 2023b). As discussed throughout this report, several auto manufacturers have plans to adopt the Tesla-developed NACS connector, which will make EVSE ports on the Tesla Supercharger and Destination networks accessible to a greater number of vehicles beginning with model year 2025 vehicles.

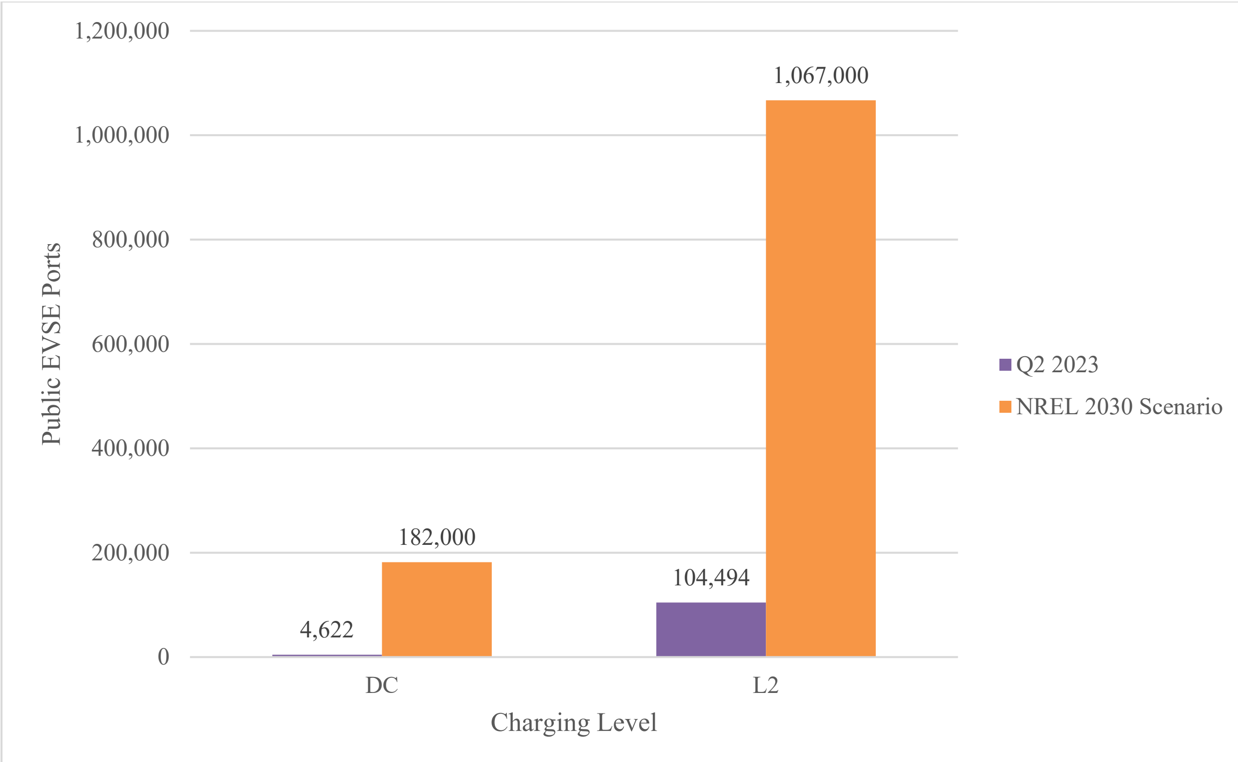

Figure 2. Current availability of public charging (excluding Tesla-only) versus NREL's scenario of 2030 public infrastructure requirements in the United States.

Wood et al.'s baseline scenario also estimates that by 2030, there will need to be 0.6 public DC fast EVSE ports and 3.2 public Level 2 EVSE ports per 100 EVs. There were approximately 3.8 million EVs on the road in the United States as of June 30, 2023 (Experian Information Solutions 2023b). The ratios of public DC fast and Level 2 EVSE ports per 100 EVs in Q2 were 0.4 and 3.2, respectively, including EVSE ports on the Tesla Supercharger and Destination networks (Table 1). Using Wood et al.'s estimated ratios of the number of public DC fast and Level 2 EVSE ports per 100 EVs as a proxy for how much infrastructure is sufficient to meet charging needs in 2030, Table 1 suggests that as of Q2, public DC fast and Level 2 EVSE port deployment currently falls short. However, roughly 11.5% of the 33 million light-duty EVs in NREL's analysis were on the road as of Q2. As the number of EV registrations continues to grow at a faster rate each quarter, and especially if EV adoption levels increase in line with Wood et al.'s study, public EVSE installations will need to ramp up considerably to keep up with demand.

Table 1. Current Public EVSE per 100 EVs Versus NREL's Scenario of 2030 Infrastructure Requirements in the United States.

Port Level	EVSE per 100 EVs in Q2 2023	EVSE per 100 EVs Needed in 2030 To Support 33 Million EVs
DC fast	0.4	0.6
Level 2	3.0	3.2

2 Electric Vehicle Charging Infrastructure Trends

The purpose of this report is to identify EV charging infrastructure trends for Q2 of 2023. In Q2, the number of EVSE ports in the Station Locator grew by 4.0%, or 6,478 EVSE ports. Public EVSE ports grew by 4.1%, or 5,807 ports, and account for the majority of EVSE ports in the Station Locator (Figure 3). Private EVSE ports increased by 3.4%, or 671 EVSE ports. As of Q2, there was a total of 168,040 EVSE ports in the Station Locator, compared with 87,352 EVSE ports in Q4 2019.

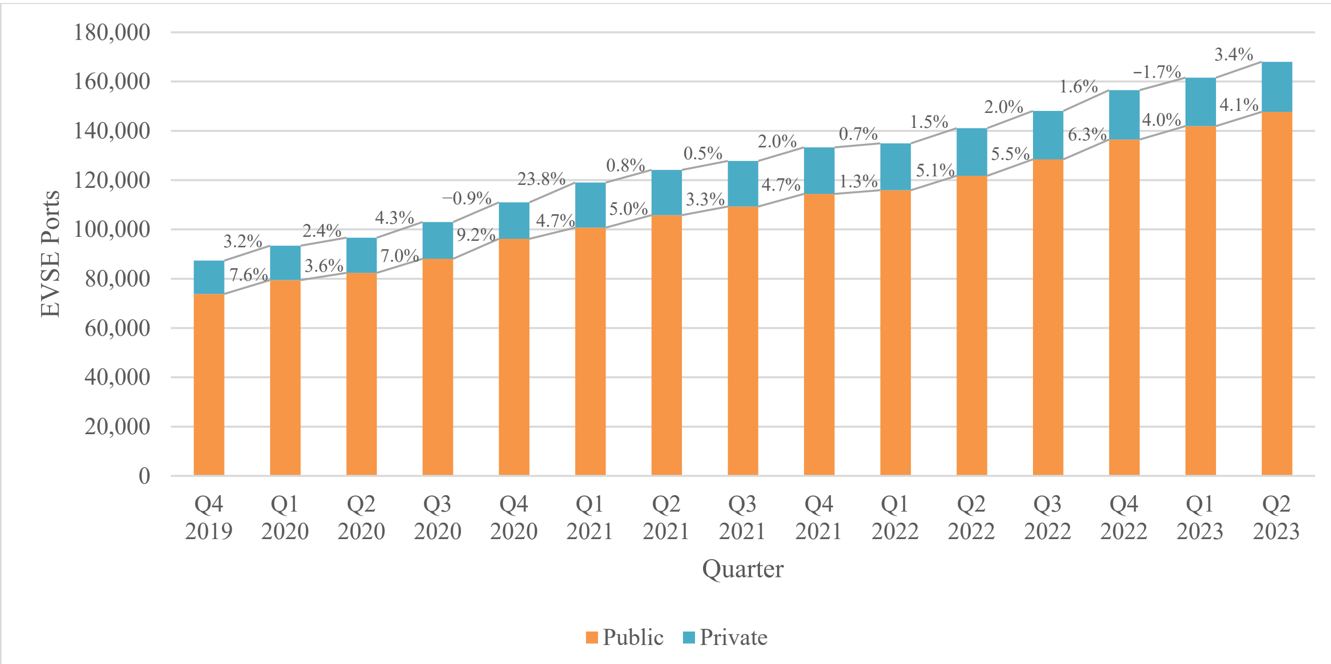

Figure 3. Quarterly growth of EVSE ports by access.

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 Q2 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 Q2, the number of public EVSE ports in the Station Locator increased by 5,807, bringing the total number of public EVSE ports in the Station Locator to 147,714 and representing a 4.1% increase since Q1 2023. 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 4, 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 have increased by the greatest percentage compared to other charging levels in almost every quarter since Q4 2019 (Figure 4). As of the end of Q2 2023, DC fast EVSE ports make up 21.9% of public EVSE ports in the Station Locator, compared with 16.7% in Q4 2019. Level 1 EVSE ports decreased by 2.0% (17 EVSE ports) in Q2, primarily driven by the removal of older (i.e., opened more than 5 years ago), non-networked EVSE ports.

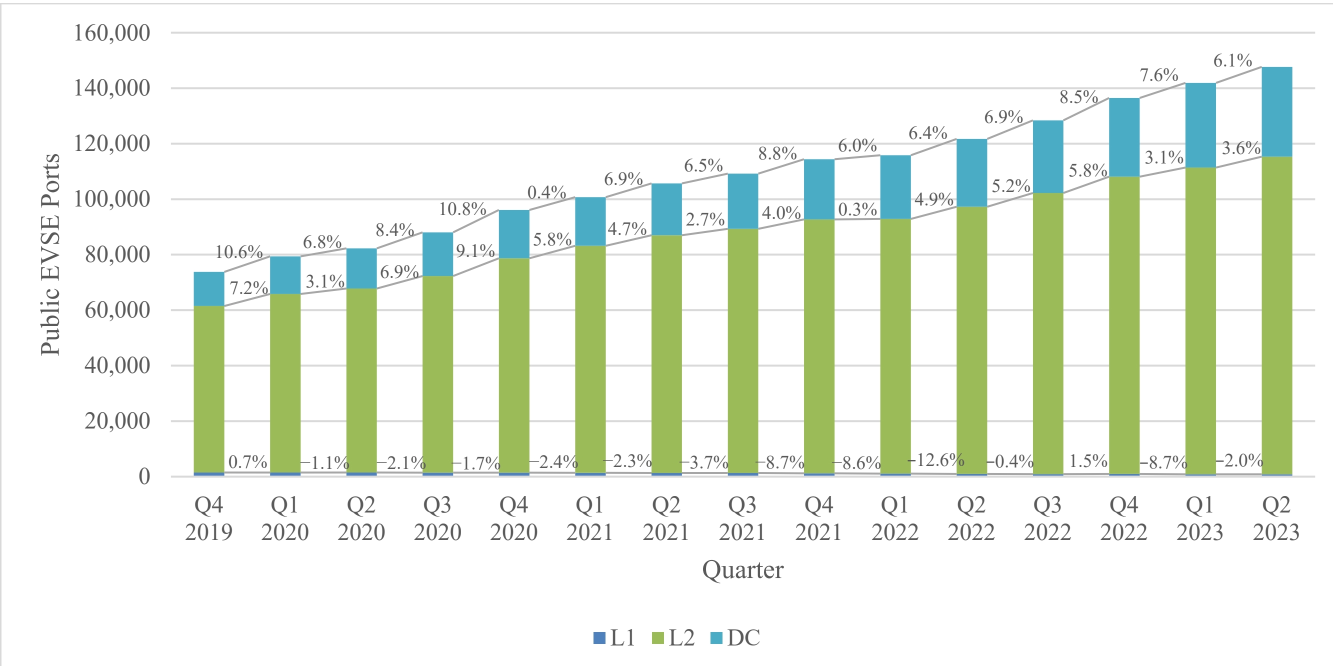

Figure 4. Quarterly growth of public EVSE ports by charging level.

Note: Figure excludes legacy EVSE ports that are not classified by charging level and are no longer manufactured. As of Q2, there were 27 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 EVSE ports, DC fast EVSE ports have the highest power output and therefore provide the most charge in the least amount of time. One of the conclusions drawn from NREL's report *The 2030 National Charging Network: Estimating U.S. Light-Duty Demand for Electric Vehicle Charging Infrastructure* is that building out a network of reliable public DC fast chargers is a key component to building consumer confidence in EV ownership and supporting EV adoption in the United States (Wood et al. 2023). 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 EVSE ports is about 1–2 kW, and Level 2 EVSE ports can operate at up to 19 kW, the power output of DC fast EVSE ports ranges from 24 to 350+ kW. DC fast EVSE ports with power outputs of 50 and 150 kW are common, though the number of DC fast EVSE ports at higher power levels are steadily increasing, as seen in Figure 5.

Of the 32,365 public DC fast EVSE ports in the Station Locator, power output data are currently available for 65.6%; Figure 5 is therefore based on power output data for 21,232 DC fast EVSE ports, up from 4,644 in Q4 2019.[10] Additionally, if a DC fast EVSE port has two connectors with different power outputs, only the maximum power output is counted in Figure 5.

As shown in Figure 5, the number of EVSE ports with a power output greater than 349 kW grew by the largest percentage in Q2 (18.1%). This growth is largely driven by new EVgo installations with a power output of 350 kW and new Rivian Adventure Network installations with a power output of 480 kW. The decrease in the number of EVSE ports with a power output between 150 and 249 kW is primarily attributed to Electrify America's practice of temporarily reducing the power output of 275 of its 150-kW EVSE ports to 50 kW while maintenance or upgrades are being performed, as also seen in past reports. These EVSE ports will be returned to 150 kW once maintenance is complete. 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.

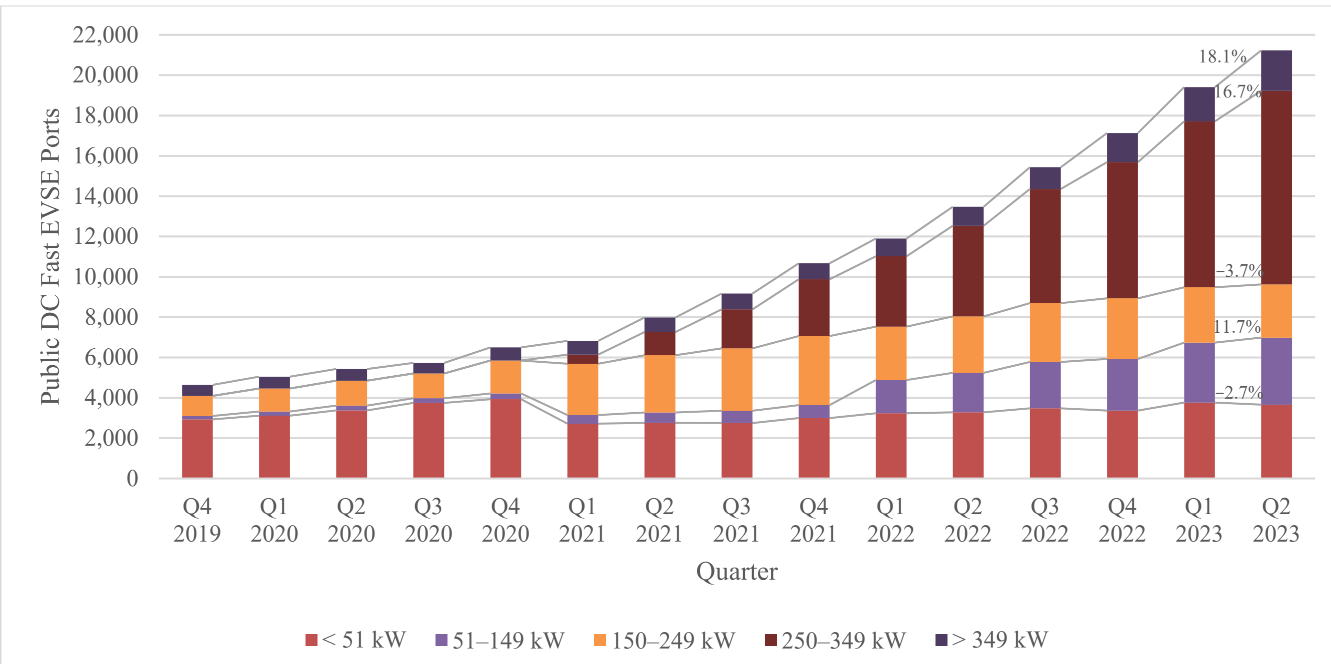

Figure 5. Quarterly growth of public DC fast EVSE ports by power output.

Note: The percentages in this figure indicate the percent growth between each quarter. For an explanation of the changes seen in Q1 2021, see the Q1 2021 report (Brown, Schayowitz, and Klotz 2021).

Finally, there are currently three types of connectors available for DC fast chargers: CHAdeMO, CCS, and NACS. As noted in Section 1.1, 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 available in the United States with the CHAdeMO connector standard. Currently, only Tesla vehicles can charge with the NACS connector. However, as discussed in Section 3, a growing number of auto manufacturers, including Ford and GM, have plans to integrate NACS

[10] The remaining 34.4% of public DC fast EVSE ports are primarily on the Tesla Supercharger network or are non-networked. The Station Locator is working to close this gap by requesting this data from Tesla and site hosts of non-networked stations.

charge ports into their new EV models beginning with model year 2025 vehicles. Additionally, as discussed in Section 1.2, Tesla has recently launched the Magic Dock at several Tesla Supercharger stations, which allows non-Tesla vehicles with the CCS standard to charge at Tesla Superchargers. Finally, Tesla sells adapters that allow Tesla vehicles to charge at non-Tesla DC fast chargers with a CCS or a CHAdeMO connector, and a growing number of auto manufacturers are working with Tesla to provide their customers with adapters so that they can begin charging at Tesla stations with NACS connectors as early as 2024. For the purposes of this report, however, the following excludes data on adapters and rather focuses on the charge ports that are native to vehicles and charging hardware.

As of June 30, 2023, approximately 66% of registered all-electric vehicles in the United States were Teslas and therefore compatible with the NACS connector, 28% were compatible with the CCS connector, and 5% were compatible with the CHAdeMO connector (Experian Information Solutions 2023b).[11] Of the 38,634 DC fast connectors in the Station Locator as of Q2, NACS connectors grew by the largest percentage (7.4%), followed by CCS connectors (4.5%) (Figure 6). Despite CHAdeMO-compatible vehicles making up the smallest percentage of registered EVs, the number of CHAdeMO connectors in the Station Locator continued to grow (3.6%) in Q2. One possible reason for this continued growth is that, historically, some grant and incentive programs have required that public DC fast stations have both CHAdeMO and CCS connectors available to be eligible for funding. Additionally, there continue to be older EV models on the road with the CHAdeMO standard. However, CHAdeMO connectors continue to make up a smaller share of public DC fast connectors each quarter. In Q4 2019, CHAdeMO connectors made up 22.1%, compared with 19.2% in Q2 2023.

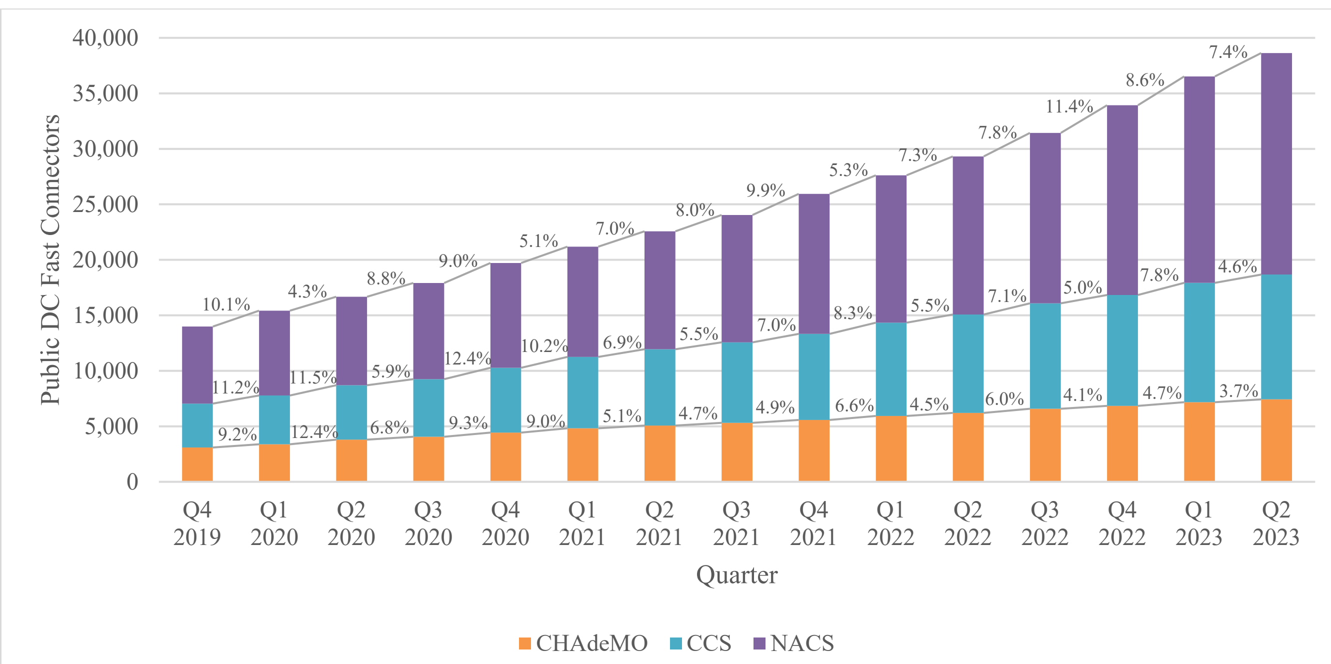

Figure 6. Quarterly growth of public DC fast connectors by type.

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

[11] These figures exclude plug-in hybrid electric vehicles because most are not compatible with DC fast EVSE ports.

2.1.2 By Network

The Station Locator team works with most major electric vehicle service providers (EVSPs) to collect EV charging infrastructure data for the Station Locator. Currently, the Station Locator includes stations on the 34 networks listed below, 13 of which update on a nightly basis via an API (marked with asterisks). 7Charge, Chargie, and Noodoe are new to the Station Locator as of Q2. In addition, the Station Locator contains non-networked (NON) station data, which includes stations that were previously networked.

- 7Charge (7CHARGE)
- AmpUp (AMPUP)
- Blink (BN)*
- ChargeLab (CHARGELAB)
- ChargePoint (CPN)*
- ChargeUp (CHARGEUP)
- Chargie (CHARGIE)
- Circle K (CIRCLE_K)
- Electrify America (EA)*
- EV Connect (EVC)*
- EV Charging Solutions (EVCS)
- EvGateway (EVGATEWAY)
- EVgo (EVN)*
- EV Range (EVRANGE)
- FLASH (FLASH)*
- FLO (FLO)*
- FPL EVolution (FPLEV)
- Francis Energy (FCN)
- Graviti Energy (GRAVITI_ENERGY)
- Livingston Energy Group (LIVINGSTON)
- Noodoe (NOODOE)
- OpConnect (OC)*
- PowerFlex (POWERFLEX)
- Red E Charging (RED_E)
- Rivian Adventure Network (RIVIAN_ADVENTURE)*
- Rivian Waypoints (RIVIAN_WAYPOINTS)*
- SemaConnect (SCN)*
- Shell Recharge (SHELL_RECHARGE)*
- SWTCH Energy (SWTCH)
- Tesla Destination (TESLAD)
- Tesla Supercharger (TESLA)
- Universal EV Chargers (UNIVERSAL)
- Volta (VLTA)*
- ZEF Energy (ZEFNET)

As with previous quarters, the ChargePoint network continued to account for the largest number of public EVSE ports (60,201, or 42.4%) in the Station Locator in Q2, and Level 2 EVSE ports continued to make up the majority of ChargePoint's network (Figure 7). This holds true for many of the networks in the Station Locator, except for the Electrify America, EVgo, Francis Energy, FPL EVolution, Rivian Adventure Network, and Tesla Supercharger networks. These networks are predominantly, if not completely, made up of DC fast EVSE ports. Of the networks with DC fast EVSE ports, Tesla Supercharger had the largest share of public DC fast EVSE ports (61.6%) in Q2, followed by Electrify America (10.8%) and EVgo (8.3%) (Figure 8).

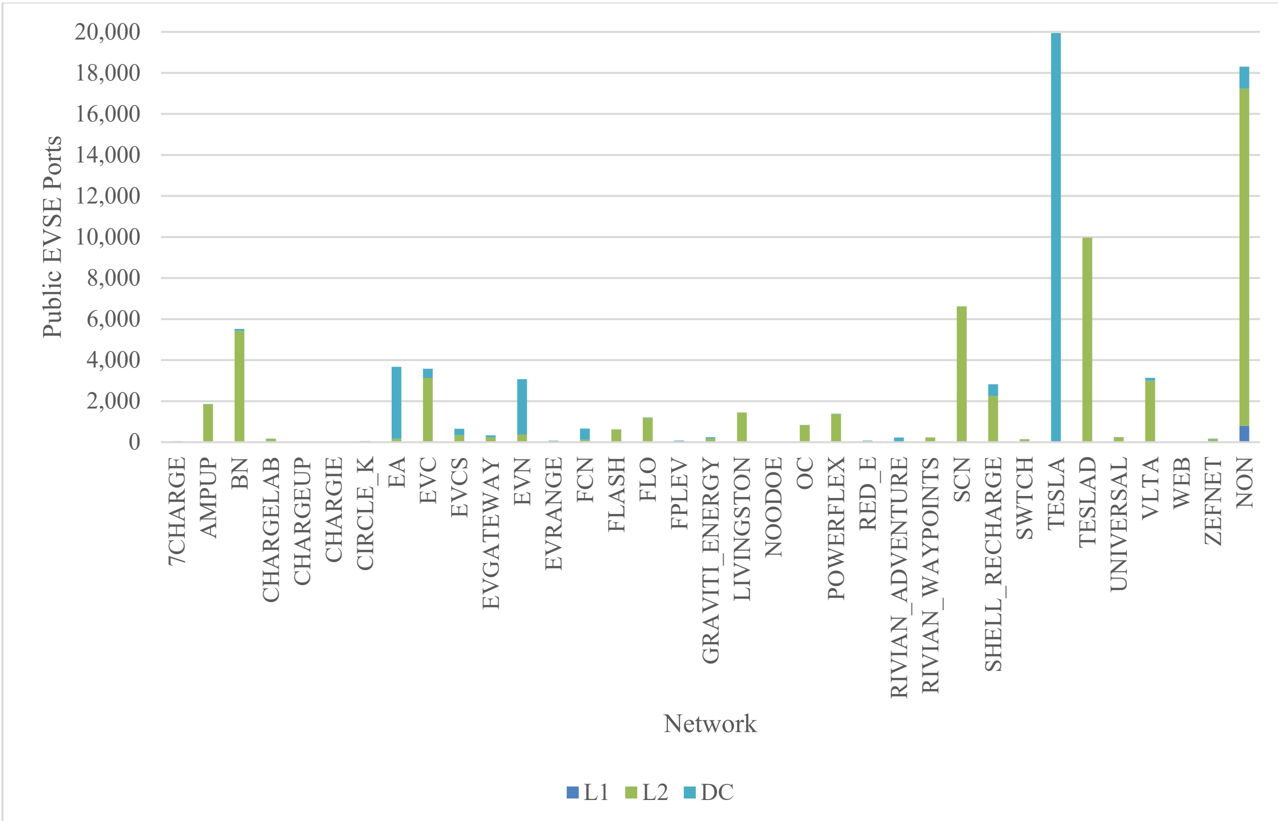

Figure 7. Breakdown of public EVSE ports by network and charging level in Q2 2023.

Note: ChargePoint is excluded from Figure 7. The size of its network is much larger than others and therefore skews the graph.

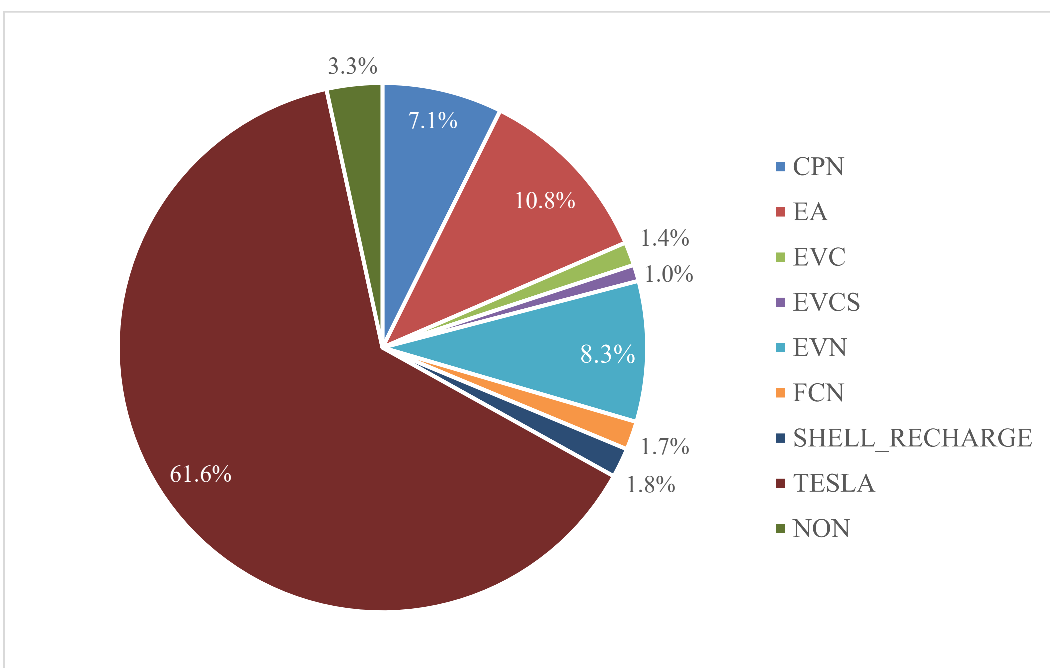

Figure 8. Breakdown of public DC fast EVSE ports by network in Q2 2023.

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

Table 2 includes the percent growth of each network over the last four quarters. The growth of many networks in Q2 2023 was largely a result of the Station Locator's manual data collection process, as noted in Section 1. For example, this is the reason for the large growth seen on the ChargeLab, Circle K, EV Range, Graviti Energy, SWTCH Energy, and Universal EV Chargers networks. With the exception of Graviti Energy, the growth of these networks in Q2 reflects the addition of approximately 30 to 50 EVSE ports each.

The large growth on the FLASH network, the network with the second largest growth in Q2 (331.9%), is due to the integration of FLASH's application programming interface (API) with the Station Locator, which added 478 new EVSE ports to the database. As discussed in Appendix B, API integrations allow for automated daily imports of station data from networks, meaning that once new stations are commissioned, they are added to the Station Locator database the following day.

As with previous quarters, the significant increase of EVSE ports on the Rivian Adventure Network (82.1%), on the other hand, was not a result of the manual data collection process, as Rivian's station data are imported and updated on a nightly basis via an API (see the end of this section for networks updated via an API). This increase on both networks primarily reflects new installations in Arizona, Michigan, and Virginia. Similarly, FLO deployed 150 new Level 2 EVSE ports in Los Angeles, California, which was the primary driver of the 26.3% increase seen in Q2.

Also in Q2, the Station Locator team reclassified all EVSE ports formerly on the Webasto network to the EV Charging Solutions network, which has taken over Webasto EVSE ports, driving the 23.9% increase.

Finally, the number of EVSE ports on the Electrify America, OpConnect, SemaConnect, and Shell Recharge networks, all of which import their data into the Station Locator, decreased slightly in Q2. With the exception of Electrify America, the decrease on these networks was primarily a result of the removal of Level 2 EVSE ports. The decrease of EVSE ports on Electrify America's network is due to the removal of DC fast EVSE ports from the Station Locator resulting from a data sharing issue that the Station Locator team and Electrify America are actively resolving.

Table 2. Growth of Public EVSE Ports by Network Over the Last Four Quarters

Network	Q3 2022 Growth	Q4 2022 Growth	Q1 2023 Growth	Q2 2023 Growth
7CHARGE	N/A	N/A	N/A	N/A
AMPUP	61.9%	387.8%	7.6%	11.2%
BN	13.2%	−0.8%	47.8%	9.8%
CHARGELAB	1,180.0%	65.6%	15.1%	40.2%
CHARGEUP	N/A	N/A	N/A	0.0%
CHARGIE	N/A	N/A	N/A	N/A
CIRCLE_K	N/A	N/A	N/A	333.3%
CPN	5.4%	4.6%	5.1%	3.4%
EA	2.6%	1.7%	1.7%	−3.9%
EVC	−2.4%	2.8%	7.4%	10.5%
EVCS	−3.5%	22.7%	11.8%	23.9%
EVGATEWAY	80.5%	11.2%	7.4%	4.0%
EVN	9.1%	4.3%	7.7%	3.0%
EVRANGE	N/A	62.5%	25.6%	61.2%
FCN	−1.4%	2.6%	2.7%	1.8%
FLASH	N/A	N/A	0.0%	331.9%
FLO	21.2%	8.3%	10.1%	26.3%
FPLEV	0.0%	0.0%	14.9%	5.2%
GRAVITI_ENERGY	N/A	N/A	N/A	258.8%
LIVINGSTON	287.4%	24.0%	6.9%	1.1%
NOODOE	N/A	N/A	N/A	N/A
OC	11.5%	18.8%	5.9%	−2.9%
POWERFLEX	7.8%	17.9%	0.0%	3.0%
RED_E	N/A	N/A	13.8%	10.8%
RIVIAN_ADVENTURE	161.5%	50.0%	141.2%	82.1%
RIVIAN_WAYPOINTS	30.4%	160.0%	33.3%	14.4%
SCN	5.7%	7.3%	−7.7%	−1.3%
SHELL_RECHARGE	−6.4%	2.1%	5.1%	−5.5%
SWTCH	46.2%	47.4%	239.3%	55.8%
TESLA	7.8%	11.5%	8.6%	7.4%
TESLAD	−1.3%	0.6%	−11.5%	0.5%
UNIVERSAL	N/A	208.3%	29.1%	27.7%
VLTA	9.5%	2.7%	−2.1%	1.0%
ZEFNET	85.7%	0.0%	496.2%	13.5%
NON	2.3%	2.3%	−1.0%	1.4%
Total	**5.5%**	**6.3%**	**4.0%**	**4.1%**

2.1.3 By Region

The regional growth of public EV charging infrastructure was analyzed by dividing the country into the same seven regions used by the Clean Cities Coalition Network (Figure 10) (Clean Cities Coalition Network 2023a). See the Q1 2020 report for more information about the Clean Cities Coalition Network (Brown et al. 2020).

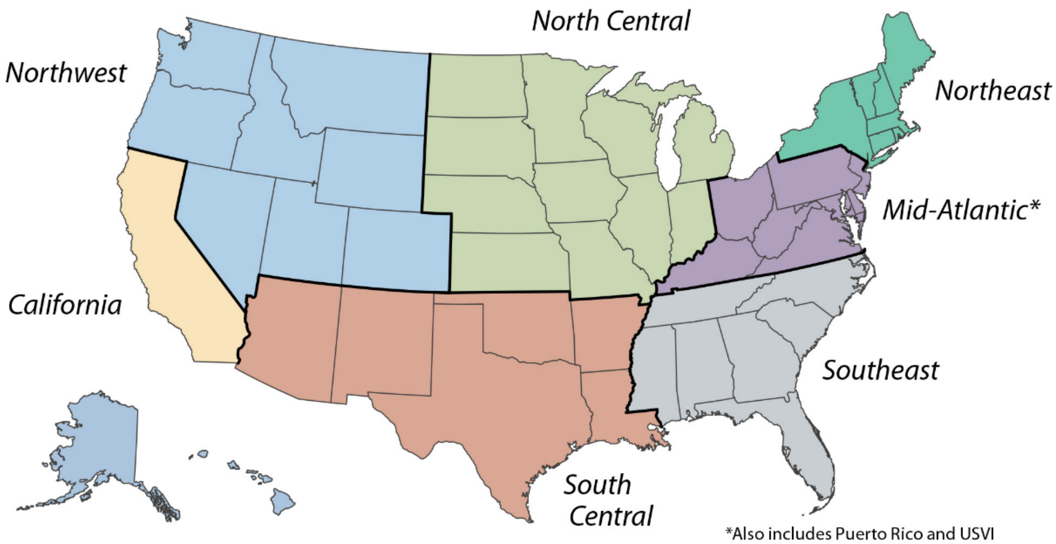

Figure 9. Clean Cities regions.

Source: Clean Cities Coalition Network (2023b)

As shown in Figure 9, the California region continues to have the largest share of the country's public EVSE ports (28.1%). However, the Mid-Atlantic region grew by the largest percentage in Q2 (7.1%), primarily as a result of new Level 2 installations on the ChargePoint networks in Maryland, New Jersey, and Pennsylvania; new Level 2 FLASH installations in Pennsylvania; and new Tesla Supercharger installations in Maryland and Ohio. With the exception of the Northeast, DC fast EVSE ports grew at a faster rate than Level 2 EVSE ports in each region in Q2, with the South Central region seeing the largest percentage growth (Table 3).

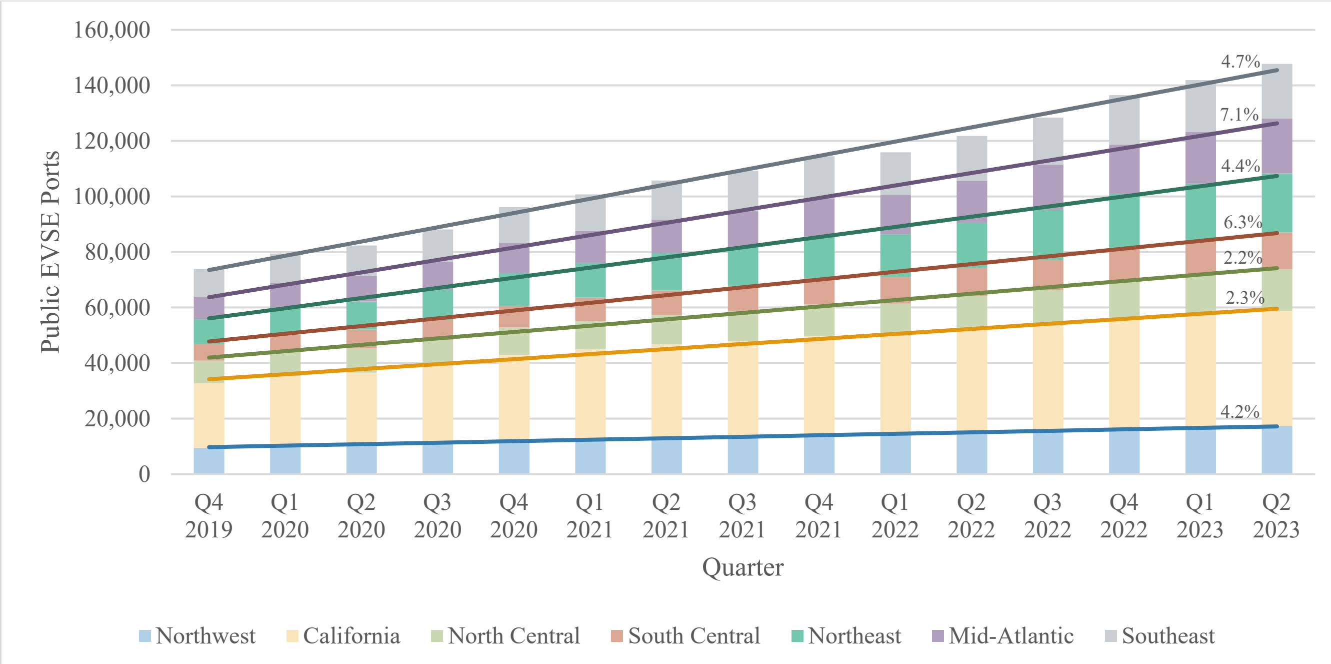

Figure 10. Quarterly growth of public EVSE ports by Clean Cities region.

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

Table 3. Growth of Public Level 2 and DC Fast EVSE Ports by Clean Cities Region in Q2 2023.

Clean Cities Region	Level 2 EVSE Port Growth	DC Fast EVSE Port Growth
California	2.0%	3.2%
Mid-Atlantic	6.9%	7.8%
North Central	1.0%	6.2%
Northeast	4.6%	3.9%
Northwest	3.9%	5.6%
Southeast	3.5%	8.8%
South Central	4.7%	10.6%

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, though U.S. territories, such as Puerto Rico, are excluded. The vehicle registration data are based on Experian's registration information as of Dec. 31, 2022 (Experian Information Solutions 2023a).

In Q2, the five states that had the largest percent growth of EVSE ports per 100 EVs were Pennsylvania, Delaware, Louisiana, Ohio, and New Jersey, all of which outpaced the growth in the United States as a whole (Table 4). Four out of five of these states are located in the Mid-

Atlantic region, which, as discussed in Section 2.1.3, had the largest growth of public EVSE ports in Q2. New Level 2 installations on the ChargePoint and FLASH networks accounted for the largest share of new EVSE ports in Pennsylvania, while new DC fast ports on the Tesla Supercharger network contributed to the growth seen in Delaware.

Table 4. Top Five States With the Largest Growth of EVSE Ports per 100 EVs in Q2 2023.[12]

State	EVSE Ports per 100 EVs in Q1 2023	EVSE Ports per 100 EVs in Q2 2023	Growth of EVSE Ports per 100 EVs in Q2 2023
Pennsylvania	5.2	6.0	16.7%
Delaware	5.1	5.8	14.5%
Louisiana	6.4	7.2	12.5%
Ohio	6.1	6.6	9.1%
New Jersey	2.8	3.0	9.0%

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 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 11, public EVSE ports are predominantly located in suburban census tracts, followed by urban and rural tracts. DC fast EVSE ports showed the largest growth across all density categories compared with Level 2, while Level 1 showed a significant decrease overall. DC fast EVSE ports grew by the largest percentage in rural areas (8.0%), followed by suburban and urban areas (5.5% and 4.9%, respectively).

[12] See Appendix A for the growth of EVSE ports per 100 EVs in all states in Q2.

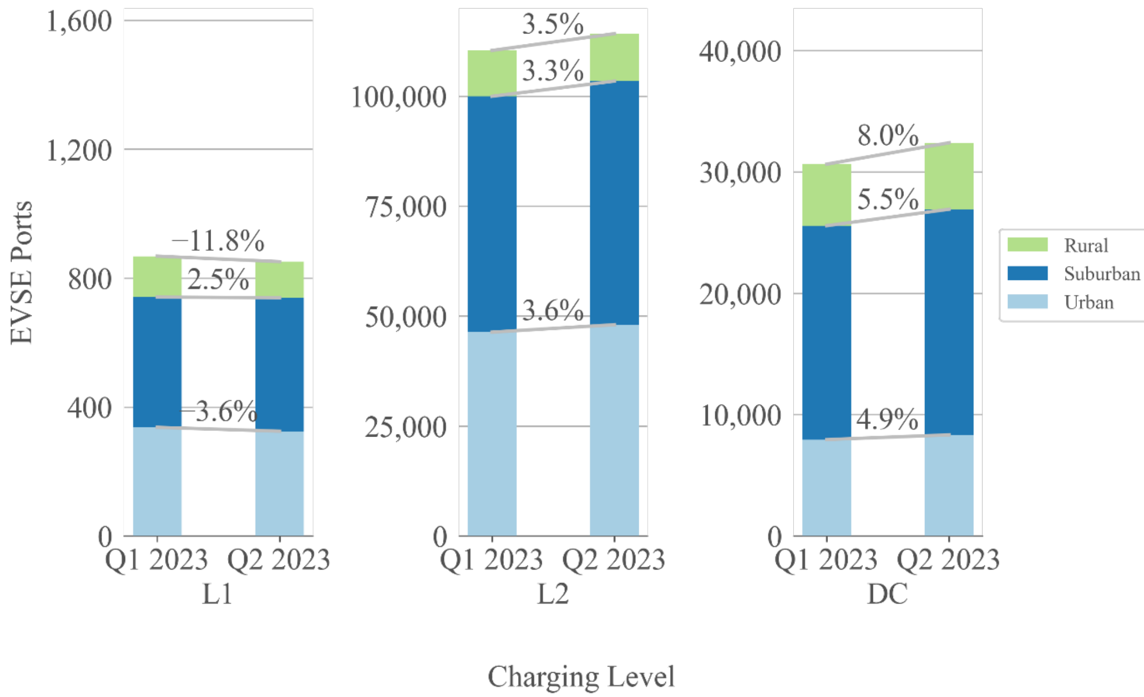

Figure 11. Q2 2023 growth of public EVSE ports by neighborhood type and charging level.

Note: These graphs are not to scale.

2.1.6 By Disadvantaged Community Designation

Executive Order 14008: Tackling the Climate Crisis at Home and Abroad, issued in early 2021, ensures that the benefits of federal climate investments flow to communities that have been historically underserved and disproportionately burdened by climate change, pollution, and environmental hazards (Argonne National Laboratory 2023). The Justice40 Initiative, which came out of Executive Order 14008, directs 40% of the overall benefits of certain federal investments, including the National Electric Vehicle Infrastructure (NEVI) Formula Program, to disadvantaged communities (DACs). Although charging infrastructure funded by the NEVI Formula Program has not yet been deployed, this section focuses on the growth of EVSE ports in both DACs and non-DACs for comparison. The map in Figure 12 shows the census tracts classified as DACs across the United States.

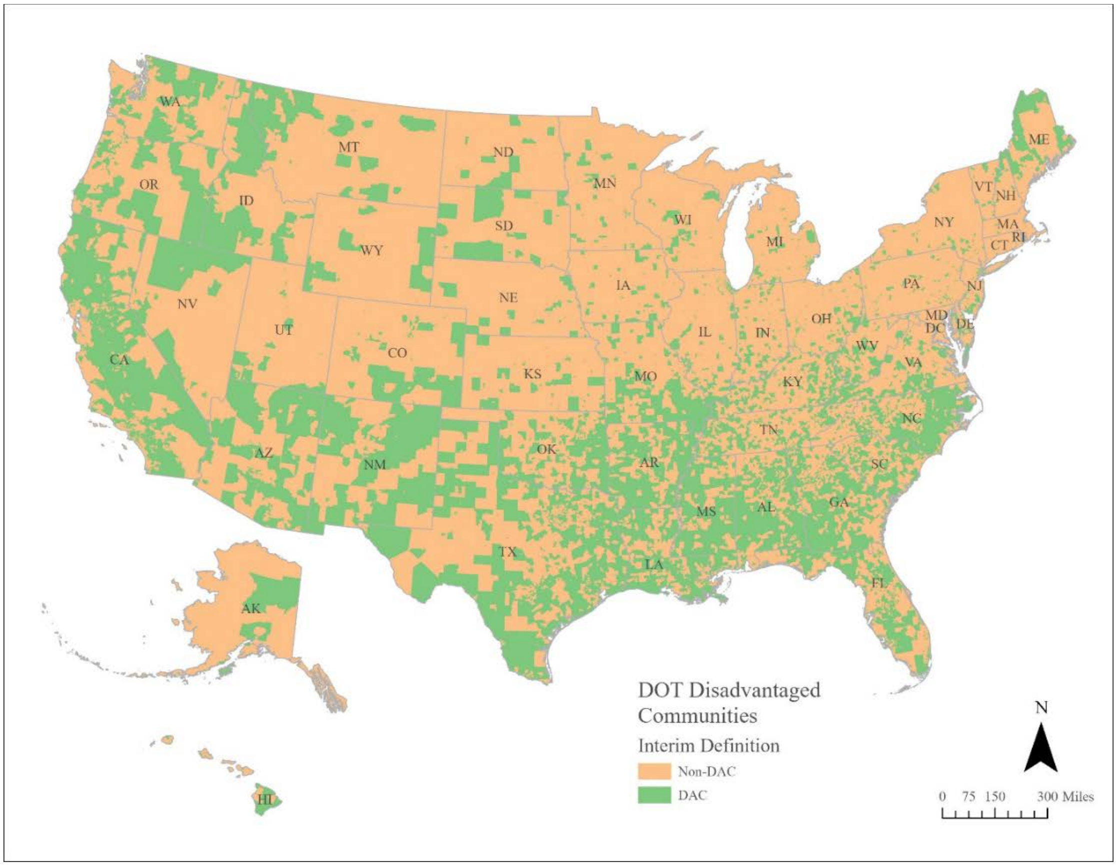

Figure 12. Display of the disadvantaged communities across the United States.

Note: Alaska and Hawaii are not to scale.

The Station Locator team used a joint interim guidance map for DACs developed by DOE and the U.S. Department of Transportation for the NEVI Formula Program for this section of the analysis. GIS shapefiles with these data are hosted by Argonne National Laboratory (2023). The DAC shapefile was prepared by aggregating several social, economic, and environmental features into a spatial data set. There are two interim definitions for DACs: one from DOE and one from the U.S. Department of Transportation. This analysis uses the latter, which accounts for 22 census tract-level indicators under six categories of transportation disadvantage: transportation access, health, environment, economic, resilience, and social (U.S. Department of Transportation 2023).

Overall, 32.9% of public EVSE ports across all charging levels are in DACs, down from 36.2% in the previous quarter. As shown in Figure 13, the growth of DC fast EVSE ports in DACs slightly outpaced growth in non-DACs, whereas the growth of Level 2 ports was relatively even in both categories. Although Level 1 EVSE ports decreased overall, there was a smaller decrease in DACs than non-DACs (Figure 13).

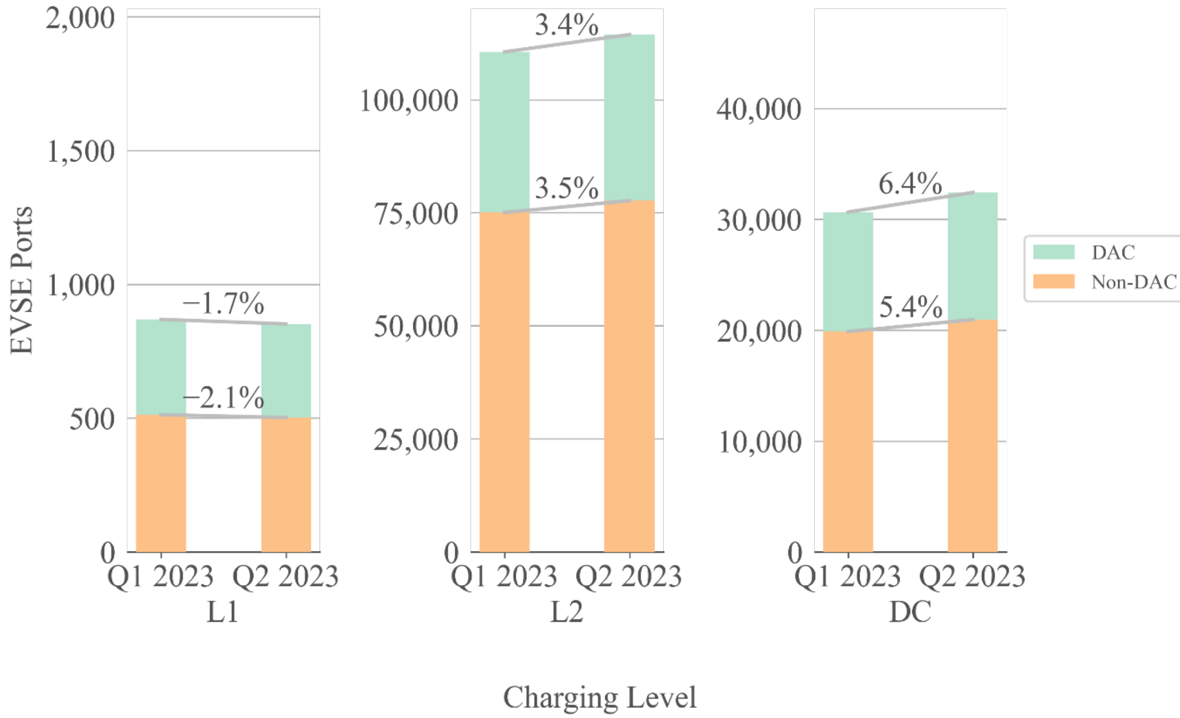

Figure 13. Q2 2023 growth of public EVSE ports by DAC designation and charging level.

Note: These graphs are not to scale.

2.2 Private Charging Trends

In Q2 2022, the Station Locator saw modest growth in the number of private EVSE ports, with an increase of 671 ports (3.4%) compared to Q1 2023. Specifically, private EVSE ports rose from 19,653 in Q1 2023 to 20,324 in Q2 2023. The growth can be mainly attributed to the addition of Level 2 EVSE ports from both the AmpUp and SWTCH Energy networks, along with non-networked EVSE. Both AmpUp and SWTCH Energy provided large updates to the Station Locator in Q2. The following sections break down the growth of private EVSE ports by level, as well as by three specific types: workplace, multifamily housing, and fleet charging.

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 charging stations 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 data collection in these areas.

2.2.1 By Charging Level

As shown in Figure 14, the vast majority of private EVSE ports in the Station Locator are Level 2, making up 87.5% of all private EVSE ports. In Q2, all charging levels experienced growth, with Level 2 EVSE ports increasing by the largest percentage (3.8%), followed by DC fast

EVSE ports (3.1%). Specifically, there was an addition of 654 private Level 2 ports and 10 private DC fast EVSE ports during this period. As noted above, the growth in Level 2 EVSE ports can be attributed to the addition EVSE ports from AmpUp, SWTCH Energy, and non-networked sources across 23 states. Meanwhile, the percentage of private Level 1 EVSE ports marginally increased by 0.3% in Q2, representing the addition of seven ports.

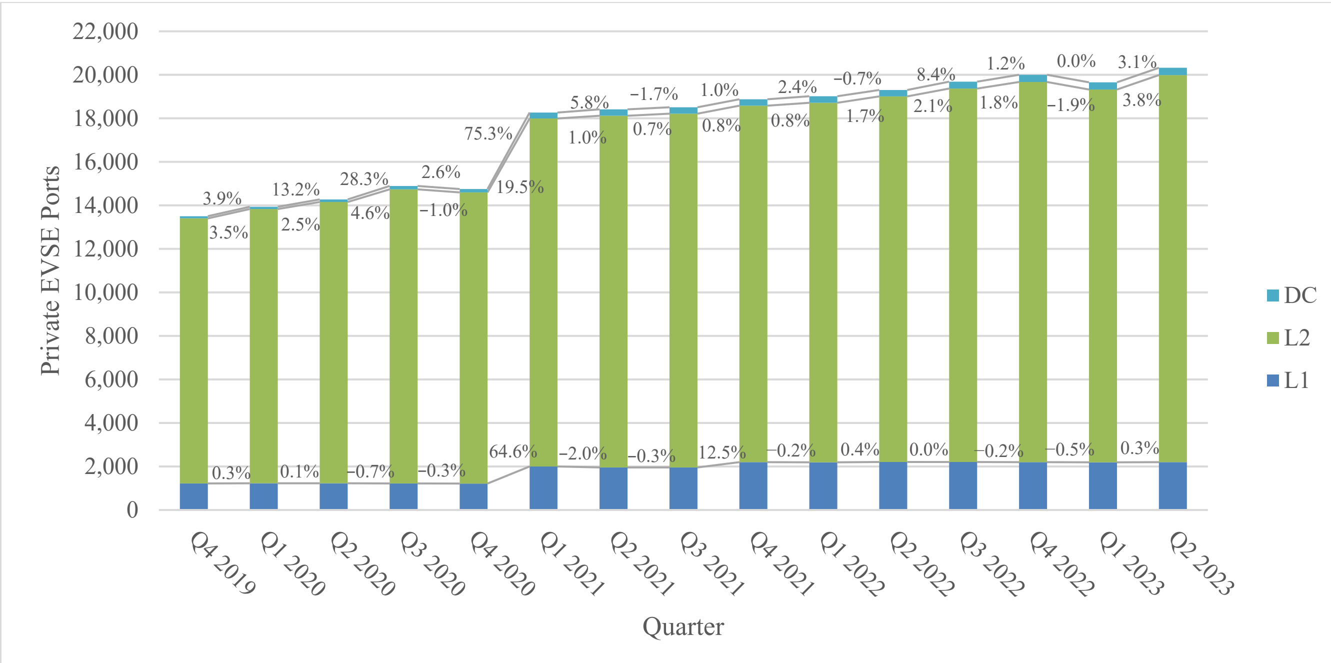

Figure 14. Quarterly growth of private EVSE ports by charging level.

Note: Figure excludes legacy EVSE ports that are not classified by charging level and are no longer manufactured. As of Q2, there were two private legacy EVSE ports in the Station Locator. Additionally, the percentages in this figure indicate the percent growth between each quarter. Finally, the large increase in Q1 2021 is primarily attributed to the addition of federally owned EVSE ports from NREL's Federal Fleets team.

2.2.2 Workplace Charging

Workplace EV charging infrastructure consists of charging stations that are private and designated exclusively for employee use. In the Station Locator, the majority (99%) of private workplace EVSE ports are Level 2 (Figure 15). This is expected since employees typically use workplace chargers while their vehicles are parked for an extended period at work, making rapid charging less necessary. However, it is worth noting that in Q2, the number of workplace DC fast charging EVSE ports experienced the largest increase (3.4%). This is followed by an increase in Level 2 (1.8%) and Level 1 (1.7%) workplace EVSE ports during the same period.

Overall, the total number of private EVSE ports at workplaces increased by 1.8% in Q2, representing an addition of 185 EVSE ports compared to the previous quarter. By the end of Q2, the total count of private workplace EVSE ports reached 10,301 EVSE ports (Figure 15). This growth can be attributed to the deployment of stations from AmpUp, SWTCH Energy, ChargePoint, and non-networked sources across 12 different states. As previously noted, data on private workplace charging ports in the Station Locator are likely underrepresented.

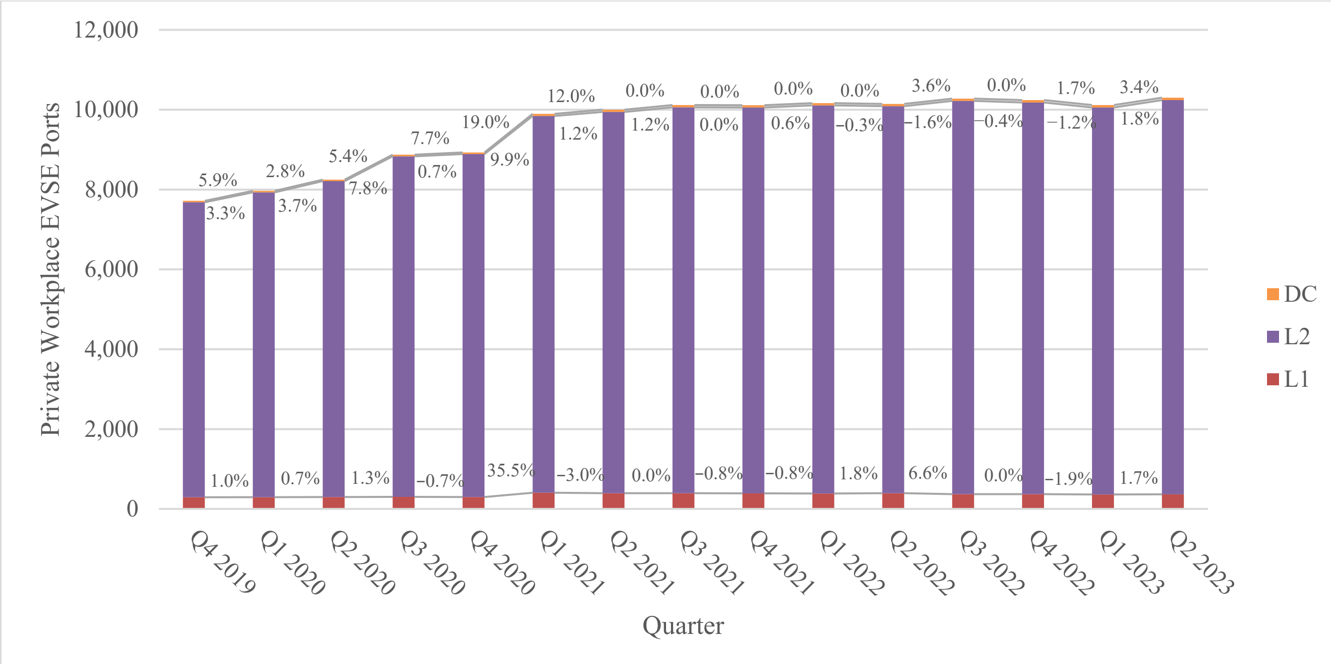

Figure 15. Quarterly growth of private workplace EVSE ports by charging level.

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

2.2.3 Multifamily Housing Charging

The Station Locator team continues to focus efforts on capturing private charging infrastructure installed at multifamily housing that is available for resident use only. As shown in Figure 16, multifamily housing EVSE ports in the Station Locator are either Level 1 or Level 2. Between Q1 and Q2 2023, the number of Level 1 multifamily EVSE ports remained unchanged. However, there was a significant increase of 14.1% in Level 2 multifamily EVSE ports (Figure 16). This growth can be attributed to the addition of 215 new Level 2 EVSE ports, primarily in Connecticut and California, bringing the total number of multifamily EVSE ports in the Station Locator to 1,758. Overall, EVSE ports at multifamily housing represent 8.6% of private EVSE ports in the Station Locator.

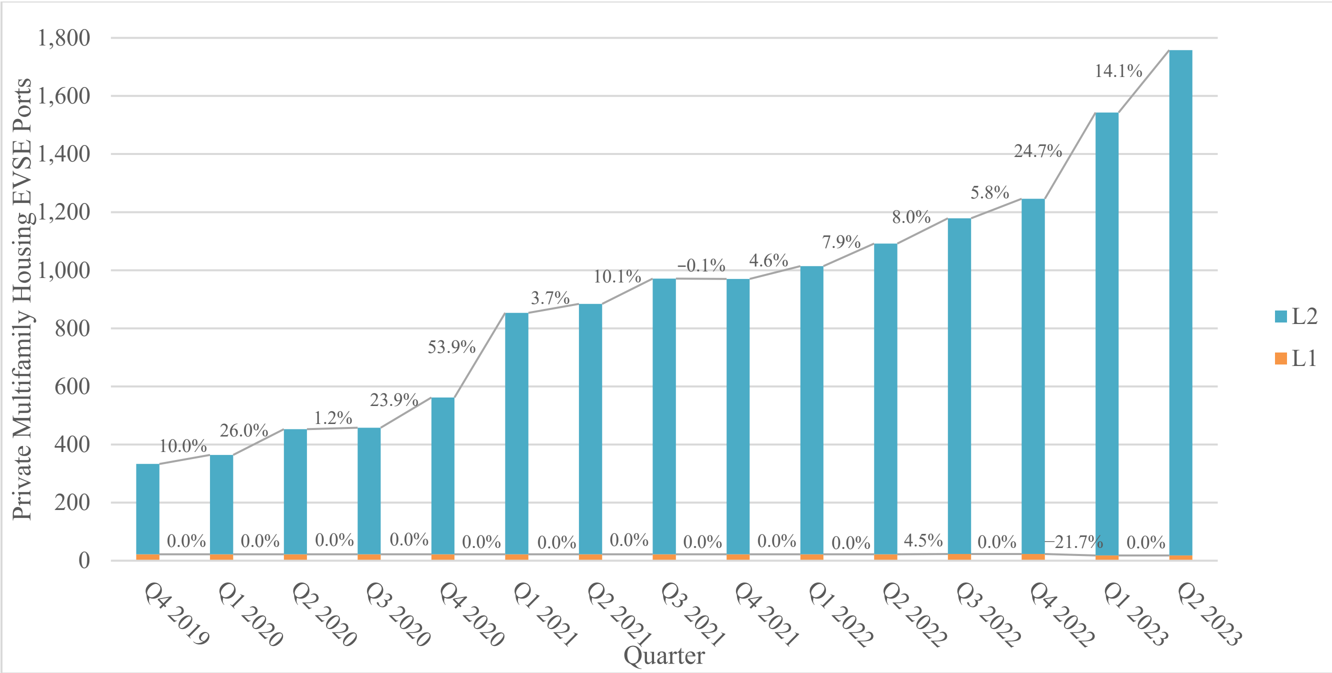

Figure 16. Quarterly growth of private multifamily housing EVSE ports by charging level.

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

2.2.4 Fleet Charging

The Station Locator team collects data on whether stations are dedicated fleet-charging stations, and if so, what types of vehicles charge at the station based on Federal Highway Administration weight classes (i.e., light-duty, medium-duty, or heavy-duty vehicles). As of Q2 2023, the team has collected this information for 87.2% of private EVSE ports in the Station Locator, of which 38.2% are being used for fleet-charging purposes. Note that some fleet EVSE ports are also used by employees and are therefore counted as workplace EVSE ports 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 Q2 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 light-duty vehicles, such as sedans, SUVs, and pickup trucks; unsurprisingly, the majority of fleet-charging EVSE ports are used to charge light-duty vehicles (Figure 17). Additionally, the majority of fleet-charging EVSE ports are Level 2 (Figure 17).

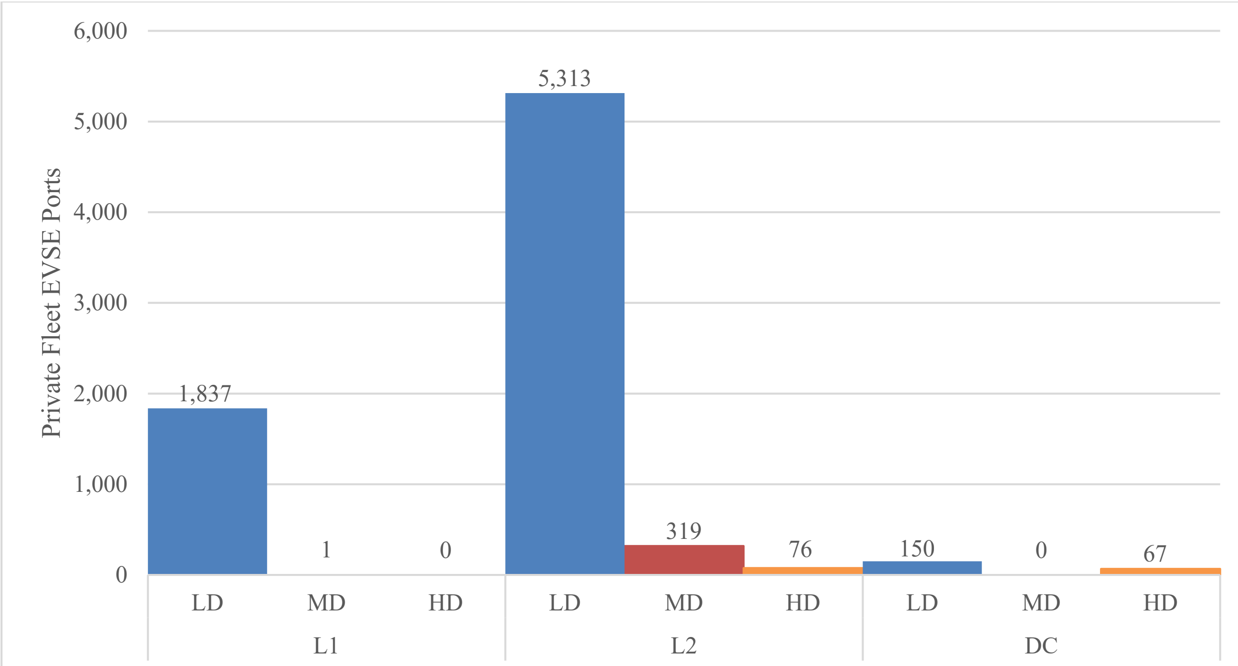

Figure 17. Breakdown of private fleet EVSE ports by charging level and fleet type in Q2 2023.

Note: LD = light-duty, MD = medium-duty, and HD = heavy-duty

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

3 Developments That Could Impact Future Quarters

In Q2, the Charging and Fueling Infrastructure (CFI) Discretionary Grant Program, established by the Bipartisan Infrastructure Law, allocated a substantial sum of up to $700 million for fiscal years 2022 and 2023 through a notice of funding opportunity that closed on June 13 (Federal Highway Administration 2023a). As highlighted in the Q1 report, this program plays a pivotal role in financing both the Community Charging and Fueling Grants and Alternative Fuel Corridor Grants (Brown et al. 2023). The primary objective of this program is to strategically deploy EV charging infrastructure and other alternative fueling projects in publicly accessible areas across urban and rural communities. This program is instrumental to the expansion of EV charging stations, especially in regions where EV charging infrastructure is currently lacking. Notably, priority is given to rural areas, low- and moderate-income neighborhoods, and multifamily housing locations. This targeted approach aims to bridge the gaps in charging accessibility, making EV adoption more viable and inclusive across the country.

As referenced in earlier sections of this report, the EV charging industry witnessed a surge of announcements regarding plans to adopt the Tesla-developed NACS connector, which was once exclusively used by Tesla vehicles and only available on Tesla EVSE ports. This groundbreaking series of announcements began in June with influential auto manufacturers such as Ford, General Motors, and Rivian announcing their plans to integrate NACS into new EV models starting in 2025, which set off a domino effect that spread throughout the charging sector. As a result, large EV charging networks including Blink, ChargePoint, and EVgo revealed plans to incorporate NACS into their charging products (Atlas Public Policy 2023a). The significance of this trend further intensified as SAE revealed their intention to standardize the NACS connector and initiated an expedited review process to evaluate NACS as a potential public standard (SAE International 2023). While the industry actions related to NACS are still playing out as of the publication of this report, this move is expected to have far-reaching implications. It will enable non-Tesla vehicles to utilize Tesla's comprehensive network of stations and ensure that any supplier or manufacturer can utilize, produce, or deploy the NACS connector on EVs and EV charging equipment across North America, further expanding access to charging regardless of vehicle and charging hardware manufacturer.

Along with this flurry of announcements, the Federal Highway Administration announced that NACS connectors are eligible for NEVI Formula Program funding and other eligible Title 23 U.S.C. funds, so long as DC fast chargers with NACS connectors also include at least one CCS connector capable of charging a CCS-compliant vehicle (Federal Highway Administration 2023b). Previously, proprietary charging standards such as Tesla's were ineligible for federal funds. Additionally, Texas and Washington took a proactive stance by signaling their intent to mandate both CCS and NACS connector types on their NEVI Formula Program-funded EV charging stations (The White House 2023). As of the writing of this report, new auto manufacturers and charging hardware manufacturers continue to announce plans to adopt NACS, and new states continue to announce requirements to include both CCS and NACS connectors on charging stations. The Station Locator expects to see even more rapid growth of NACS connectors in the coming years as a result.

In the private sector, Walmart recently unveiled plans to further expand the United States' EV charging network. Walmart has already deployed 1,300 Electrify America DC fast chargers at more than 280 facilities and intends to install more DC fast charging stations at thousands of additional Walmart and Sam's Club locations nationwide in partnership with Electrify America (Kapadia 2023). Approximately 90% of Americans live within a 10-mile radius of a Walmart store, so this approach is intended to make DC fast charging significantly more accessible and to make EV ownership a more viable option. In addition to Walmart's initiatives, Enel X Way made notable progress to propel the NEVI Formula Program forward, recently outlining their ambitious plan to deploy more than 10,000 DC fast public charging stations throughout various locations across the nation (Enel X Way 2023).

States are increasingly embracing California's Advanced Clean Trucks regulation and Advanced Clean Car II (ACCII). At present, a total of eight states have committed to adhering to California's Advanced Clean Trucks rule, mandating that all new medium- and heavy-duty vehicles sold within their borders be ZEVs by 2045. Notably, Colorado recently joined the ranks of Massachusetts, New Jersey, New York, Oregon, and Washington in supporting the Advanced Clean Trucks rule. Additionally, Maryland has taken a momentous step by adopting ACCII. This regulation requires all new passenger vehicles to be zero emission by 2035 (AFDC 2023e). Other states that have already adopted ACCII include Massachusetts, New York, Oregon, Vermont, Virginia, and Washington (Atlas Public Policy 2023b). As states continue to embrace these bold policies, the successful implementation of such initiatives will heavily rely on the strategic buildout of EV charging infrastructure.

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, the Station Locator team's counting logic aligns with the hierarchy defined in the OCPI protocol: station locations, EVSE ports, and connectors (EVRoaming Foundation 2020). The Station Locator therefore counts the number of EVSE ports at each station location. As of Q2, all manually collected data, as well as EVSE ports on the Blink, ChargePoint, Electrify America, EV Connect, EVgo, FLASH, SemaConnect, Shell Recharge, OpConnect, Rivian, and Volta networks, are counted according to the OCPI logic. Additionally, NREL is continuously working with EVSPs to add new APIs to the Station Locator to help keep the Station Locator as up to date as possible. Finally, the Station Locator team is making a concerted effort to collect power data for all DC fast EVSE ports and may add new fields to the Station Locator to support Bipartisan Infrastructure Law 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.

4 Conclusion

This report examines the growth of EV infrastructure in the Station Locator, including the growth of public EV charging by charging level, network, region, and state, as well as the growth of private EV charging by charging level and use type (i.e., workplace, multifamily housing, and fleet) in Q2 2023. 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.

Overall, there was a 4.0% increase in the number of EVSE ports in the Station Locator in Q2. Although public Level 2 EVSE ports grew by the largest number (3,968) in Q2 and continue to make up the largest share (77.5%) of EVSE ports in the Station Locator, public DC fast EVSE ports grew at the fastest rate (6.1%). California continues to lead the country in terms of the total number of public EVSE ports available (41,538), though public charging infrastructure grew by the largest percentage in the Mid-Atlantic region in Q2 (7.1%).

Based on NREL's report *The 2030 National Charging Network: Estimating U.S. Light-Duty Demand for Electric Vehicle Charging Infrastructure*, which estimates the number of public EVSE ports required to support a scenario in which there are 33 million EVs on the road by 2030, the number of DC fast and Level 2 EVSE ports is 7.8% and 10.7%, respectively, of the way toward meeting projected 2030 requirements. However, it is important to note that 61.6% of public DC fast EVSE ports and 8.7% of public Level 2 EVSE ports in the Station Locator are on the Tesla Supercharger and Destination networks, respectively, and are therefore only readily accessible to Tesla vehicles. When public EVSE ports on these networks are excluded, the number of DC fast and Level 2 EVSE ports currently installed decreases to 4,622 (2.5%) and 104,494 (9.8%), respectively (Figure 2).

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 A. EVSE Ports Growth by State

Table A-1. Q2 2023 Growth of Public EVSE Ports per 100 EVs by State.

State	EVSE Ports per 100 EVs in Q1 2023	EVSE Ports per 100 EVs in Q2 2023	Growth of EVSE Ports per 100 EVs in Q2 2023
AK	4.5	4.4	−2.7%
AL	6.0	6.3	4.2%
AR	10.1	10.8	7.3%
AZ	3.7	3.8	4.5%
CA	3.5	3.6	2.3%
CO	5.7	6.0	5.0%
CT	4.8	5.2	8.0%
DC	10.7	10.6	−0.9%
DE	5.1	5.8	14.5%
FL	3.9	4.1	4.2%
GA	6.2	6.4	2.8%
HI	3.7	3.6	−1.5%
IA	6.8	7.2	5.8%
ID	3.6	3.5	−0.3%
IL	3.8	3.4	−8.4%
IN	4.4	4.7	7.4%
KS	9.7	9.9	2.4%
KY	5.7	6.2	7.2%
LA	6.4	7.2	12.5%
MA	8.1	8.6	5.6%
MD	6.2	6.3	2.2%
ME	8.6	9.2	7.1%
MI	5.1	5.4	6.0%
MN	4.9	5.1	4.7%
MO	9.5	10.0	4.8%
MS	9.9	10.5	6.6%
MT	5.7	5.7	−0.8%
NC	5.3	5.6	7.3%
ND	16.7	17.1	2.7%
NE	6.9	7.2	4.7%
NH	4.1	4.3	6.8%
NJ	2.8	3.0	9.0%

State	EVSE Ports per 100 EVs in Q1 2023	EVSE Ports per 100 EVs in Q2 2023	Growth of EVSE Ports per 100 EVs in Q2 2023
NM	5.7	5.7	0.4%
NV	4.3	4.4	3.4%
NY	7.4	7.7	3.4%
OH	6.1	6.6	9.1%
OK	4.2	4.3	1.9%
OR	4.0	4.1	3.9%
PA	5.2	6.0	16.7%
RI	10.4	10.4	0.0%
SC	5.8	6.1	4.9%
SD	10.1	10.4	3.0%
TN	5.7	6.1	6.6%
TX	4.0	4.3	7.6%
UT	5.4	5.7	5.9%
VA	4.7	4.8	1.2%
VT	10.3	10.4	0.9%
WA	3.6	3.8	5.2%
WI	4.7	4.9	4.2%
WV	11.9	12.2	2.8%
WY	16.4	16.4	0.0%

Appendix B. EV Charging Data Sources

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 from January 2010 through January 2020 (Brown et al. 2020).

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. EVSPs, responsible for managing a network of EV charging stations (Figure B-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 directors, 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 EV charging stations, 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 EV charging stations to be considered a network, it cannot be considered part of another network, and it must have a dedicated platform that allows users to locate EV charging stations as well as initiate and pay for charging events.

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

B.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 API and importing each network's API data into the database. Using APIs ensures the efficiency, accuracy, and completeness of the data are maintained.

Table B-1 shows a timeline of the integration of the network APIs into the Station Locator data management process, including the integration of OCPI-based APIs. In Q2, FLASH's OCPI-based API was integrated into the Station Locator. See Section 1.1 for more information on the OCPI protocol.

Table B-1. Timeline of API integrations in the Station Locator.

Date	Network
January 2014	Blink, ChargePoint, SemaConnect
February 2015	Webasto
August 2015	EVgo
June 2018	Shell Recharge
April 2019	Electrify America
October 2019	EVgo (OCPI)
January 2020	FLO
August 2020	OpConnect (OCPI)
January 2021	ChargePoint (OCPI), Shell Recharge (OCPI)
June 2022	Rivian (OCPI)
September 2022	EV Connect (OCPI)
December 2022	Blink (OCPI), SemaConnect (OCPI)
January 2023	Volta (OCPI)
April 2023	FLASH (OCPI)

As of the end of Q2, there were 57,723 available and temporarily available public and private charging stations in the database, which are available on the Station Locator or accessible via API or data download (AFDC 2023b). Of those, approximately 76% 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.

B.2 Manually Collected Data

For non-networked (i.e., not connected to the internet) EV charging stations, data sources include trade media, Clean Cities directors, 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. In Q2, the Station Locator team received an updated list of stations from AmpUp and SWTCH Energy. 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.