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

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

1 National Renewable Energy Laboratory
2 ICF Inc.

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Office of Energy Efficiency & Renewable Energy
Operated by the Alliance for Sustainable Energy, LLC

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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	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
EVMATCH	EVmatch 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	connector type for Level 1 and Level 2 charging
JULE	Jule network
L1	Level 1
L2	Level 2
LIVINGSTON	Livingston Energy Group network
LOOP	Loop 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
REVEL	Revel network
RIVIAN_ADVENTURE	Rivian Adventure Network
RIVIAN_WAYPOINTS	Rivian Waypoints network
SHELL_RECHARGE	Shell Recharge network
SWTCH	SWTCH Energy network
TESLA	Tesla Supercharger network
TESLAD	Tesla DestinaDCtion network
UNIVERSAL	Universal EV Chargers network
VLTA	Volta 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 third calendar quarter of 2023 (Q3 2023) by charging level, network, and location. Additionally, this report measures the current state of charging infrastructure compared to the infrastructure requirement scenario outlined in the National Renewable Energy Laboratory's (NREL's) report, *The 2030 National Charging Network: Estimating U.S. Light-Duty Demand for Electric Vehicle Charging Infrastructure* (Wood et al. 2023). 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 15th report in a series. Reports from previous quarters can be found in the Alternative Fuels Data Center (AFDC) and NREL publication databases, as well as the AFDC Charging Infrastructure Trends page (https://afdc.energy.gov/fuels/electricity_infrastructure_trends.html).

In Q3 2023, the number of electric vehicle supply equipment (EVSE) ports in the Station Locator grew by 7.7%, or 12,986 EVSE ports, bringing the total number of ports to 181,026. Public EVSE ports, which account for most ports in the Station Locator (88.5%), grew by 8.4% or 12,423 EVSE ports (Figure ES-1). Meanwhile, private EVSE ports increased by 2.8%, or 563 ports. California continues to lead the country in the number of public EVSE ports—home to more than a quarter (27%) of all public ports in the Station Locator—though its share has gradually declined from its peak of 32% of public ports in Q1 2021, owing to steady infrastructure deployment across the nation. Notably, the Northwest region witnessed the most substantial growth in public charging infrastructure during Q3, with a 13.0% increase in EVSE ports.

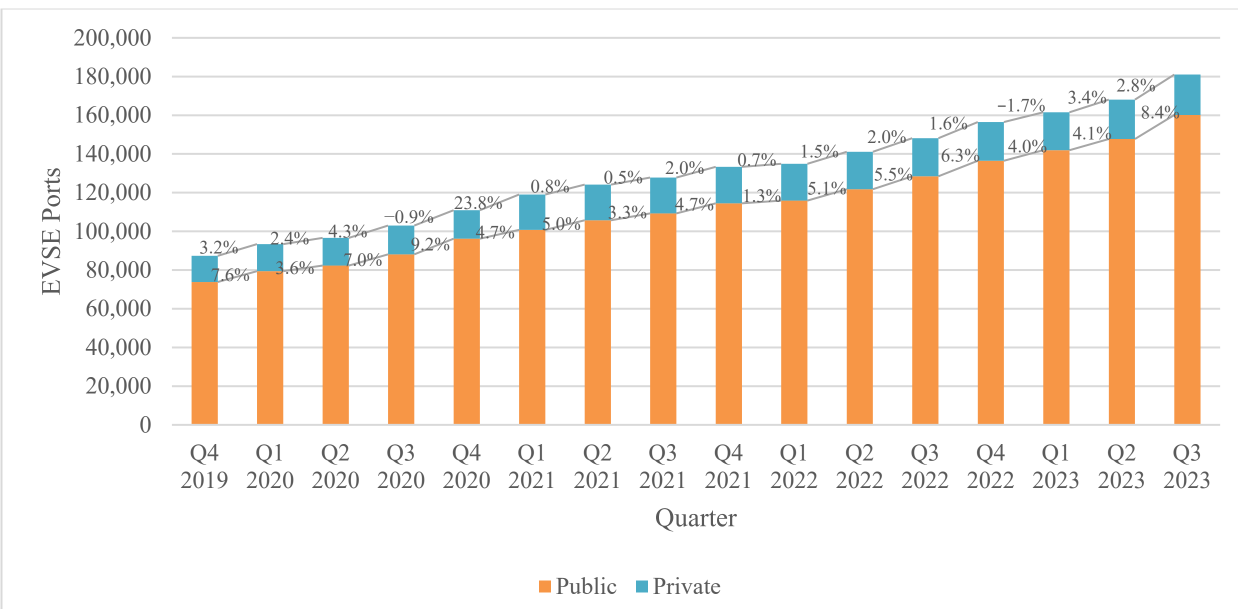

Figure ES-1. Quarterly growth of EVSE ports by access.

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

Among the public EVSE ports, Level 1 EVSE ports experienced the most growth in Q3 (15.5%), representing the addition of 132 EVSE ports. The growth in Level 1 EVSE ports is primarily attributed to installations at airports in Washington and California. Meanwhile, Level 2 and direct-current (DC) fast EVSE ports grew by 8.4% and 8.3%, respectively (Figure ES-2).

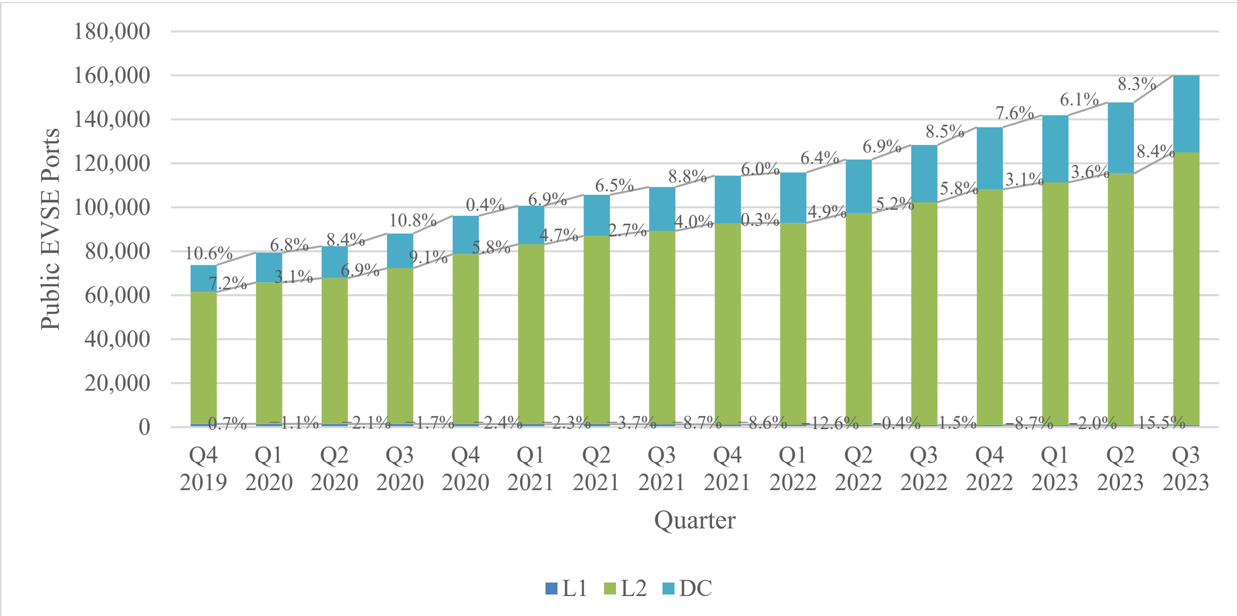

Figure ES-2. Quarterly growth of public EVSE ports by charging level.

Note: Figure excludes legacy EVSE ports that are not classified by charging level and are no longer manufactured. As of Q3, there were 26 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 among the charging levels, allowing them to charge EVs in the least amount of time. One of the conclusions drawn from NREL's report is that deploying a dependable network of public DC fast chargers is essential for fostering consumer acceptance of EVs in the United States (Wood et al. 2023). As such, it is 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 to 350 kW. While DC fast EVSE ports with power outputs of 50 kW and 150 kW are the most common, the number of DC fast EVSE ports at higher power levels is steadily increasing (Figure ES-3).

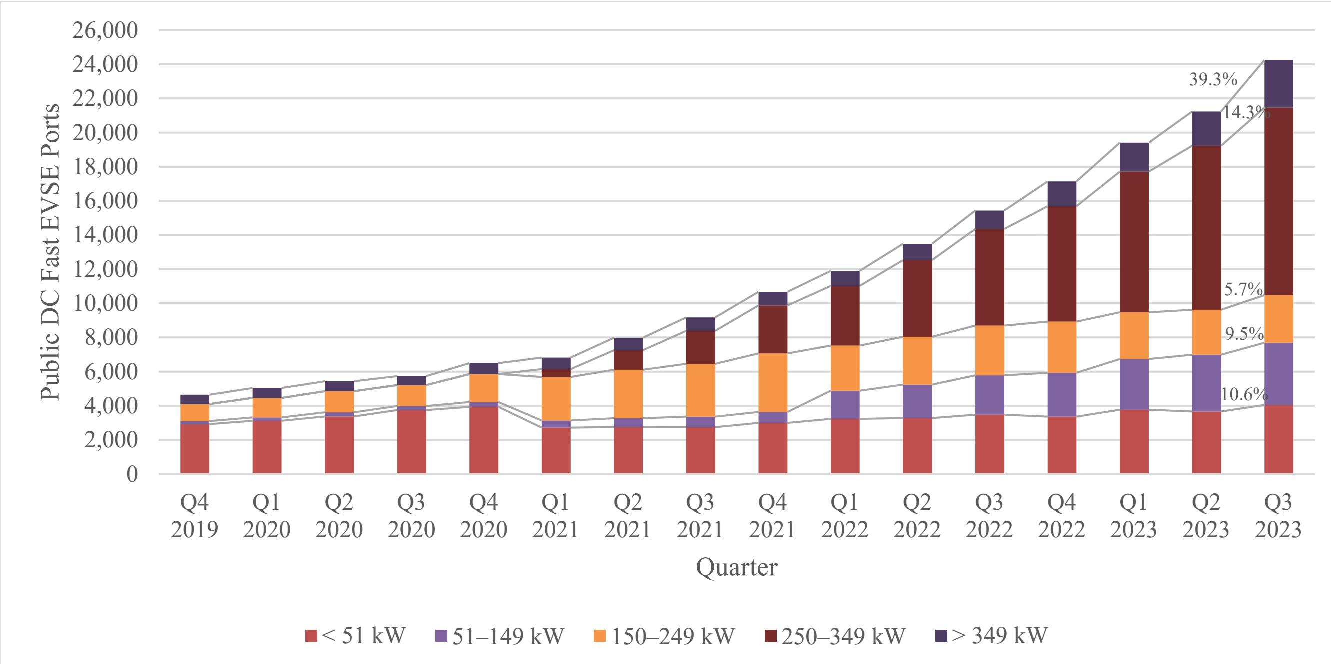

Figure ES-3. Quarterly growth of public DC fast EVSE ports by power output.

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).

Further, *The 2030 National Charging Network* report estimates that the United States would need 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 from the Station Locator, 9.1% of the estimated DC fast EVSE ports and 11.6% of the estimated Level 2 EVSE ports are currently available to meet such charging needs. However, it is important to note that 61.7% of public DC fast EVSE ports and 8.1% 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 to meet the charging needs of 33 million EVs on the road by 2030 decreases to 5,554 (3.1%) and 114,069 (10.7%), 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 target. Using Station Locator data, this report explores the growth of both public and private EV charging infrastructure in the United States for the third calendar quarter of 2023 (Q3 2023). This is the 15th 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 that 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.

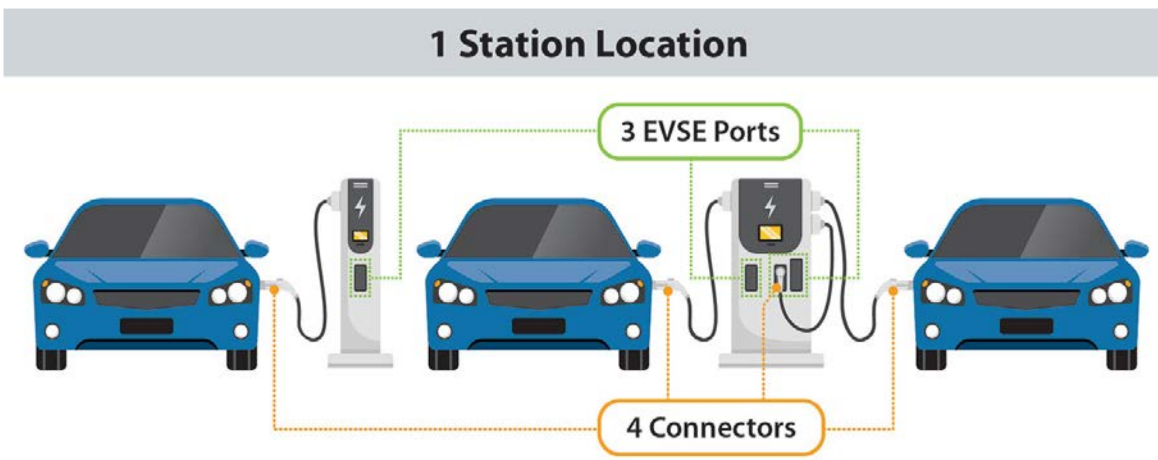

Figure 1. EV charging infrastructure hierarchy.

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] 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*

[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.

Charging Infrastructure, projects 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 EVs 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]

As of Q3, there were 16,558 public DC fast EVSE ports with a power output of 150 kW or greater and 124,066 public Level 2 EVSE ports in the Station Locator.[8] Based on data in the Station Locator in Q3, 9.1% of the estimated DC fast EVSE ports and 11.6% of the estimated Level 2 EVSE ports have been installed to support the infrastructure needs of the 2030 fleet. However, it is important to note that a large share of the public DC fast EVSE ports (61.7%) and a smaller portion of the Level 2 EVSE ports (8.1%) are on the Tesla Supercharger and Destination networks, respectively. As such, these ports are not readily accessible to non-Tesla drivers without the use of an adapter.[9] When public EVSE ports on the Tesla networks are excluded, the number of DC fast and Level 2 EVSE ports currently installed to support the 2030 fleet drops to 5,554 (3.1%) and 114,069 (10.7%), respectively (Figure 2).

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[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 69.2% 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 September 30, 2023, 47% 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.

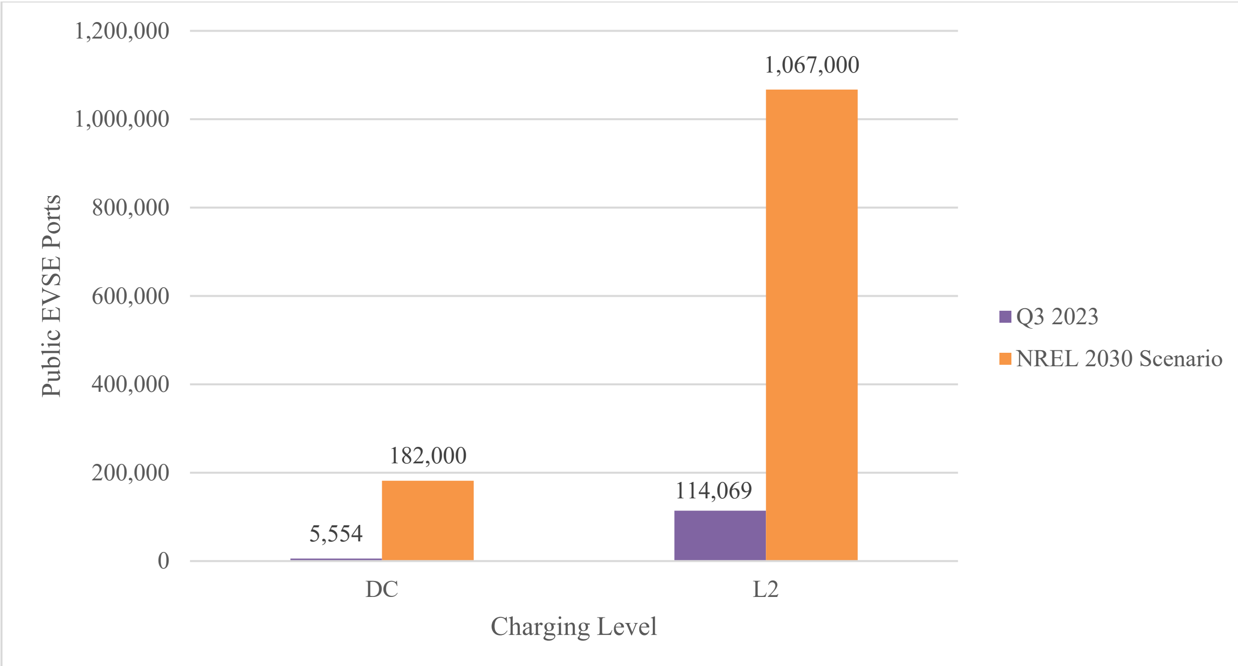

Figure 2. Current availability of public charging (excluding Tesla-only) versus NREL's scenario of 2030 public infrastructure requirements in the United States.

By 2030, Wood et al.'s baseline scenario also estimates that there will need to be 0.6 public DC fast EVSE ports and 3.2 public Level 2 EVSE ports per 100 EVs. As of Sept. 30, 2023, there were approximately 4.16 million EVs on the road in the United States (Experian Information Solutions 2023b). In Q3, the ratios of public DC fast and Level 2 EVSE ports per 100 EVs were 0.4 and 3.0, respectively. These ratios include EVSE ports on both 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 Q3, the deployment of public DC fast and Level 2 EVSE ports falls short. However, over 12.6% of the 33 million light-duty EVs in NREL's analysis were on the road as of Q3. As EV registrations continue to grow each quarter, and especially if EV adoption levels increase in line with the study by Wood et al., public EVSE installations will need to ramp up significantly 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 Q3 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 Q3 of 2023. In Q3, the number of EVSE ports in the Station Locator grew by 7.7%, or 12,986 EVSE ports. Public EVSE ports, which account for the majority of ports in the Station Locator (88.5%), grew by 8.4% or 12,423 EVSE ports (Figure 3). Meanwhile, private EVSE ports increased by 2.8%, or 671 EVSE ports. Further, there was a total of 181,026 EVSE ports in the Station Locator as of Q3, reflecting a 107% increase since the initial report in Q4 2019.

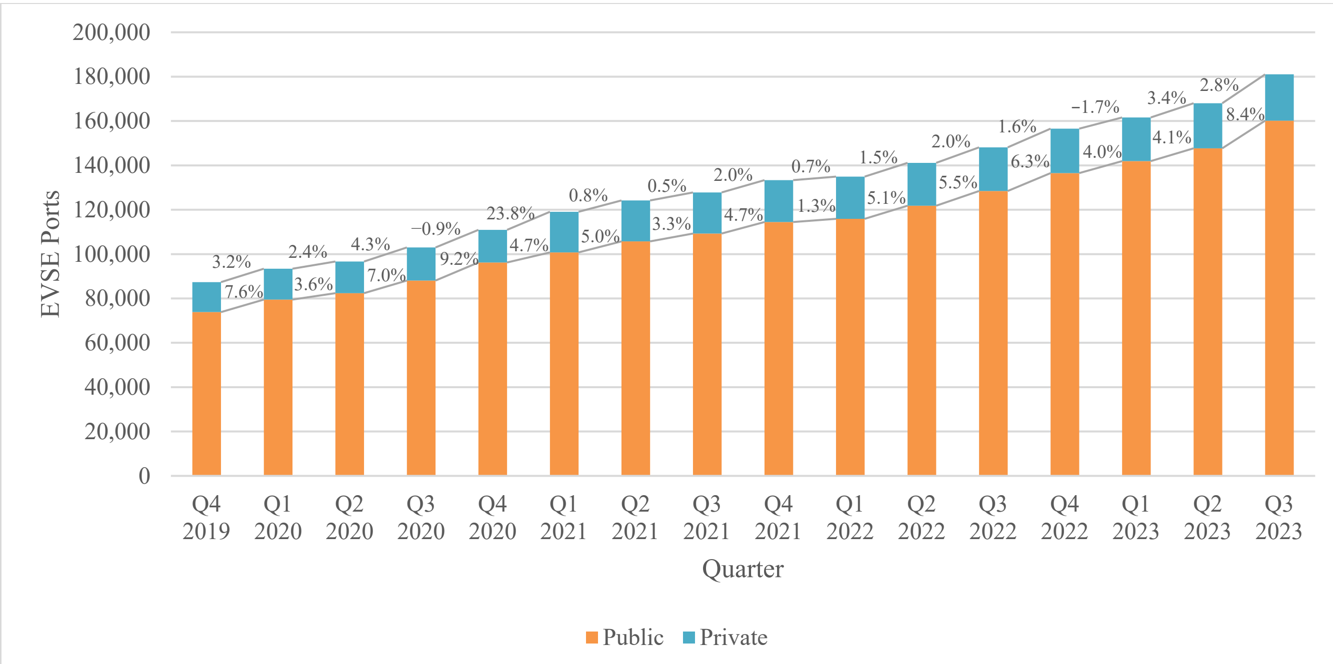

Figure 3. Quarterly growth of EVSE ports by access.

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 Q3 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. Q3 2023 saw an increase of 12,426 public EVSE ports, bringing the total count of public EVSE ports in the Station Locator to 160,111. This expansion represents an 8.4% increase in public EVSE ports since Q2 2023. The following sections break down the growth of public EVSE ports by charging level, network, region, state, housing density, and disadvantaged community designation.

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. In Q3 2023, the growth trends for charging levels diverged from the historical pattern, where the number of DC fast EVSE ports has typically shown the highest percentage increase compared to other charging levels. Level 1 EVSE ports, comprising the smallest share of public EVSE ports in the Station Locator (0.6%), experienced a 15.5% growth, with the addition of 123 Level 1 EVSE ports. This increase is primarily attributed to the installation of Level 1 EVSE ports at airports in Washington and California. Public Level 2 EVSE ports grew by 8.4%, representing the largest increase in the number of new public EVSE ports (9,596). This surge was largely driven by the installation of public Level 2 EVSE ports in California, Texas, and Florida, although Level 2 EVSE was also installed in 46 other states and the District of Columbia. Trailing the growth in Level 2 EVSE ports, public DC fast EVSE ports grew by 8.3% in Q3, representing the addition of 2,696 DC fast ports (Figure 4).

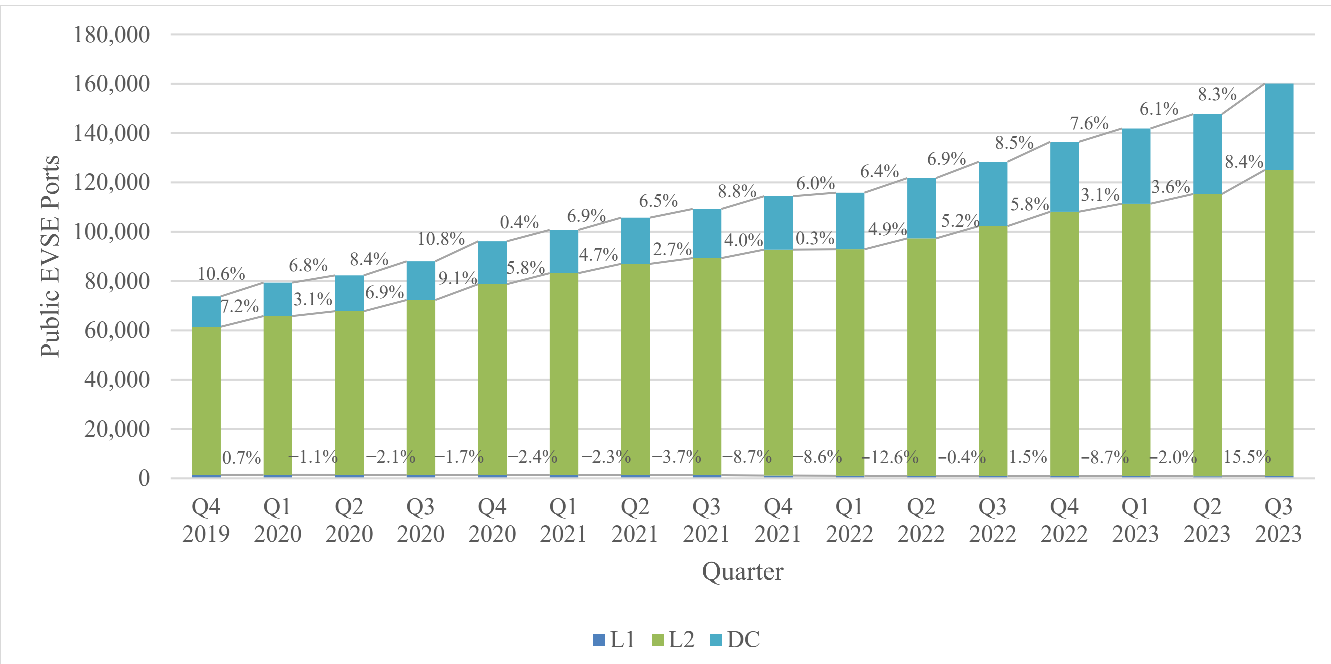

Figure 4. Quarterly growth of public EVSE ports by charging level.

Note: Figure excludes legacy EVSE ports that are not classified by charging level and are no longer manufactured. As of Q3, there were 26 public legacy EVSE ports in the Station Locator. Additionally, the percentages in this figure indicate the percent growth between each quarter.

In comparison to Level 1 and Level 2 EVSE ports, DC fast EVSE ports have the highest power output among the charging levels, allowing them to charge EVs 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 deploying a dependable network of public DC fast chargers is essential for driving EV adoption in the United States (Wood et al. 2023). Therefore, it is important to highlight trends in the growth of DC fast EVSE ports in the Station Locator. While Level 1 EVSE ports typically have a power output of around 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 more than 350 kW. The most common power outputs for DC fast EVSE ports are 50 and 150 kW, though the number of DC fast EVSE ports at higher power levels is steadily increasing, as depicted in Figure 5.

It is worth noting that as of Q3, power output data are available for 69.2% of the 35,061 public DC fast EVSE ports in the Station Locator, up from just 37.8% of public DC fast EVSE ports in Q4 2019. Thus, Figure 5 is based on power output data for 24,247 DC fast EVSE ports.[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.

Figure 5 highlights a significant growth (39.3%) in the count of EVSE ports with a power output exceeding 349 kW during Q3. This notable surge is attributed to new installations on the Rivian Adventure Network with a power output of 480 kW and EVgo installations with a power output of 350 kW. Notably, most new Rivian Adventure Network installations were concentrated in North Carolina, Texas, and Michigan, and most EVgo installations in California.

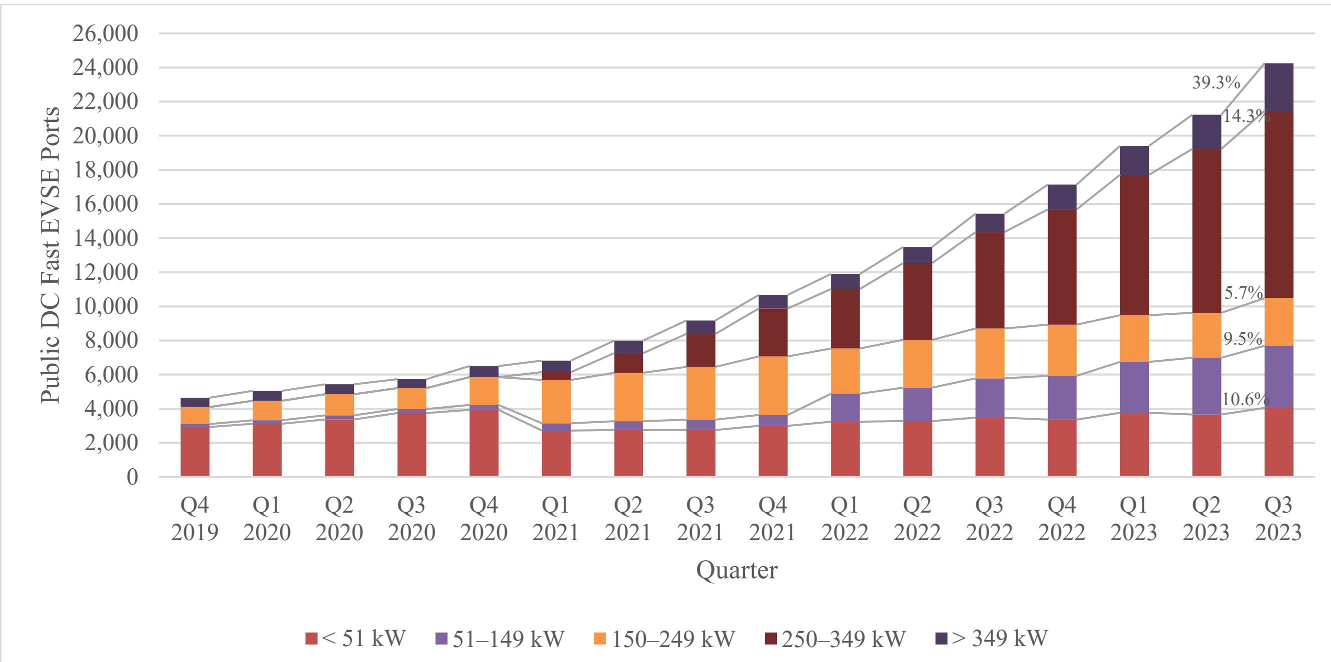

Figure 5. Quarterly growth of public DC fast EVSE ports by power output.

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

[10] The remaining 30.8% 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 these data from Tesla and site hosts of non-networked stations.

growing number of auto manufacturers, including Ford and GM, have plans to integrate NACS 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 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 Sept. 30, 2023, approximately 65% of registered all-electric vehicles in the United States were Teslas and therefore compatible with the NACS connector, 30% were compatible with the CCS connector, and 5% were compatible with the CHAdeMO connector (Experian Information Solutions 2023b).[11] Of the 42,386 DC fast connectors in the Station Locator as of Q3, CCS connectors grew by the largest percentage (14.0%), followed by NACS connectors (8.7%) (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 (3.1%) in Q3. 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. In addition to the two current EV models using CHAdeMO connectors (Nissan LEAF and Mitsubishi Outlander) there continue to be older EV models on the road with the CHAdeMO standard. Each quarter, CHAdeMO connectors continue to make up a smaller share of public DC fast connectors. In Q4 2019, CHAdeMO connectors made up 22.1%, compared with 18.6% in Q3 2023.

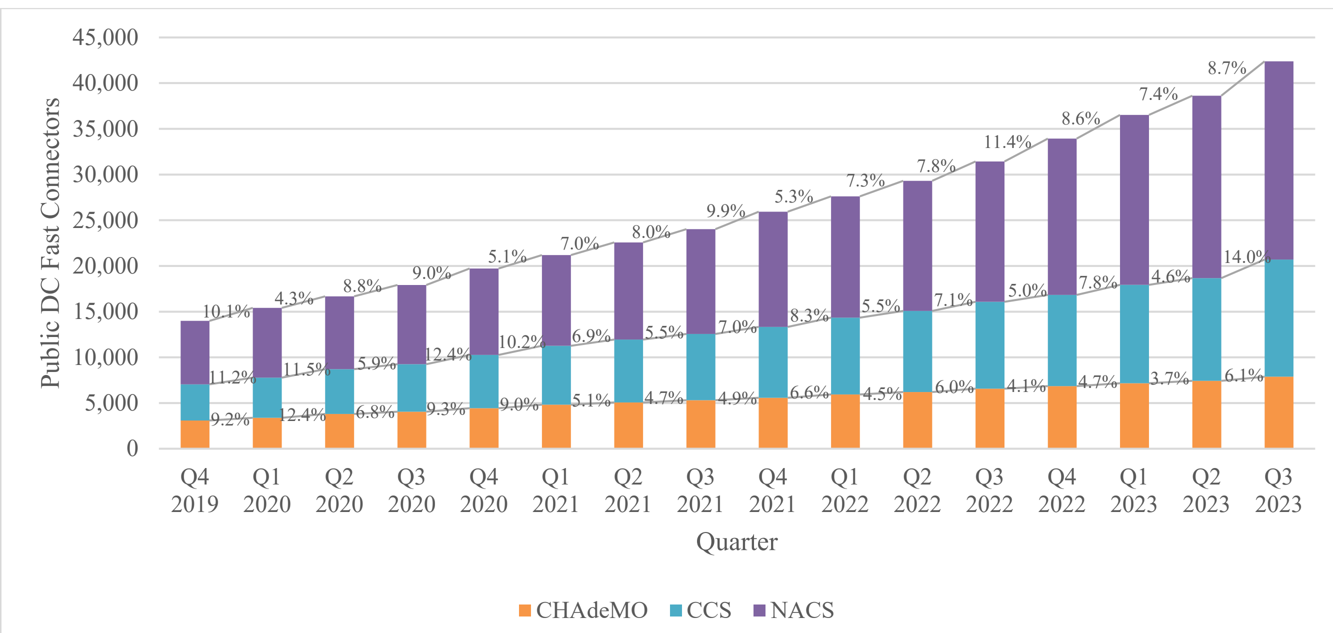

Figure 6. Quarterly growth of public DC fast connectors by type.

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

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

2.1.2 By Network

As with previous quarters, the ChargePoint network continued to account for the largest number of public EVSE ports (62,580, or 44.1%) in the Station Locator in Q3, and Level 2 EVSE ports continued to make up the majority of ChargePoint's network. This holds true for many of the networks in the Station Locator, except for the 7Charge, Electrify America, ChargeUp, Circle K, EVgo, Francis Energy, FPL EVolution, Jule, Rivian Adventure Network, Revel, and Tesla Supercharger networks (Figure 7). These networks are predominantly, if not completely, made up of DC fast EVSE ports. In Q3, the Tesla Supercharger network had the largest share of public DC fast EVSE ports across the networks in the Station Locator (61.7%), followed by Electrify America at 11.1% and EVgo at 7.7% (Figure 8).

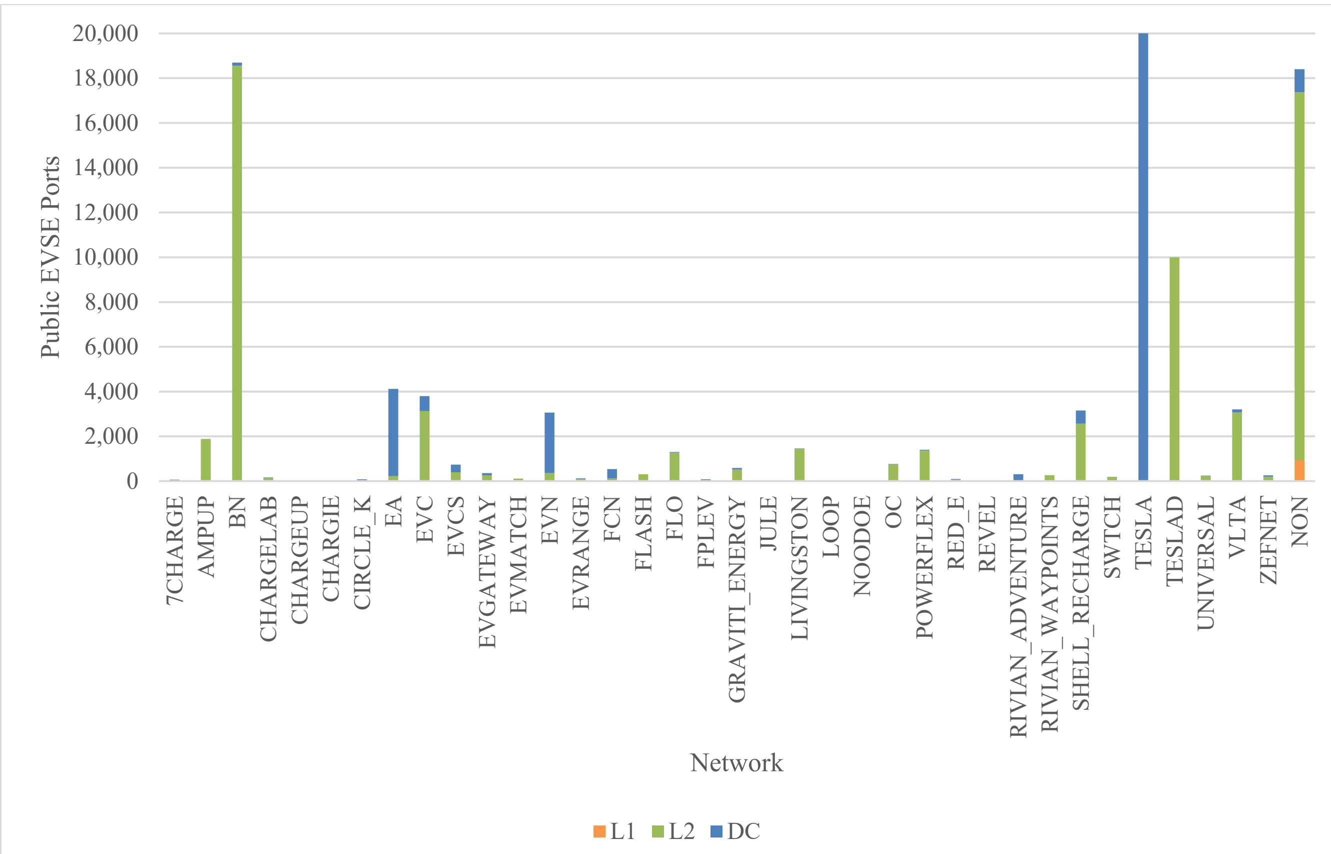

Figure 7. Breakdown of public EVSE ports by network and charging level in Q3 2023.

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

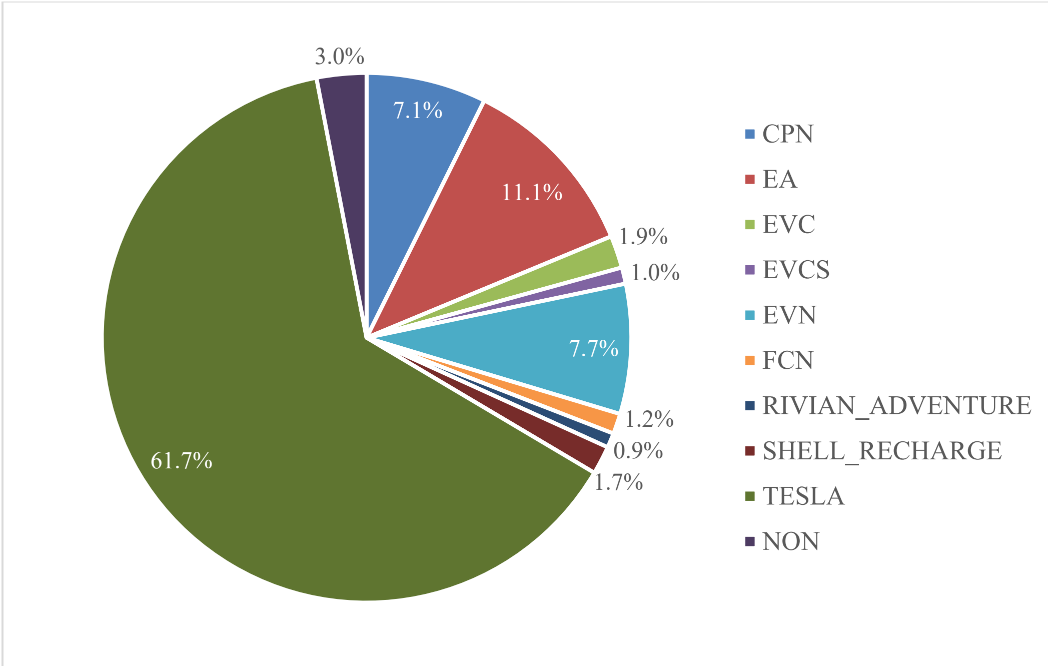

Figure 8. Breakdown of public DC fast EVSE ports by network in Q3 2023.

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

Table 2 presents the percent growth of each network over the last four quarters. The expansive growth of many networks in Q3 2023 was largely a result of the Station Locator's manual data collection process, as mentioned in Section 1. Notably, this is the reason for the large growth seen on the ChargeUp, Circle K, Graviti Energy, Noodoe, ZEF Energy, and 7Charge networks. Among these, the Graviti Energy and ZEF Energy networks experienced the most substantial increase in new EVSE ports, with the addition of 345 and 81 ports, respectively. In contrast, the remaining networks, for which data are manually collected, added only about 20 to 25 EVSE ports each. For example, the Noodoe network experienced the largest growth in public EVSE ports (2,000%), which was the result of the port count increasing from one in Q2 2023 to 21 in Q3 2023.

During Q3, the Station Locator team also reclassified all EVSE ports previously associated with the SemaConnect network to the Blink network, following Blink's acquisition of SemaConnect the previous year. Consequently, all 6,625 former SemaConnect stations are now being imported and updated nightly through Blink's API (refer to the end of this section for networks updated via an API). This reclassification partially contributed to the 238.5% increase in public EVSE ports on the Blink network, along with the installation of new Level 2 EVSE ports.

Finally, the number of EVSE ports on the Flash, Francis Energy, and OpConnect networks decreased slightly in Q3. The decrease in public EVSE ports on the Flash and OpConnect networks—which import their data into the Station Locator via an API—was due to the removal of Level 2 EVSE ports. Meanwhile, the decline observed in the Francis Energy network can be attributed to the removal of DC fast EVSE ports from the Station Locator.

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

Network	Q4 2022 Growth	Q1 2023 Growth	Q2 2023 Growth	Q3 2023 Growth
7CHARGE	N/A	N/A	N/A	43.5%
AMPUP	387.8%	7.6%	11.2%	1.1%
BN	−0.8%	47.8%	9.8%	238.5%
CHARGELAB	65.6%	15.1%	40.2%	2.3%
CHARGEUP	N/A	N/A	0.0%	255.6%
CHARGIE	N/A	N/A	N/A	0.0%
CIRCLE_K	N/A	N/A	333.3%	46.2%
CPN	4.6%	5.1%	3.4%	4.0%
EA	1.7%	1.7%	−3.9%	12.1%
EVC	2.8%	7.4%	10.5%	6.1%
EVCS	22.7%	11.8%	23.9%	11.4%
EVGATEWAY	11.2%	7.4%	4.0%	7.8%
EV MATCH	N/A	N/A	N/A	N/A
EVN	4.3%	7.7%	3.0%	−0.4%
EVRANGE	62.5%	25.6%	61.2%	62.0%
FCN	2.6%	2.7%	1.8%	−19.2%
FLASH	N/A	0.0%	331.9%	−51.0%
FLO	8.3%	10.1%	26.3%	7.7%
FPLEV	0.0%	14.9%	5.2%	0.0%
GRAVITI_ENERGY	N/A	N/A	258.8%	141.4%
JULE	N/A	N/A	N/A	N/A
LIVINGSTON	24.0%	6.9%	1.1%	1.4%
LOOP	N/A	N/A	N/A	N/A
NOODOE	N/A	N/A	N/A	2,000.0%
OC	18.8%	5.9%	−2.9%	−9.1%
POWERFLEX	17.9%	0.0%	3.0%	0.9%
RED_E	N/A	13.8%	10.8%	17.1%
REVEL	N/A	N/A	N/A	N/A
RIVIAN_ADVENTURE	50.0%	141.2%	82.1%	36.2%
RIVIAN_WAYPOINTS	160.0%	33.3%	14.4%	12.2%
SHELL_RECHARGE	2.1%	5.1%	−5.5%	11.9%
SWTCH	47.4%	239.3%	55.8%	26.4%
TESLA	11.5%	8.6%	7.4%	8.6%
TESLAD	0.6%	−11.5%	0.5%	0.2%

Network	Q4 2022 Growth	Q1 2023 Growth	Q2 2023 Growth	Q3 2023 Growth
UNIVERSAL	208.3%	29.1%	27.7%	2.5%
VLTA	2.7%	−2.1%	1.0%	2.3%
ZEFNET	0.0%	496.2%	13.5%	46.0%
NON	2.3%	−1.0%	1.4%	0.6%
Total	**6.3%**	**4.0%**	**4.1%**	**8.4%**

The Station Locator team collaborates with most major electric vehicle service providers (EVSPs) to gather EV charging infrastructure data for the Station Locator. As of Q3, the Station Locator incorporates stations from the 37 networks listed below, 13 of which update nightly through an API (marked with asterisks). Four networks—EVmatch, Jule, Loop, and Revel—were added to the Station Locator in Q3. In addition, the Station Locator contains non-networked (NON) station data, which include 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)
- EVmatch (EVMATCH)
- EVgo (EVN)*
- EV Range (EVRANGE)*
- FLASH (FLASH)*
- FLO (FLO)*
- FPL EVolution (FPLEV)
- Francis Energy (FCN)
- Graviti Energy (GRAVITI_ENERGY)
- Jule (JULE)
- Livingston Energy Group (LIVINGSTON)
- Loop (LOOP)
- Noodoe (NOODOE)
- OpConnect (OC)*
- PowerFlex (POWERFLEX)
- Red E Charging (RED_E)
- Revel (REVEL)
- Rivian Adventure Network (RIVIAN_ADVENTURE)*
- Rivian Waypoints (RIVIAN_WAYPOINTS)*
- Shell Recharge (SHELL_RECHARGE)*
- SWTCH Energy (SWTCH)
- Tesla Destination (TESLAD)
- Tesla Supercharger (TESLA)
- Universal EV Chargers (UNIVERSAL)
- Volta (VLTA)*
- ZEF Energy (ZEFNET)

2.1.3 By Region

As shown in Figure 9, the California region continues to have the largest share of the country's public EVSE ports (27.4%). However, the Northwest region grew by the largest percentage in Q3 (13.0%), primarily from new Level 2 installations on the Blink network in Colorado, Washington, and Oregon; new ChargePoint Level 2 installations in Colorado, Washington, and Nevada; and new Tesla Supercharger installations in Nevada, Oregon, and Washington. In Q3, growth in public Level 2 EVSE ports outpaced that of DC fast EVSE ports across four Clean Cities regions: the Northeast, Northwest, South Central, and Southeast (Table 3).

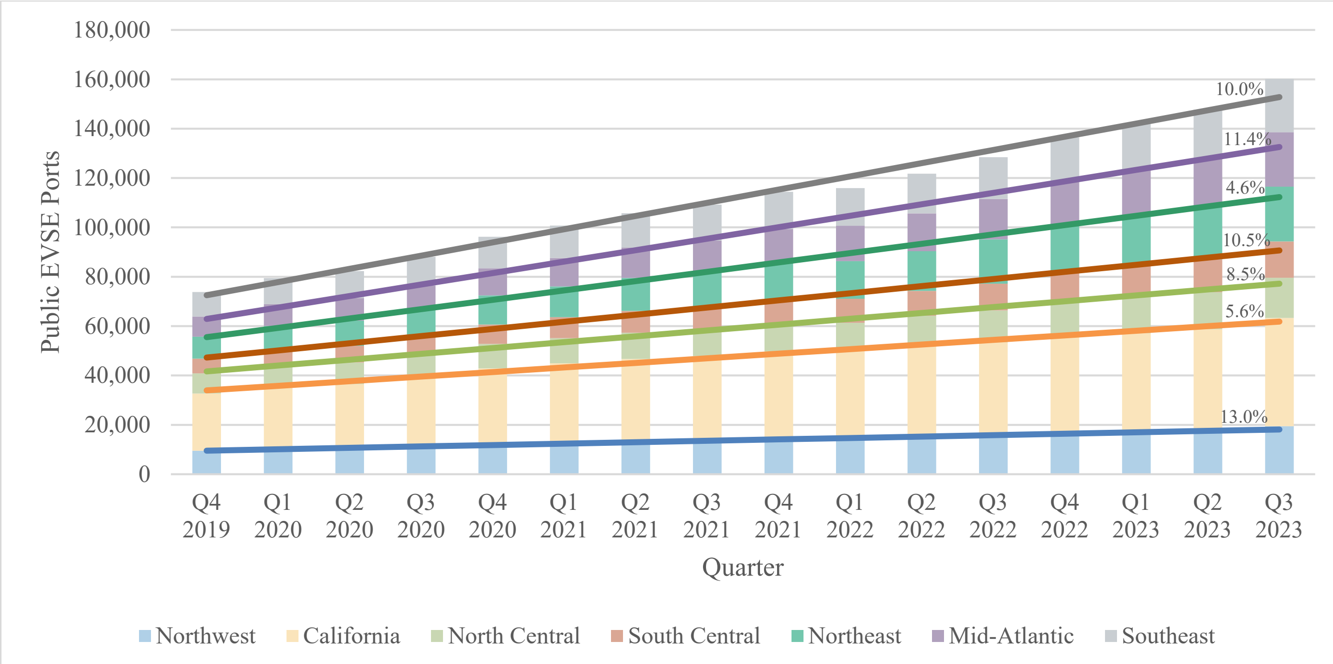

Figure 9. Quarterly growth of public EVSE ports by Clean Cities region.

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 Q3 2023

Clean Cities Region	Level 2 EVSE Port Growth	DC Fast EVSE Port Growth
California	5.2%	6.7%
Mid-Atlantic	11.4%	11.9%
North Central	7.3%	12.8%
Northeast	5.0%	2.4%
Northwest	12.9%	10.6%
Southeast	12.2%	6.4%
South Central	10.7%	8.3%

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).

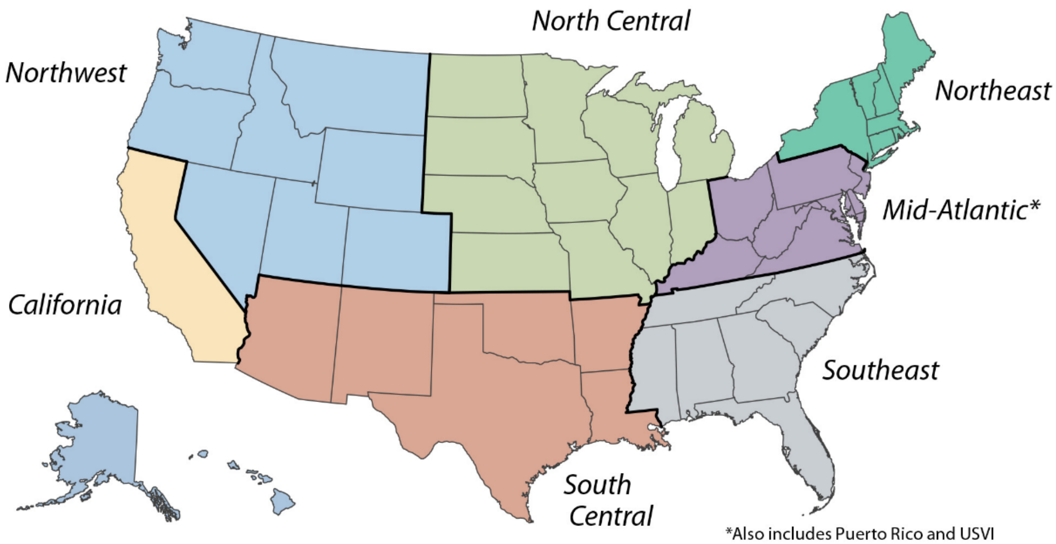

Figure 10. Clean Cities regions.

Source: Clean Cities Coalition Network (2023b)

2.1.4 By State

In Q3, Montana, Idaho, the District of Columbia, Maryland, and Washington were the five states with the most significant percentage growth of EVSE ports per 100 EVs, all surpassing the growth rate of the United States as a whole (Table 4). New DC fast ports on the Tesla Supercharger network contributed to the growth seen in Montana, while new Level 2 port installations on the Blink network contributed to the growth seen in Idaho. Further, ChargePoint network Level 2 EVSE ports accounted for the largest share of new EVSE ports in Maryland and Washington.

Table 4. Top Five States With the Largest Growth of EVSE Ports per 100 EVs in Q3 2023 [12]

State	EVSE Ports per 100 EVs in Q2 2023	EVSE Ports per 100 EVs in Q3 2023	Growth of EVSE Ports per 100 EVs in Q3 2023
Montana	5.7	7.0	23.0%
Idaho	3.5	4.4	23.0%
District of Columbia	10.6	12.7	19.1%
Maryland	6.3	7.5	18.9%
Washington	3.8	4.5	16.7%

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. The District of Columbia is considered a state for the purpose of this analysis, though U.S. territories, such as Puerto Rico, are excluded. The vehicle

[12] See Appendix A for the growth of EVSE ports per 100 EVs in all states in Q3.

registration data are based on Experian's registration information as of Dec. 31, 2022 (Experian Information Solutions 2023a).

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. 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 slight decrease in rural and suburban areas. There was a stark increase in urban Level 1 ports of 42.5%, however this was a relatively small increase of a couple hundred ports overall. DC fast EVSE ports grew by the largest percentage in rural areas (9.8%), followed by suburban and urban areas (9.6% and 7.7%, respectively).

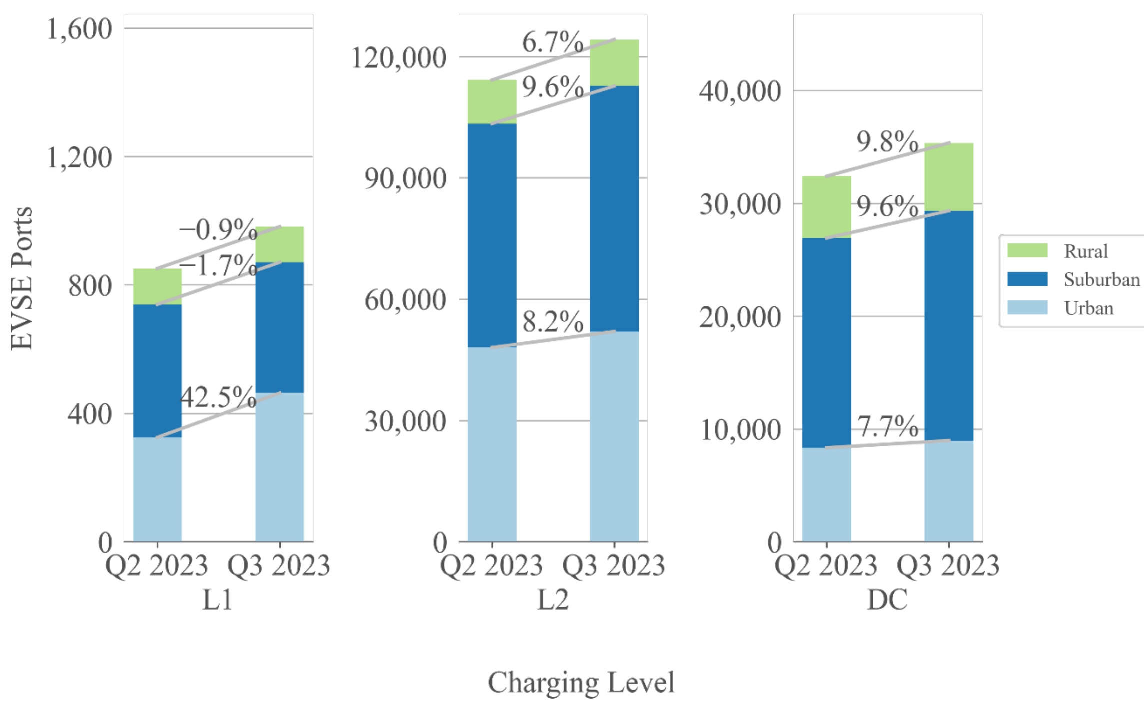

Figure 11. Q3 2023 growth of public EVSE ports by neighborhood type and charging level.

Note: These graphs are not to scale.

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.

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 Grant Program, to disadvantaged communities (DACs). Although charging infrastructure funded by the NEVI Formula Grant 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.

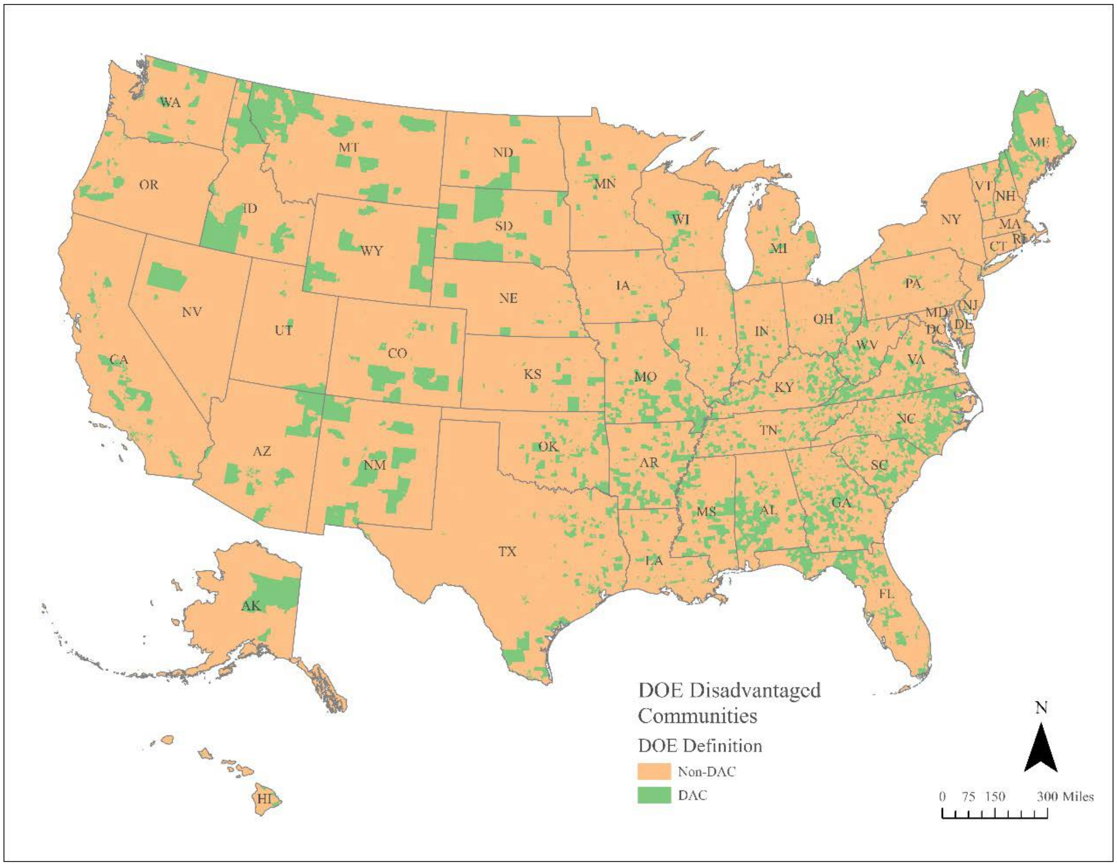

Figure 12. Display of the disadvantaged communities across the United States.

Note: Alaska and Hawaii are not to scale.

Overall, 14.4 % of public EVSE ports across all charging levels are in DACs, in line with 14.3% from the previous quarter. As shown in Figure 13, the growth of DC fast EVSE ports in non-DACs slightly outpaced growth in DACs, whereas the reverse was true for Level 2 ports. There was a slight increase in Level 1 ports in non-DACs, whereas DACs saw a large percentage increase of 65.9%. However, this large increase is due to a relatively small overall increase of 114 for ports up from 173 (Figure 13).

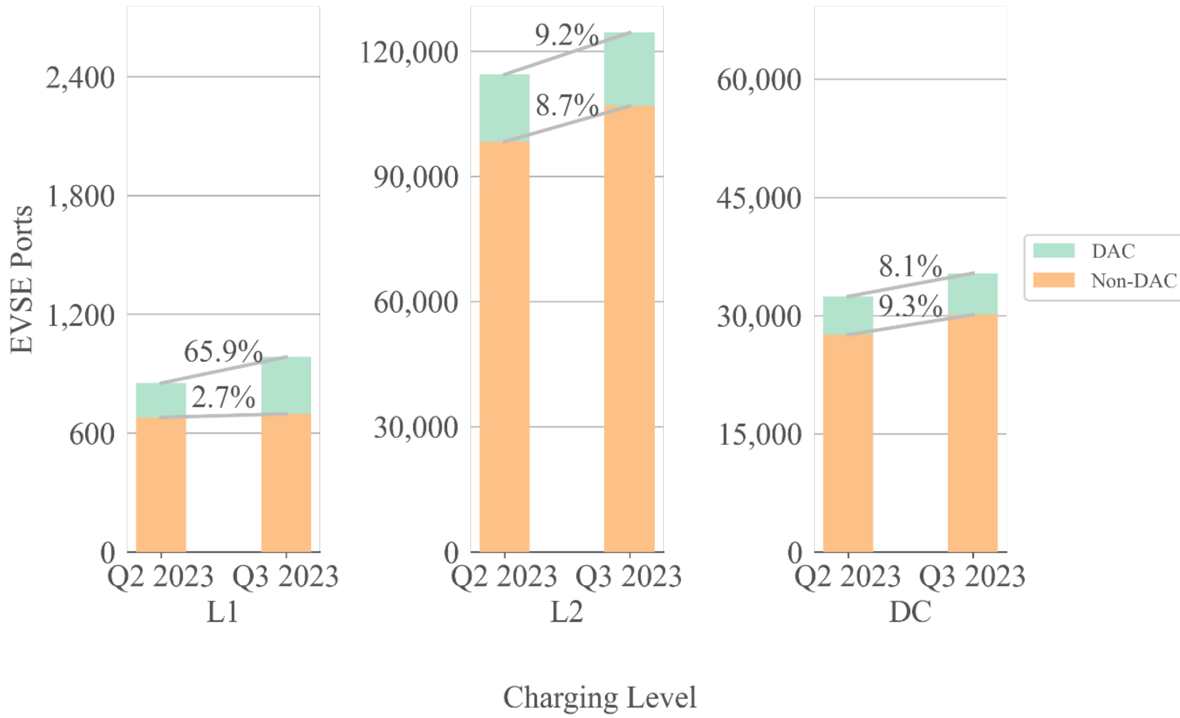

Figure 13. Q3 2023 growth of public EVSE ports by DAC designation and charging level.

Note: These graphs 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 Grant 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 former, which accounts for 36 census tract-level indicators under four categories of disadvantage: fossil dependence; energy burden; socioeconomic, housing, transportation, and other vulnerability; and environmental and climate hazards (U.S. Department of Transportation 2023).

2.2 Private Charging Trends

In Q3 2023, the Station Locator saw marginal growth in the number of private EVSE ports, with an increase of 536 ports (2.8%) compared to the previous quarter. Specifically, private EVSE ports rose from 20,324 in Q2 2023 to 20,889 in Q3 2023. The increase in port counts can be primarily attributed to the addition of non-networked Level 2 EVSE ports, as well as the integration of new Level 2 EVSE ports on the SWTCH Energy and ChargePoint networks. Notably, SWTCH Energy provided large updates to the Station Locator in Q3. While Level 2 EVSE saw the greatest number of new ports installed in Q3, private DC fast EVSE experienced the most growth (11.0%) among charging levels. 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 87.3% of all private EVSE ports. In Q3, all charging levels experienced growth, with DC fast EVSE ports increasing by the largest percentage (11.0%), followed by Level 1 EVSE ports (3.5%). Specifically, there was an addition of 37 private DC fast EVSE and 76 Level 1 EVSE ports during this period. The increase in DC fast EVSE ports was driven by the addition of new ports on the Revel and ChargePoint networks. The Station Locator team collaborated with Revel in Q3, resulting in the addition of 16 private DC fast EVSE ports in New York. The growth in Level 1 EVSE ports was driven by the inclusion of private ports in California. While private Level 2 EVSE ports only increased by 2.8% in Q3, the growth represents the addition of 450 ports. The growth in Level 2 EVSE ports can be attributed to the addition of new non-networked, SWTCH Energy, and ChargePoint Level 2 EVSE ports in California.

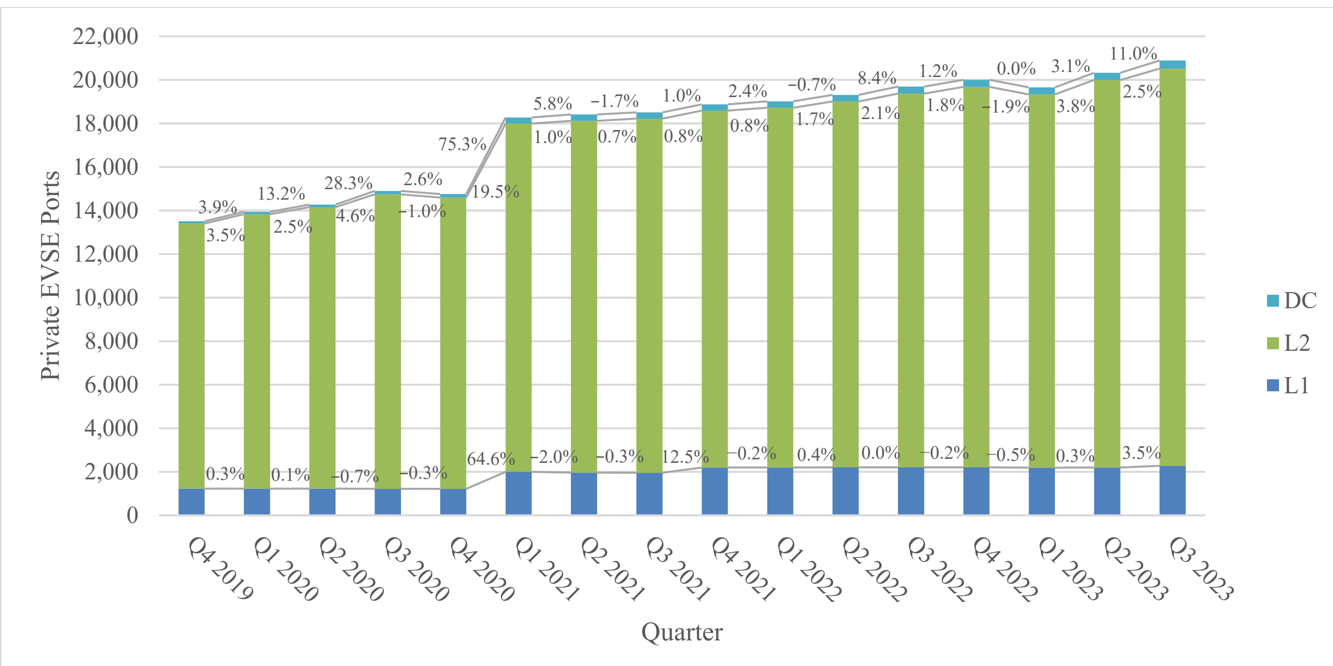

Figure 14. Quarterly growth of private EVSE ports by charging level.

Note: Figure excludes legacy EVSE ports that are not classified by charging level and are no longer manufactured. As of Q3, 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 (95.1%) 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. That said, over the past three quarters, the number of workplace DC fast charging EVSE ports has seen the most growth across the charging levels. Specifically, in Q3, workplace DC fast charging EVSE ports increased by 29.5%, equating to the addition of 18 ports. This is followed by an increase in Level 1 (21.0%) and Level 2 (2.4%) workplace EVSE ports during the same period.

Overall, the total number of private EVSE ports at workplaces increased marginally in Q3 (3.2%), representing an addition of 333 EVSE ports compared to the previous quarter. By the end of Q3, the total count of private workplace EVSE ports reached 10,634 EVSE ports (Figure 15). The growth in DC fast and Level 1 EVSE ports is partially attributed to the addition of private workplace ports in California. Similarly, the growth in Level 2 EVSE is primarily attributed to the deployment of non-network, ChargePoint, and PowerFlex network ports in California. As previously noted, data on private workplace charging ports in the Station Locator are likely underrepresented.

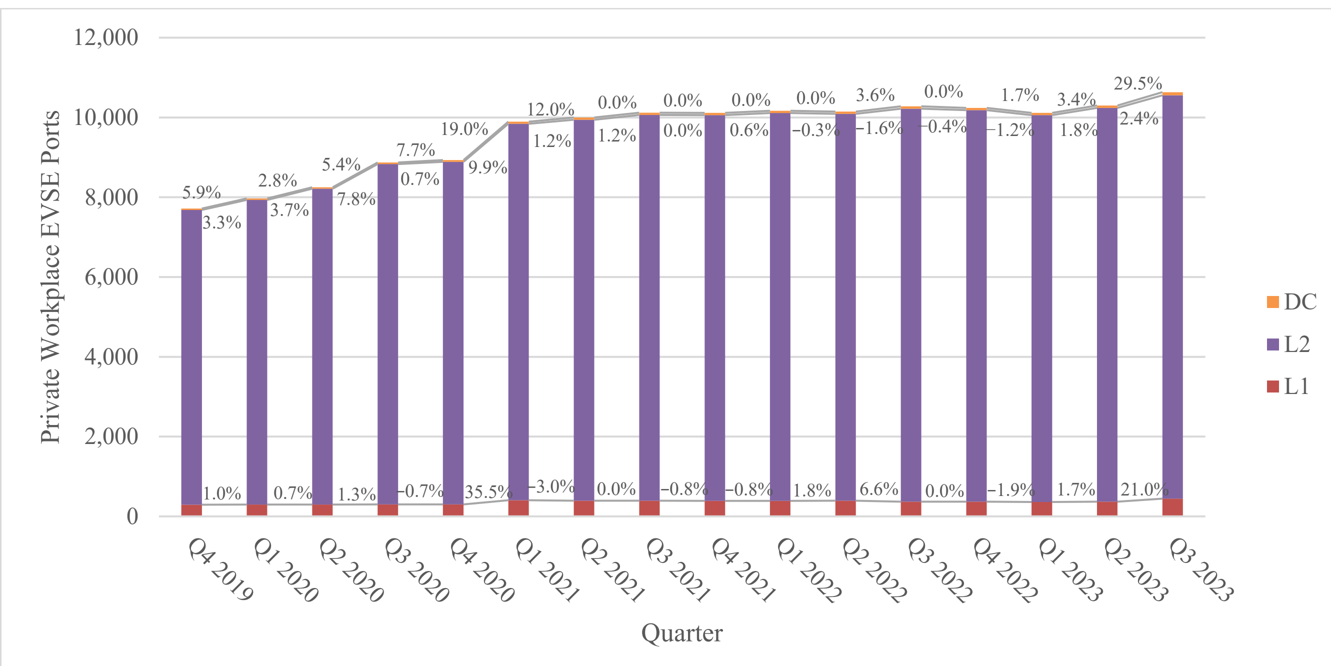

Figure 15. Quarterly growth of private workplace EVSE ports by charging level.

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, though the vast majority (99.0%) are Level 2. While the number of Level 1 multifamily EVSE ports remained unchanged between Q2 and Q3 2023, Level 2 multifamily EVSE ports increased by 6.5% (Figure 16). This growth can be attributed to the addition of 113 new Level 2 EVSE ports, primarily in California and Colorado, bringing the total number of multifamily EVSE ports in the Station Locator to 1,871. Overall, EVSE ports at multifamily housing represent 9.0% of private EVSE ports in the Station Locator.

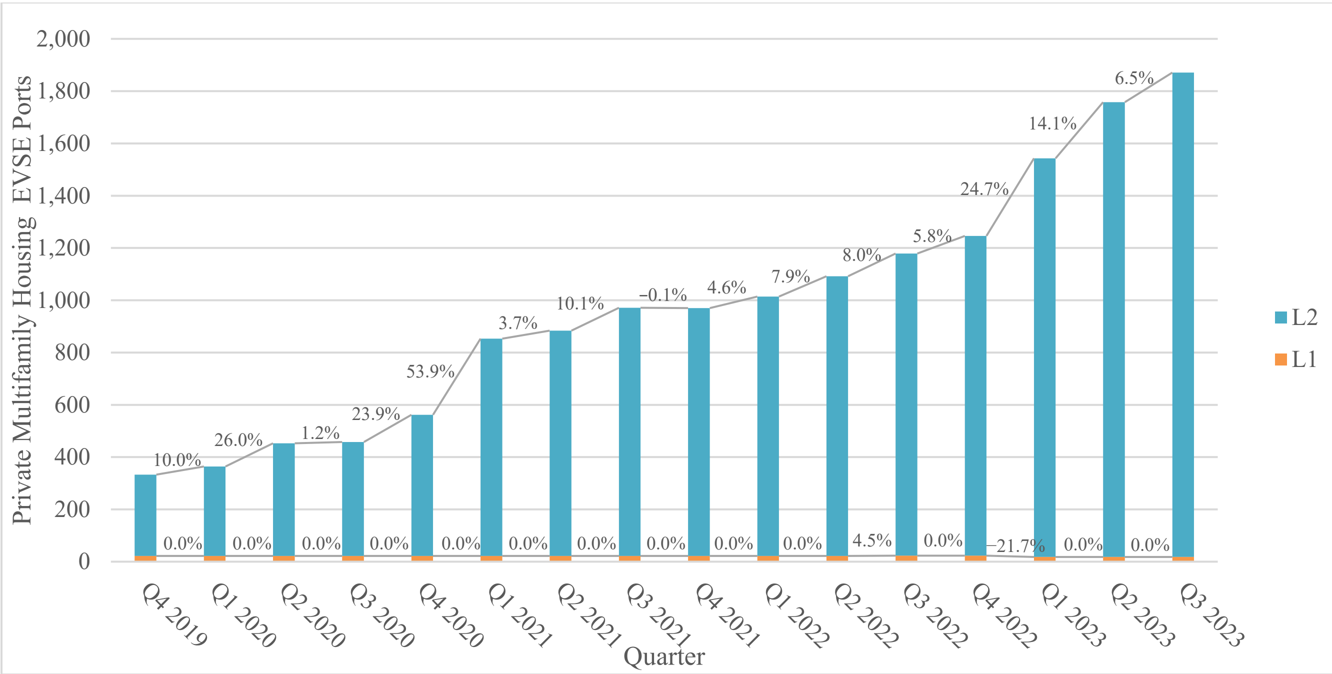

Figure 16. Quarterly growth of private multifamily housing EVSE ports by charging level.

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 Q3 2023, the team has collected this information for 87.6% of private EVSE ports in the Station Locator, of which 44.0% 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 Q3 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).

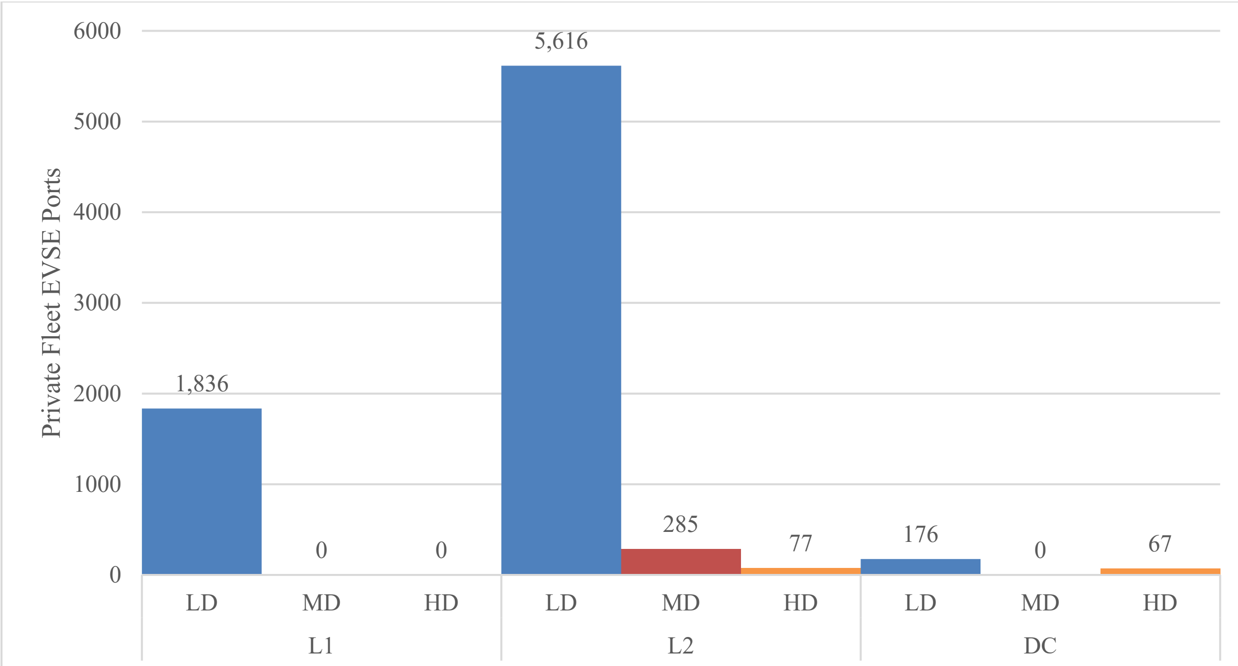

Figure 17. Breakdown of private fleet EVSE ports by charging level and fleet type in Q3 2023.

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

The NEVI Formula Program made significant strides in Q3. Each state has successfully formulated and submitted its second state EV infrastructure development plan, outlining the intended utilization of their allocated NEVI Formula Program funds for Year 2. With approval granted for all state plans, the Fiscal Year 2024 funds are now released to states, intended to further enhance the nationwide EV charging network (Federal Highway Administration 2023b). Although the majority of NEVI program funding is earmarked for the implementation of these state plans, a dedicated 10% has been reserved for the secretary of transportation "to make grants to States and localities that require additional assistance to strategically deploy electric vehicle charging infrastructure" (Federal Highway Administration 2023a). This allocation is designed to provide funds to states and localities requiring additional support for strategic EV charging infrastructure deployment. The first round of funding, approximately $100 million, is primarily focused on the restoration or replacement of inoperative public and private DC fast and Level 2 EV charging stations. The program is closely guided by data sourced from the Alternative Fueling Station Locator, with funding aimed at charging ports listed as temporarily unavailable (Federal Highway Administration 2023a).

The Bipartisan Infrastructure Law has proven to be a catalyst not only for the NEVI program, but also for significant progress in the realm of clean transportation initiatives. This legislation has facilitated the allocation of a substantial $1.7 billion in funding across 130 projects spanning 46 states and territories, signaling an impending surge in EV charging infrastructure at fleet facilities (Federal Transit Administration 2023). As electric transit continues to gain momentum and proliferate, fleet operators are met with the urgent need to deploy and install EV charging infrastructure to accommodate the growing number of electric transit vehicles.

The federal government is not the sole driving force behind the expansion of EV charging infrastructure. Seven global automakers have joined forces to undertake the ambitious endeavor of installing a minimum of 30,000 DC fast charging stations for EVs across North America. These charging stations will feature both Tesla's NACS and CCS connectors. The initial charging stations are scheduled to be operational by summer 2024 (Stellantis 2023). Moreover, additional auto manufacturers and EV charging networks have committed to supporting NACS, with Electrify America pledging to add the NACS connector alongside the CCS connector at their charging stations (Electrify America 2023). Furthermore, Nissan has announced plans to introduce EVs equipped with NACS ports, commencing in 2025 (Nissan Motor Corporation 2023). Although the NACS connector has yet to be standardized by SAE International at this time, it is slated for expedited development (SAE International 2023).

Utility investments in EV charging infrastructure are also gaining prominence. A total of 59 utilities have invested a substantial $5.8 billion across 35 states to bolster EV charging infrastructure. These investments encompass a variety of forms, including research and development, educational initiatives, incentives, and EV-specific rates, among others. It is anticipated that utilities will continue to play a crucial role in facilitating the shift toward electric transportation (Atlas Public Policy 2023).

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 Q3, all manually collected data, as well as EVSE ports on the Blink, ChargePoint, ChargeUp, Electrify America, EV Connect, EVgo, EV Range, 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 Q3 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 7.7% increase in the number of EVSE ports in the Station Locator in Q3. Although public Level 2 EVSE ports grew by the largest number (9,596) in Q3 and continue to make up the largest share (77.5%) of EVSE ports in the Station Locator, public Level 1 EVSE ports grew at the fastest rate (15.5%) due to installations at airports. California continues to lead the country in terms of the total number of public EVSE ports available (43,586), though public charging infrastructure grew by the largest percentage in the Northwest region in Q3 (13.1%).

Based on NREL's report *The 2030 National Charging Network*, which projects the required number of public EVSE ports to accommodate 33 million EVs on the road by 2030, the current availability of DC fast and Level 2 EVSE ports is 9.1% and 11.6%, respectively, of the projected 2030 requirements. However, it is important to note that 61.7% of public DC fast EVSE ports and 8.1% 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 the Tesla networks are excluded, the number of DC fast and Level 2 EVSE ports currently installed to meet the projected 2030 requirements decreases to 5,554 (3.1%) and 114,069 (10.7%), respectively.

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. Q3 2023 Growth of Public EVSE Ports per 100 EVs by State

State	EVSE Ports per 100 EVs in Q2 2023	EVSE Ports per 100 EVs in Q3 2023	Growth of EVSE Ports per 100 EVs in Q3 2023
AK	4.4	4.3	–0.9%
AL	6.3	6.9	9.9%
AR	10.8	11.4	6.1%
AZ	3.8	4.1	8.6%
CA	3.6	3.8	5.6%
CO	6.0	6.8	13.9%
CT	5.2	6.0	16.3%
DC	10.6	12.7	19.1%
DE	5.8	6.6	13.6%
FL	4.1	4.6	12.2%
GA	6.4	6.8	6.7%
HI	3.6	3.7	2.5%
IA	7.2	7.5	4.5%
ID	3.5	4.4	23.0%
IL	3.4	3.9	14.2%
IN	4.7	5.2	11.0%
KS	9.9	10.5	5.5%
KY	6.2	6.9	12.3%
LA	7.2	7.7	7.7%
MA	8.6	9.0	4.8%
MD	6.3	7.5	18.9%
ME	9.2	9.8	6.6%
MI	5.4	5.8	7.9%
MN	5.1	5.6	9.1%
MO	10.0	10.1	1.6%
MS	10.5	10.8	2.9%
MT	5.7	7.0	23.0%
NC	5.6	6.3	11.6%
ND	17.1	17.5	2.1%
NE	7.2	8.0	11.4%
NH	4.3	4.8	9.7%
NJ	3.0	3.3	9.9%

State	EVSE Ports per 100 EVs in Q2 2023	EVSE Ports per 100 EVs in Q3 2023	Growth of EVSE Ports per 100 EVs in Q3 2023
NM	5.7	6.2	9.2%
NV	4.4	4.9	11.8%
NY	7.7	7.9	2.6%
OH	6.6	7.1	7.4%
OK	4.3	3.9	–10.0%
OR	4.1	4.5	9.3%
PA	6.0	6.2	2.8%
RI	10.4	10.5	0.7%
SC	6.1	6.7	8.5%
SD	10.4	11.2	7.7%
TN	6.1	6.6	8.0%
TX	4.3	5.0	15.0%
UT	5.7	6.4	11.0%
VA	4.8	5.6	16.3%
VT	10.4	10.6	2.3%
WA	3.8	4.5	16.7%
WI	4.9	5.5	13.0%
WV	12.2	12.7	4.0%
WY	16.4	17.6	7.4%

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. See Section 1.1 for more information on the OCPI protocol.

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

Date	Network
Jan. 2014	Blink, ChargePoint, SemaConnect
Feb. 2015	Webasto
Aug. 2015	EVgo
June 2018	Shell Recharge
April 2019	Electrify America
Oct. 2019	EVgo (OCPI)
Jan. 2020	FLO
Aug. 2020	OpConnect (OCPI)
Jan. 2021	ChargePoint (OCPI), Shell Recharge (OCPI)
June 2022	Rivian (OCPI)
Sept. 2022	EV Connect (OCPI)
Dec. 2022	Blink (OCPI), SemaConnect (OCPI)
Jan. 2023	Volta (OCPI)
April 2023	FLASH (OCPI)
Sept. 2023	EV Range (OCPI)

As of the end of Q3, there were 66,512 available and temporarily unavailable public and private charging stations in the database that are available on the Station Locator or accessible via API or data download (AFDC 2023b). Of those, approximately 73% 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 coalition 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 Q3, the Station Locator team received an updated list of stations from the Tesla Supercharger and SWTCH Energy networks. Additionally, the Station Locator team met with representatives at Revel, EVmatch, and Jule to add their networks and associated charging stations to the Station Locator in Q3. Further, 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.