Electric Vehicle Charging Infrastructure Trends from the Alternative Fueling Station Locator: First Quarter 2024

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

1 National Renewable Energy Laboratory
2 ICF Inc.

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Office of Energy Efficiency & Renewable Energy
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List of Acronyms

7CHARGE	7Charge network
AFDC	Alternative Fuels Data Center
AMPED_UP	AmpedUp! Networks
AMPUP	AmpUp network
BN	Blink network
BP_PULSE	BP Pulse network
CCS	Combined Charging System, a connector type for DC fast charging
CHAdeMO	a connector type for DC fast charging
CHARGELAB	ChargeLab network
CHARGENET	ChargeNet 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
ENVIROSPARK	EnviroSpark network
EV	electric vehicle, including all-electric and plug-in hybrid electric vehicles
EVBOLT	EVBOLT network
EVC	EV Connect network
EVCS	EV Charging Solutions network
EVGATEWAY	EvGateway network
EVMATCH	EVmatch network
EVN	EVgo network
EVPOWER	eV Power network
EVRANGE	EV Range network
EVSP	electric vehicle service provider
FCN	Francis Energy network
FLASH	FLASH network
FLO	FLO network
FPLEV	FPL EVolution network
GRAVITI_ENERGY	Graviti Energy network
HONEY_BADGER	Honey Badger network
J1772	a connector type for Level 1 and Level 2 charging
J3400	a connector type for Level 2 and DC fast charging, also known as the North American Charging Standard
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
POWER_NODE	Electric Era network
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
STAY_N_CHARGE	Stay-N-Charge network
SWTCH	SWTCH Energy network
TESLA	Tesla Supercharger network
TESLAD	Tesla Destination network
TURNONGREEN	TurnOnGreen network
UNIVERSAL	Universal EV Chargers network
USPS	U.S. Postal Service
VLTA	Volta network
ZEFNET	ZEF Energy network

Executive Summary

Electric vehicle (EV) charging infrastructure in the United States continues to rapidly change and grow. Using data from the U.S. Department of Energy's (DOE's) Alternative Fueling Station Locator (AFDC 2024b), this report provides a snapshot of the state of EV charging infrastructure in the United States in the first calendar quarter of 2024 (Q1 2024) by charging level, network, location, housing density, and disadvantaged community designation. 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 17th 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 (afdc.energy.gov/fuels/electricity_infrastructure_trends.html).

In Q1 2024, the number of EV charging ports in the Station Locator grew by 4.6%, or 8,825 EV charging ports, bringing the total number of ports to 198,897. Public EV charging ports account for most of the ports in the Station Locator, and grew by 4.8% in Q1, while private EV charging ports grew by 3.2% (Figure ES-1). Notably, the most substantial percentage growth in public charging infrastructure during Q1 was in the Northeast region, with a 6.9% increase in EV charging ports. However, California continues to lead the nation in the number of public EV charging ports with 26.7% of all public charging ports in the Station Locator.

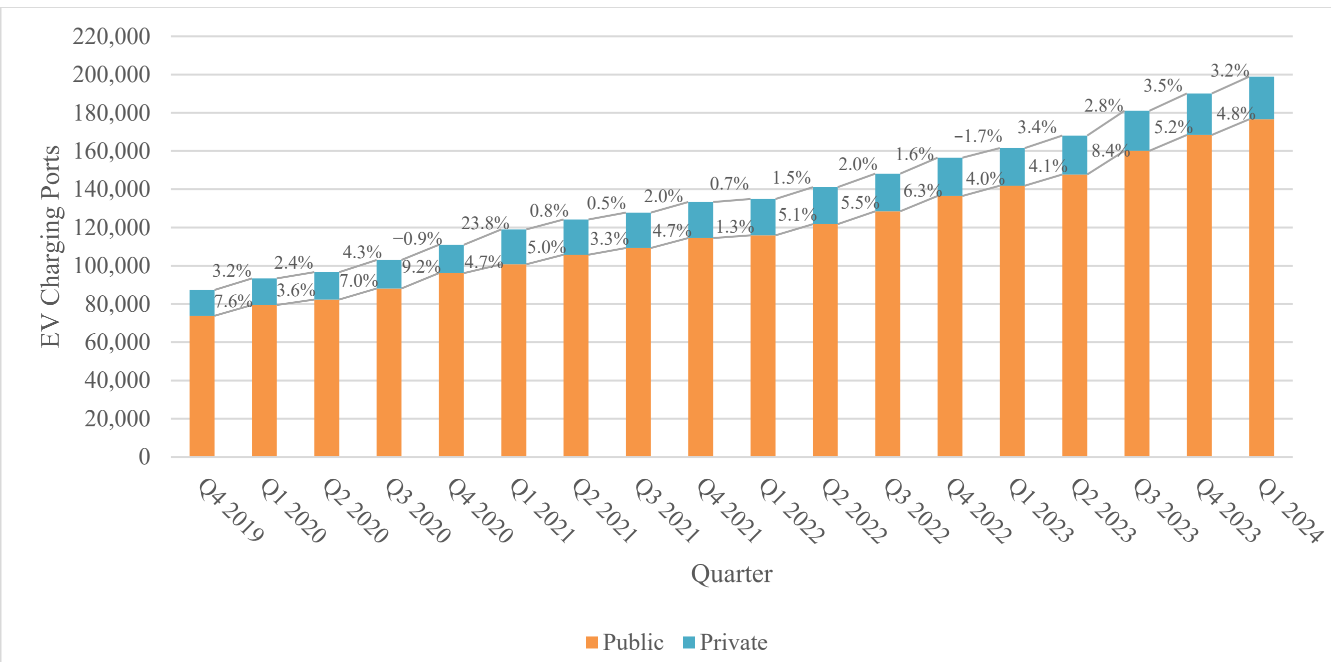

Figure ES-1. Quarterly growth of EV charging ports by access.

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

Among the public EV charging ports, direct-current (DC) fast EV charging ports grew by the largest percentage in Q1 (8.2%), representing the addition of 3,152 EV charging ports. The expansion of public DC fast EV charging ports in the Station Locator was primarily driven by new station additions in California, Texas, and Washington. Meanwhile, Level 2 (L2) EV charging ports grew by 3.8%, or 4,977 ports, primarily due to installations across California, New York, Texas, and Florida. Level 1 (L1) EV charging ports increased marginally by 11 ports, or 1.4% (Figure ES-2).

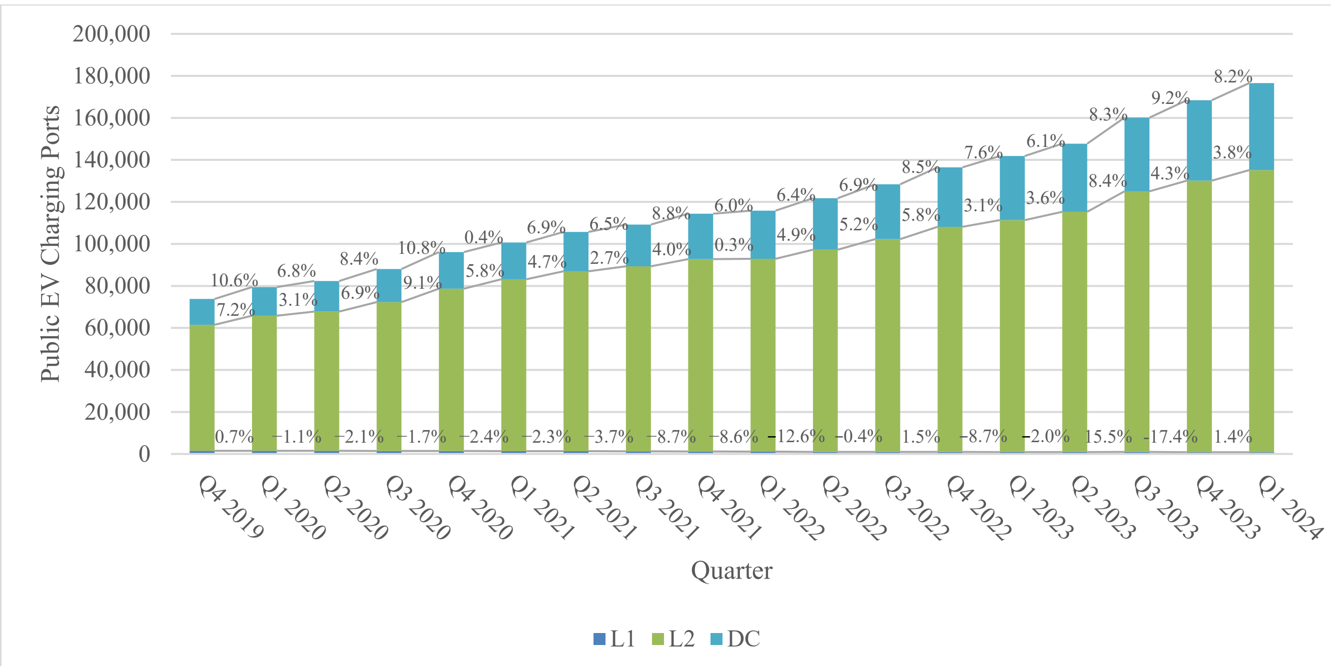

Figure ES-2. Quarterly growth of public EV charging ports by charging level.

Note: Figure excludes legacy EV charging ports that are not classified by charging level and are no longer manufactured. As of Q1, there were 26 public legacy EV charging ports in the Station Locator. Additionally, the percentages in this figure indicate the percent growth between each quarter.

DC fast EV charging ports have the highest power output among the charging levels, allowing them to charge EVs in the least amount of time. As supported by NREL's research, it is essential to deploy a dependable network of public DC fast chargers to increase consumer acceptance of EVs in the United States (Wood et al. 2023). Given the importance of DC fast port availability on consumer adoption, it is important to highlight the trends in the proliferation of these ports in the Station Locator. By way of background, the power output of DC fast EV charging ports reaches up to 500 kW. DC fast EV charging ports with power outputs of 250 kW and 349 kWare the most common and the number of DC fast EV charging ports at higher power levels is steadily increasing (Figure ES-3).

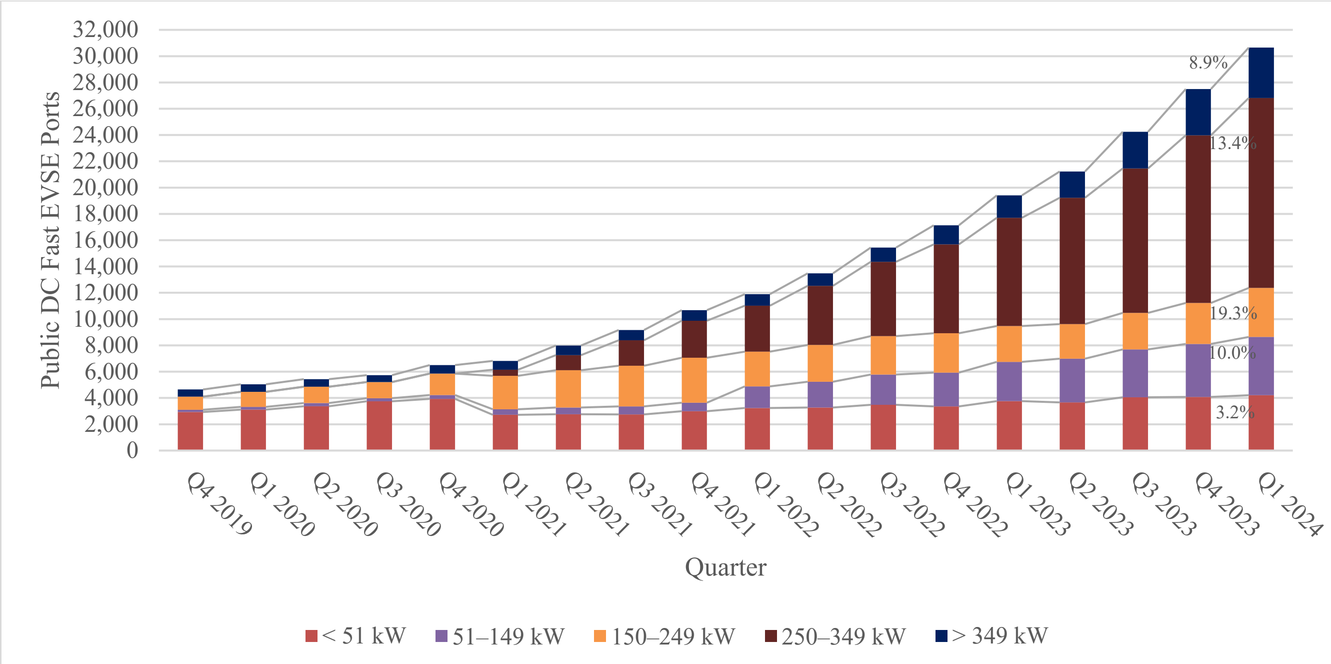

Figure ES-3. Quarterly growth of public DC fast EV charging ports by power output.

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 EV charging ports with a power output at or above 150 kW and 1,067,000 L2 public EV charging 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, 12.1% of the estimated DC fast EV charging ports and 12.6% of the estimated L2 EV charging ports are currently available to meet such charging needs. However, it is important to note that 60.4% of public DC fast EV charging ports and 7.6% of public L2 EV charging 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 EV charging ports on these networks are excluded, the number of DC fast and L2 EV charging ports currently installed to meet the estimated charging needs of 33 million EVs on the road by 2030 decreases to 7,640 (4.2%) and 124,078 (11.6%), 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) EV charging ports in the Station Locator at the end of each quarter. Notable changes may be attributed to the Station Locator team's manual data collection process, as new manually added EV charging ports are counted in the quarter 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 2024a). 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 dataset 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, propane stations, and renewable diesel.

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 EV charging 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 first calendar quarter of 2024 (Q1 2024). This is the 17th report in a series.[1] Reports from previous quarters can be found in the AFDC and NREL publication databases, as well as the AFDC Charging Infrastructure Trends page (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) EV charging 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 EV charging 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 those that are

[1] The report methodology has not changed since its inception; however, different reports have been used to project future charging infrastructure needs (Section 1.2) as newer projections have become available, and new sections have been added to the report over time.

made available to the public after business hours or 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, EV charging ports, and connectors (EVRoaming Foundation 2020), as shown in Figure 1 and described below. Therefore, the Station Locator counts the number of EV charging ports at each station location.

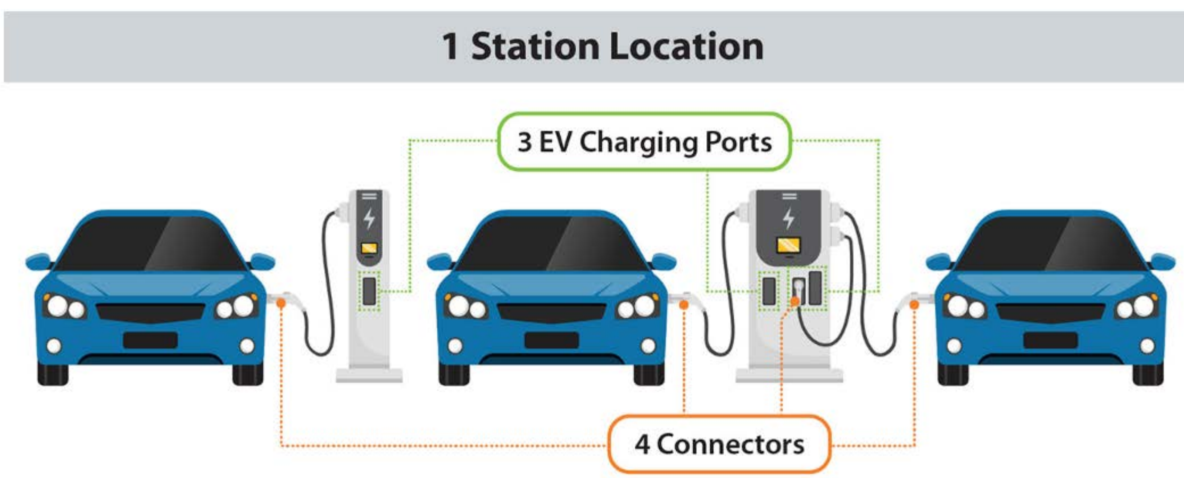

Figure 1. EV charging infrastructure hierarchy.

Source: AFDC (2024d)

The following fuel-specific fields are tracked in the Station Locator for EV charging stations (AFDC 2024c):

- EV charging information:
  - Station location: A site with one or more EV charging ports located at the same address.
  - EV charging port count: The number of outlets or ports available to simultaneously charge vehicles. An EV charging port provides power to charge only one vehicle at a time even though it may have multiple connectors. The unit that houses EV charging

ports is sometimes called a charging post, which can have one or more EV charging ports.

- EV charging port type:
  - Level 1 (L1): 120 V; 1 hour of charging = 5 miles of range.[2] The Station Locator counts standard 120-V alternating-current (AC) outlets as Level 1 EV charging ports only if the outlet is specifically designated for EV charging.
  - Level 2 (L2): 240 V; 1 hour of charging = 25 miles of range.[3]
  - Direct-current (DC) fast: 480+ V; 30 minutes of charging = 100–200+ miles of range.[4]
- Connectors (number and type): What is plugged into a vehicle to charge it. Multiple connectors and connector types can be available on one EV charging port, but only one vehicle will charge at a time.
  - J1772: For L1 and L2 charging.[5]
  - Combined Charging System (CCS): For DC fast charging for most vehicle models.[6]
  - CHAdeMO: For DC fast charging for select vehicle models.
  - J3400: For all charging levels for Tesla vehicles, also referred to as the North American Charging Standard (NACS).[7]
- Network
- Manufacturer
- Power output (kW).

- Open date
- Workplace
- Pricing
- Power sharing
- On-site renewable electricity source.

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

[2] This assumes a power output of 1.9 kW. The actual range per hour of charging depends on the power capacity, which can vary by vehicle and battery state of charge.
[3] This assumes a power output of 6.6 kW. The actual range per hour of charging depends on the power capacity, which can vary by vehicle and battery state of charge. An L2 unit can range from 2.9- to 19.2-kW power output.
[4] The power output of DC fast EV charging ports varies and can provide up to 500 kW. The actual range per hour of charging depends on the power capacity, which can vary by vehicle and battery state of charge.
[5] For L1 charging, most 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.
[6] The CCS connector is a standard developed by SAE International, similar to the J1772 standard.
[7] In December 2023, SAE International completed its standardization of the Tesla-developed NACS connector as SAE J3400. Several automotive manufacturers plan to make their model year 2025 EVs compatible with J3400, as discussed throughout this report (Joint Office of Energy and Transportation 2024b).

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, 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 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 EV charging ports—including 1.2 million public EV charging ports and 26.8 million private EV charging 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.[8]

The 1.2 million public EV charging ports modeled by NREL include 182,000 DC fast EV charging ports with a power output of 150 kW or greater and 1,067,000 Level 2 EV charging ports (Wood et al. 2023). As of Q1, there were 22,007 public DC fast EV charging ports with a power output of 150 kW or greater and 134,319 public Level 2 EV charging ports in the Station Locator.[9] Based on data in the Station Locator in Q1, 12.1% of the estimated DC fast EV charging ports and 12.6% of the estimated Level 2 EV charging 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 EV charging ports (60.4%) and a small portion of the Level 2 EV charging ports (7.6%) 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, and some are not available to non-Tesla drivers even with an adapter.[10] When public EV charging ports on the Tesla networks are excluded, the number of DC fast and Level 2 EV

[8] Wood et al.'s private infrastructure scenario includes EV charging 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 dataset, this section focuses on Wood et al.'s public infrastructure scenario only.

[9] As discussed in Section 2.1.1, power output data are currently only available for 71.8% of public DC fast EV charging ports in the Station Locator. Therefore, the number of DC fast EV charging ports with a power output of 150 kW or greater is likely underrepresented.

[10] As of March 31, 2024, 63% of registered all-electric vehicles on the road were Teslas (Experian Information Solutions 2024b). As discussed throughout this report, several auto manufacturers have plans to adopt the J3400 connector, which will make EV charging ports on the Tesla Supercharger and Destination networks accessible to a greater number of vehicles beginning with model year 2025 vehicles. Currently, 0.1% (221) of DC fast charging ports on the Tesla Supercharger network are equipped with a Magic Dock, discussed further in Section 2.1.1.

charging ports currently installed to support the 2030 fleet drops to 7,640 (4.2%) and 124,078 (11.6%), respectively (Figure 2).

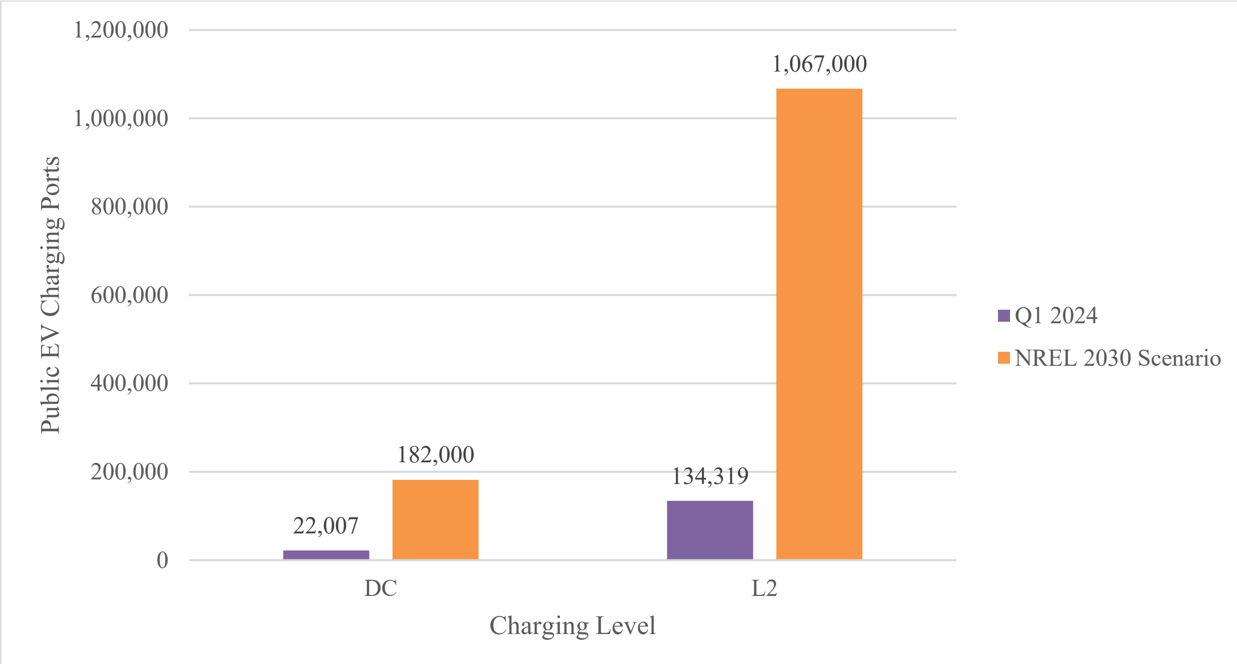

Figure 2. Current availability of public charging (excluding Tesla-only) versus NREL's scenario of 2030 public infrastructure requirements in the United States

By 2030, Wood et al.'s baseline scenario also estimates that there will need to be 0.6 public DC fast EV charging ports and 3.2 public Level 2 EV charging ports per 100 EVs. As of March 31, 2024, there were approximately 4.8 million EVs on the road in the United States (Experian Information Solutions 2024b). In Q1, the ratios of public DC fast and Level 2 EV charging ports per 100 EVs were 0.5 and 2.8, respectively. These ratios include EV charging 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 EV charging 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 Q1, the deployment of public DC fast and Level 2 EV charging ports falls short. However, 14.8% of the projected 33 million light-duty EVs in NREL's analysis were on the road as of Q1. 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 EV charging port installations will need to ramp up significantly to keep up with demand.

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

Port Level	EV Charging Ports per 100 EVs in Q1 2024	EV Charging Ports per 100 EVs Needed in 2030 To Support 33 Million EVs
DC fast	0.5	0.6
L2	2.8	3.2

2 EV Charging Infrastructure Trends

The purpose of this report is to identify EV charging infrastructure trends for Q1 of 2024. In Q1, EV charging ports in the Station Locator increased by 4.6%, or 8,825 ports. Public EV charging ports, which account for most of the EV charging ports in the Station Locator (88.8%), increased by 8,140, or 4.8%, while private EV charging ports increased by 685, or 3.2% (Figure 3). Since the first iteration of this report in Q4 2019, EV charging ports in the Station Locator have grown by nearly 128%.

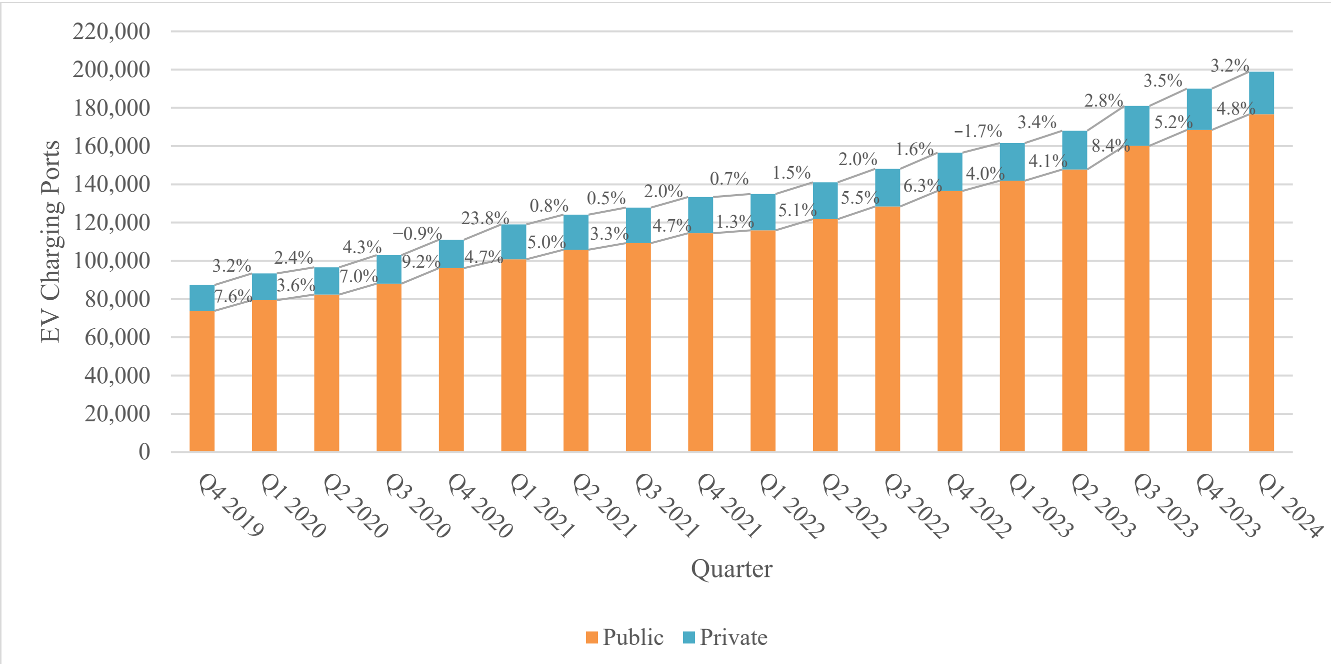

Figure 3. Quarterly growth of EV charging ports by access.

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

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

2.1 Public Charging Trends

As previously mentioned, public EV charging refers to EV charging stations that are available to all EV drivers and located in publicly accessible locations, such as commercial locations or along highway corridors. In Q1 2024, there were 176,592 public EV charging ports in the Station Locator. Between Q4 2023 and Q1 2024, the number of public EV charging ports increased by 4.8%, or 8,140 public EV charging ports. The following sections break down the growth of public EV charging ports by charging level, network, region, state, housing density, and disadvantaged community (DAC) designation.

2.1.1 By Charging Level

As shown in Figure 4, the majority of public EV charging ports in the Station Locator are L2, followed by DC fast and L1. However, in almost every quarter since Q4 2019, DC fast ports have increased by the greatest percentage compared to other charging levels (Figure 4). In line with such trends, public DC fast EV charging ports grew by 8.2% in Q1 2024, representing the addition of 3,152 EV charging ports. The rise in DC fast EV charging ports in Q1 is primarily driven by new station additions in California, which represent 21.4% of new DC fast EV charging ports in the Station Locator. The next largest increases in new DC fast EV charging ports were in Texas, Florida, and Washington, which represent 9.8%, 6.9%, and 4.5% of new DC fast EV charging ports in Q1, respectively. Meanwhile, public Level 2 EV charging ports grew by a smaller percentage (3.8%) between Q4 2023 and Q1 2024, equivalent to the addition of 4,977 ports. Similar to the increase in DC fast charging ports, the rise in public Level 2 EV charging ports was primarily due to new station additions across California, which made up 20.5% of the new public L2 charging ports added to the Station Locator in Q1. Public Level 1 EV charging ports increased marginally by 1.4%, representing the addition of 11 ports (Figure 4).

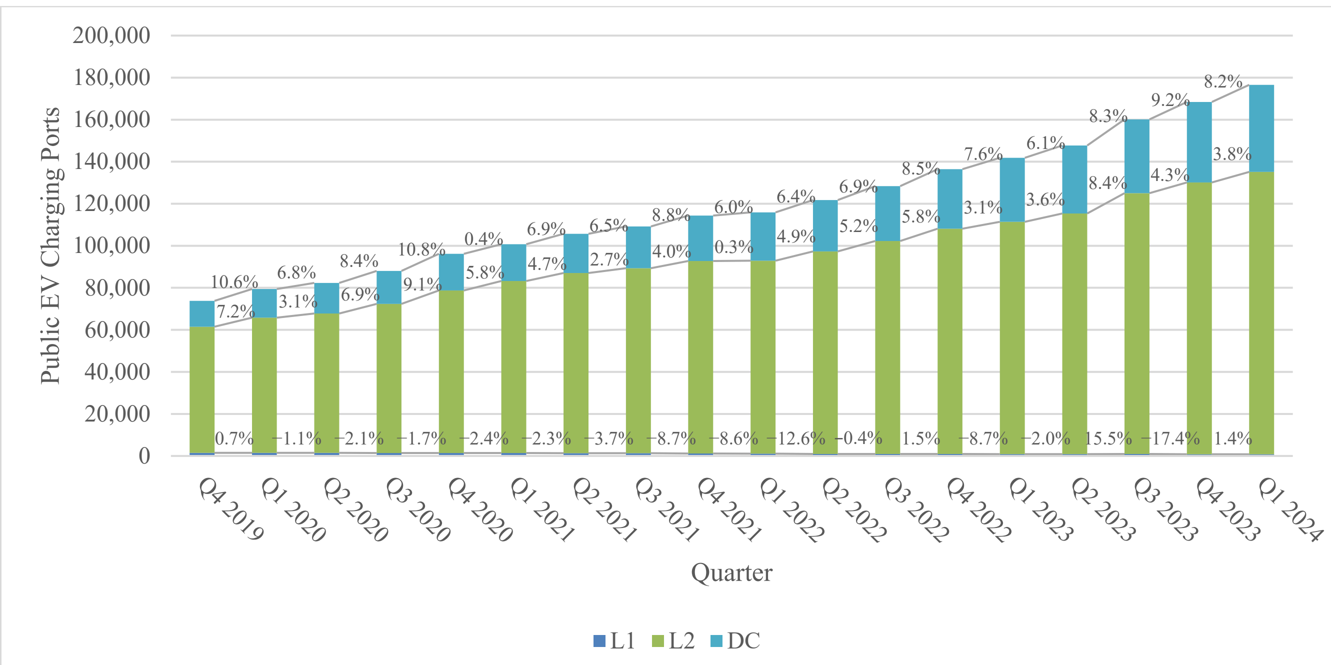

Figure 4. Quarterly growth of public EV charging ports by charging level.

Note: Figure excludes legacy EV charging ports that are not classified by charging level and are no longer manufactured. As of Q1, there were 26 public legacy EV charging 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 EV charging ports, DC fast EV charging 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 EV charging ports in the Station Locator. While Level 1 EV charging ports typically have a power output of around 1–2 kW, and Level 2 EV charging ports can operate at up to 19.2 kW, the power output of DC fast EV charging ports varies and can provide up to 500 kW. The most common power outputs for DC fast EV charging ports are 250 and 349 kW, and the number of DC fast EV charging ports at higher power levels is steadily increasing, as depicted in Figure 5.

It is worth noting that as of Q1, power output data are available for 74.0% of the 41,423 public DC fast EV charging ports in the Station Locator, up from 37.8% of public DC fast EV charging ports in Q4 2019. Thus, Figure 5 is based on power output data for 30,647 DC fast EV charging ports.[11] Additionally, if a DC fast EV charging port has two connectors with different power outputs, only the maximum power output is counted in Figure 5.

Figure 5 showcases the notable increase (19.3%) in the quantity of DC fast EV charging ports with a power output between 150 kW and 249 kW in Q1. These new stations were added across more than a dozen networks, though primarily on the EV Connect, Electrify America, and Shell Recharge networks in California. Across all EV charging networks, the states that saw the next largest increase in DC fast EV charging ports with a power output between 150 and 249 kW were Washington, Florida, and Colorado.

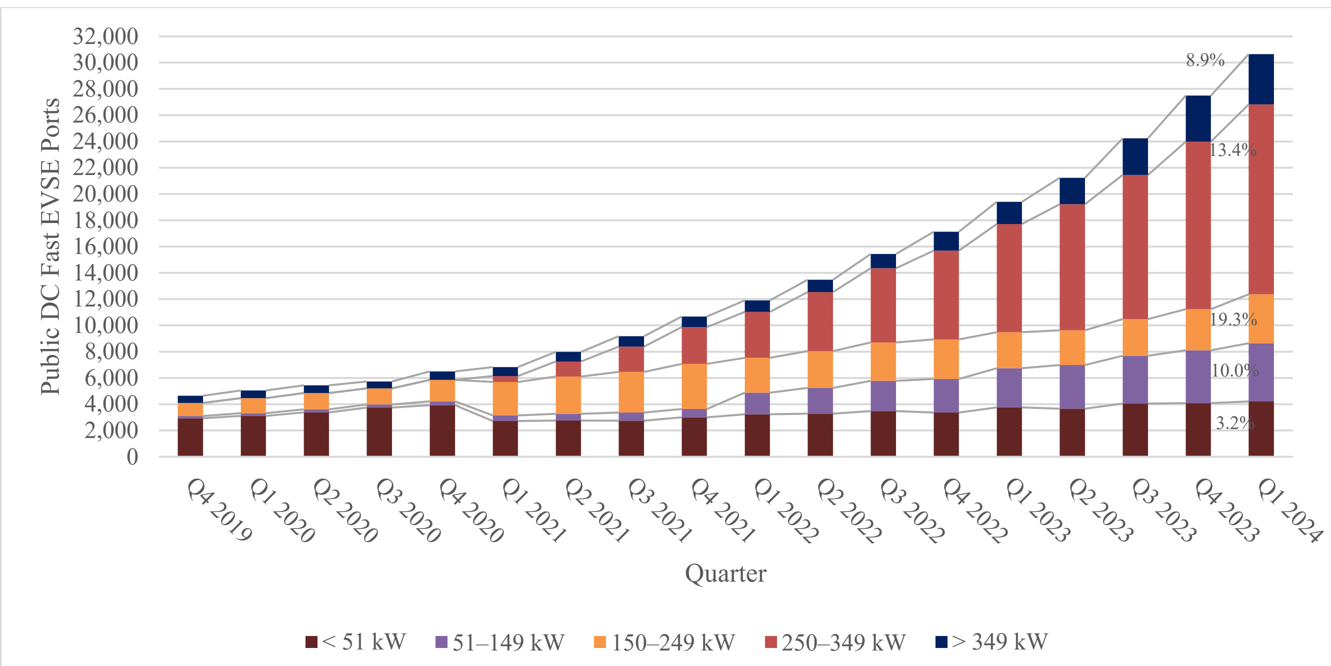

Figure 5. Quarterly growth of public DC fast EV charging ports by power output.

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).

[11] The remaining 26.0% of public DC fast EV charging ports are primarily on the Tesla Supercharger network or are non-networked. The Station Locator team is working to close this gap by requesting these data from Tesla and site hosts of non-networked stations.

There are currently three types of connectors available for DC fast chargers: CHAdeMO, CCS, and J3400. 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 J3400 connector without the use of an adaptor. However, the EV industry has announced plans for widespread adoption of the J3400 connector, and many model year 2025 EV models will be manufactured with the J3400 standard (Joint Office of Energy and Transportation 2024b). Tesla has launched the Magic Dock at several Tesla Supercharger stations, which allows non-Tesla vehicles with the CCS standard to charge at Tesla Superchargers. Additionally, 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 J3400 connectors this year. 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 March 31, 2024, approximately 63% of registered all-electric vehicles in the United States were Teslas and therefore compatible with the J3400 connector, 33% were compatible with the CCS connector, and 4% were compatible with the CHAdeMO connector (Experian Information Solutions 2024b).[12] Of the 49,089 DC fast connectors in the Station Locator as of Q1, CCS connectors grew by the largest percentage (11.5%), followed by J3400 connectors (6.9%) (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 (5.4%) in Q1. 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. Between Q4 2019 and Q1 2024, the share of DC fast connectors that were CHAdeMO in the Station Locator declined from 22.1% to 17.4%.

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

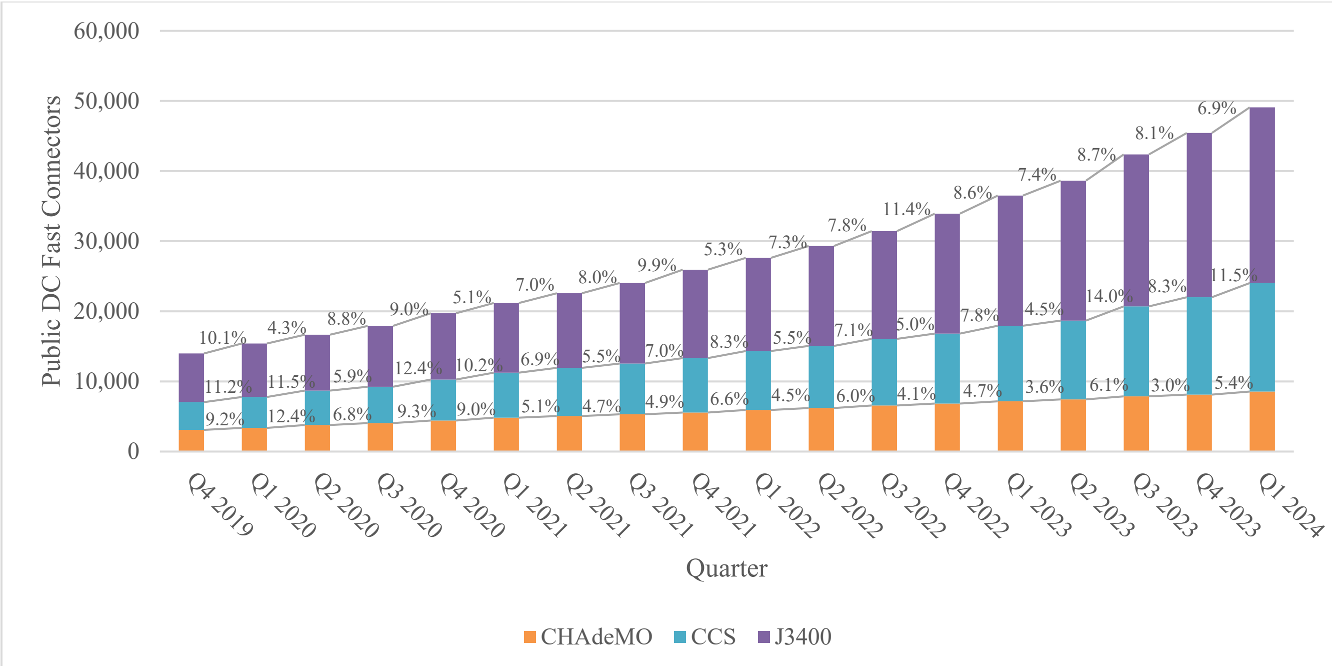

Figure 6. Quarterly growth of public DC fast connectors by type.

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

2.1.2 By Network

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 Q1, the Station Locator incorporates stations from the 47 networks listed below, 16 of which update nightly through an API (marked with asterisks). Six networks were added to the Station Locator in Q1: BP Pulse, ChargeNet, EVBOLT, eV Power, Honey Badger, and TurnOnGreen. In addition, the Station Locator contains non-networked (NON) station data, which includes stations that were previously networked.

- 7Charge (7CHARGE)
- AmpedUp! Networks (AMPED_UP)
- AmpUp (AMPUP)
- Blink (BN)*
- BP Pulse (BP_PULSE)*
- ChargeNet (CHARGENET)
- ChargeLab (CHARGELAB)
- ChargePoint (CPN)*
- ChargeUp (CHARGEUP)*
- Chargie (CHARGIE)
- Circle K (CIRCLE_K)
- Electrify America (EA)*
- EnviroSpark (ENVIROSPARK)
- EVBOLT (EVBOLT)
- EV Charging Solutions (EVCS)
- EV Connect (EVC)*
- EV Range (EVRANGE)*
- EvGateway (EVGATEWAY)
- EVgo (EVN)*
- EVmatch (EVMATCH)
- eV Power (EVPOWER)
- FLASH (FLASH)*
- FLO (FLO)*
- FPL EVolution (FPLEV)
- Francis Energy (FCN)*
- Graviti Energy (GRAVITI_ENERGY)
- Honey Badger (HONEY_BADGER)
- Jule (JULE)

- Livingston Energy Group (LIVINGSTON)
- Loop (LOOP)
- Noodoe (NOODOE)
- OpConnect (OC)*
- PowerFlex (POWERFLEX)
- PowerNode (POWER_NODE)
- Red E Charging (RED_E)
- Revel (REVEL)
- Rivian Adventure Network (RIVIAN_ADVENTURE)*
- Rivian Waypoints (RIVIAN_WAYPOINTS)*
- Shell Recharge (SHELL_RECHARGE)*
- Stay-N-Charge (STAY_N_CHARGE)
- SWTCH Energy (SWTCH)
- Tesla Destination (TESLAD)
- Tesla Supercharger (TESLA)
- TurnOnGreen (TURNONGREEN)
- Universal EV Chargers (UNIVERSAL)
- Volta (VLTA)*
- ZEF Energy (ZEFNET)

In line with preceding quarters, the ChargePoint network maintained its position as the network with the most public EV charging ports in the Station Locator in Q1, with 67,487 EV charging ports, or 38.2% of all EV charging ports in the Station Locator. Level 2 EV charging ports continue to comprise most of ChargePoint's network (95.5%). The pattern of Level 2 EV charging ports comprising the majority of the overall share of ports is observed across various networks in the Station Locator, with the exception of the 7Charge, BP Pulse, ChargeNet, ChargeUp, Circle K, Electrify America, EVgo, eV Power, Francis Energy, FPL EVolution, Jule, PowerNode, Rivian Adventure Network, Revel, and Tesla Supercharger networks (Figure 7). These networks are predominantly, if not completely, made up of DC fast EV charging ports. In Q1, the Tesla Supercharger network continued to make up the largest share of public DC fast EV charging ports across the networks in the Station Locator (60.4%), followed by Electrify America (10.0%), EVgo (7.7%), and ChargePoint (7.2%) (Figure 8).

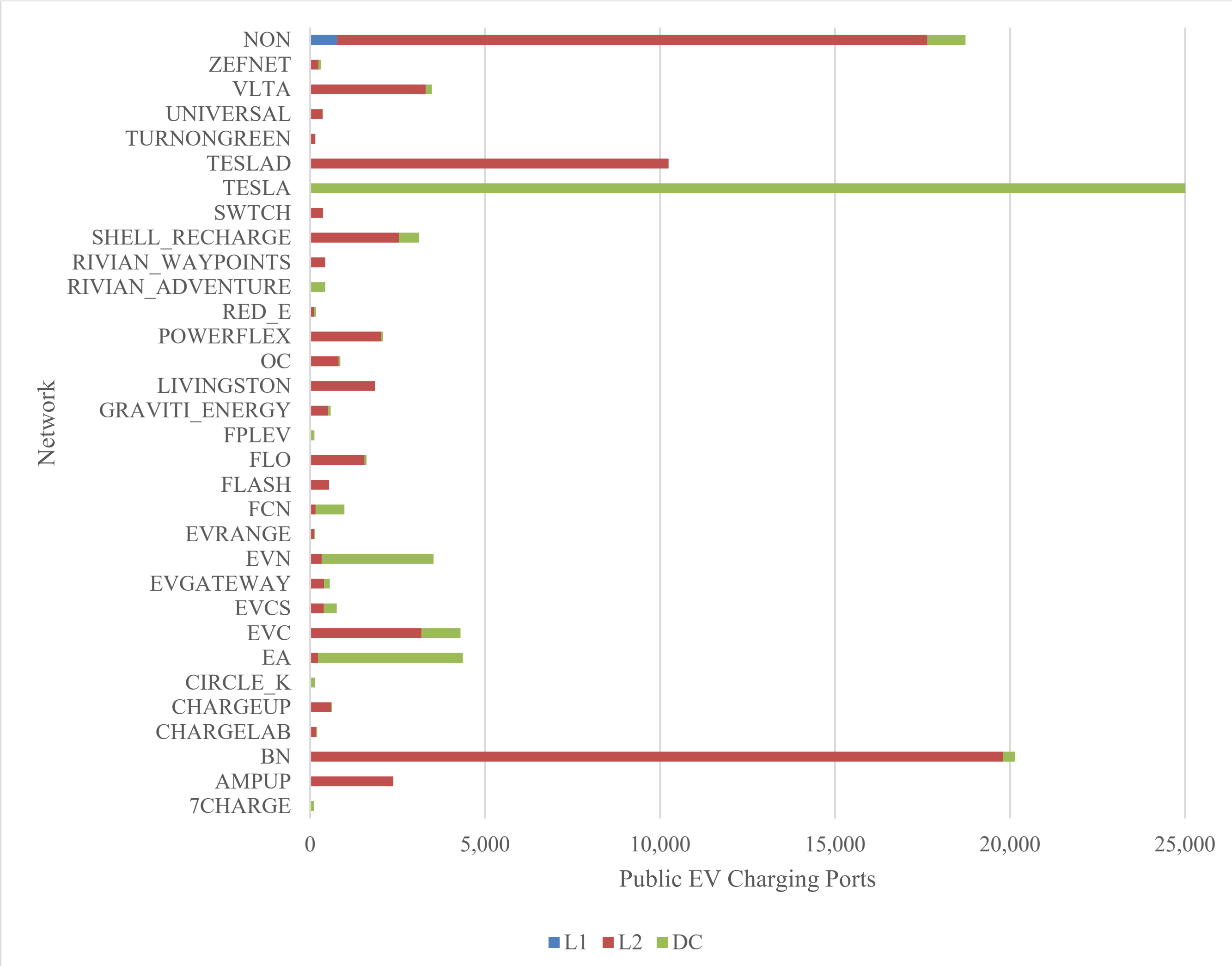

Figure 7. Breakdown of public EV charging ports by network and charging level in Q1 2024.

Note: ChargePoint is excluded from this figure. The size of its network is much larger than others and therefore skews the graph. Further, this graph only includes charging networks with more than 100 EV charging ports in the Station Locator.

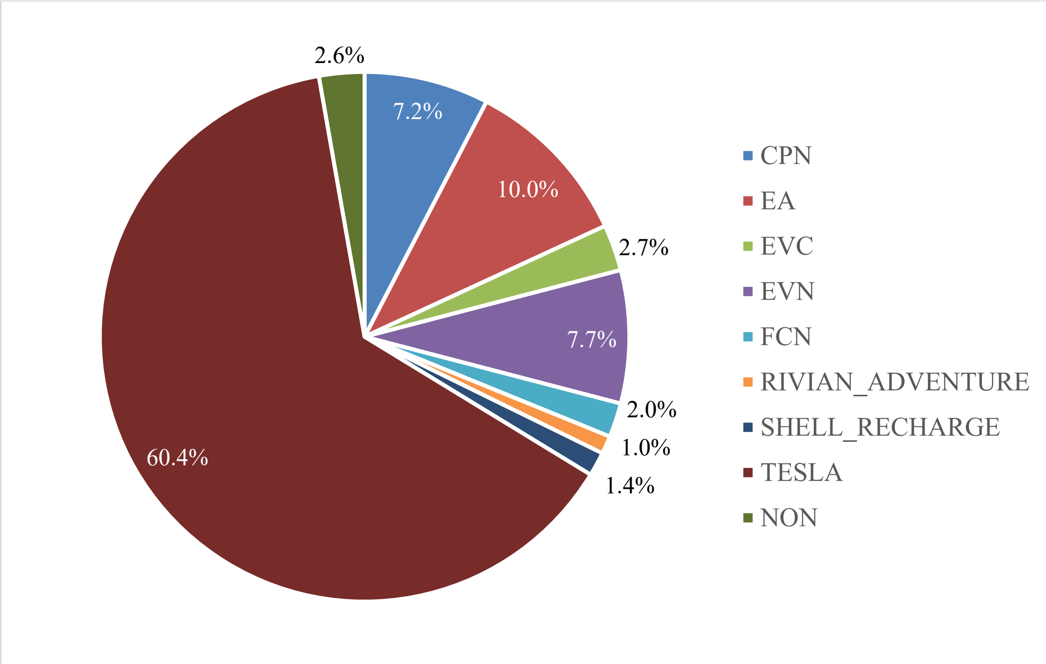

Figure 8. Breakdown of public DC fast EV charging ports by network in Q1 2024.

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

Table 2 presents the percent growth of each network over the last four quarters. The EnviroSpark and Stay-N-Charge networks experienced the most growth in Q1 (100%). However, this growth only represents the addition of two and four EV charging ports, respectively, as the number of EV charging ports on these networks in the Station Locator is currently small. The SWTCH Energy network saw the next largest growth in EV charging ports (68.6%), representing the addition of 151 new EV charging ports.

The expansion of numerous other networks in Q1 2024 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 SWTCH Energy (68.6%), EvGateway (53.0%), and PowerFlex (31.3%) networks. These networks saw the highest percentage increases in EV charging ports after EnviroSpark and Stay-N-Charge.

In contrast, there was a decrease in the number of public EV charging ports in Q1 among the EVmatch (−32.4%) and Shell Recharge (−1.7%) networks. These decreases can be attributed to the removal of 36 and 92 Level 2 EV charging ports from the Station Locator, respectively. However, Shell Recharge added 37 new DC fast EV charging ports to the Station Locator in Q1.

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

Network	Q2 2023 Growth	Q3 2023 Growth	Q4 2023 Growth	Q1 2024 Growth
7CHARGE	N/A	43.5%	15.2%	35.5%
AMPUP	11.2%	1.1%	24.7%	1.4%
AMPED_UP	N/A	0.0%	0.0%	0.0%
BN	9.8%	238.5%	2.8%	4.8%
BP PULSE	N/A	N/A	N/A	N/A
CHARGELAB	40.2%	2.3%	14.3%	0.0%
CHARGENET	N/A	N/A	N/A	N/A
CHARGEUP	0.0%	255.6%	1,825.0%	1.3%
CHARGIE	N/A	0.0%	0.0%	0.0%
CIRCLE_K	333.3%	46.2%	26.3%	50.0%
CPN	3.4%	4.0%	3.7%	4.0%
EA	−3.9%	12.1%	4.3%	1.6%
ENVIROSPARK	N/A	N/A	N/A	100%
EVBOLT	N/A	N/A	N/A	N/A
EVC	10.5%	6.1%	5.5%	7.2%
EVCS	23.9%	11.4%	3.3%	0.0%
EVGATEWAY	4.0%	7.8%	1.7%	53.0%
EVMATCH	N/A	N/A	−1.8%	−32.4%
EVN	3.0%	−0.4%	8.2%	6.6%
EVPOWER	N/A	N/A	N/A	N/A
EVRANGE	61.2%	62.0%	5.5%	3.0%
FCN	1.8%	−19.2%	81.2%	0.5%
FLASH	331.9%	−51.0%	25.2%	40.8%
FLO	26.3%	7.7%	9.3%	13.0%
FPLEV	5.2%	0.0%	4.9%	42.4%
GRAVITI_ENERGY	258.8%	141.4%	−1.4%	0.7%
HONEY_BADGER	N/A	N/A	N/A	N/A
JULE	N/A	N/A	0.0%	0.0%
LIVINGSTON	1.1%	1.4%	−0.3%	27.1%
LOOP	N/A	N/A	200.0%	3.0%
NOODOE	N/A	2,000.0%	128.6%	8.3%
OC	−2.9%	−9.1%	9.8%	2.5%
POWER_NODE	N/A	N/A	N/A	0.0%
POWERFLEX	3.0%	0.9%	13.2%	31.3%

Network	Q2 2023 Growth	Q3 2023 Growth	Q4 2023 Growth	Q1 2024 Growth
RED_E	10.8%	17.1%	61.5%	7.1%
REVEL	N/A	N/A	0.0%	0.0%
RIVIAN_ADVENTURE	82.1%	36.2%	26.2%	12.5%
RIVIAN_WAYPOINTS	14.4%	12.2%	40.4%	16.3%
SHELL_RECHARGE	−5.5%	11.9%	0.4%	−1.7%
STAY_N_CHARGE	N/A	N/A	N/A	100%
SWTCH	55.8%	26.4%	17.6%	68.6%
TESLA	7.4%	8.6%	8.1%	6.9%
TESLAD	0.5%	0.2%	0.7%	1.7%
TURNONGREEN	N/A	N/A	N/A	N/A
UNIVERSAL	27.7%	2.5%	9.2%	32.6%
VLTA	1.0%	2.3%	6.6%	1.8%
ZEFNET	13.5%	46.0%	7.4%	11.2%
NON	1.4%	0.6%	1.8%	0.0%
Total	**4.1%**	**8.4%**	**5.2%**	**4.8%**

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 and Communities coalition network (Figure 9) (Clean Cities and Communities Coalition Network 2024a). See the Q1 2020 report for more information about the Clean Cities and Communities coalition network (Brown et al. 2020).

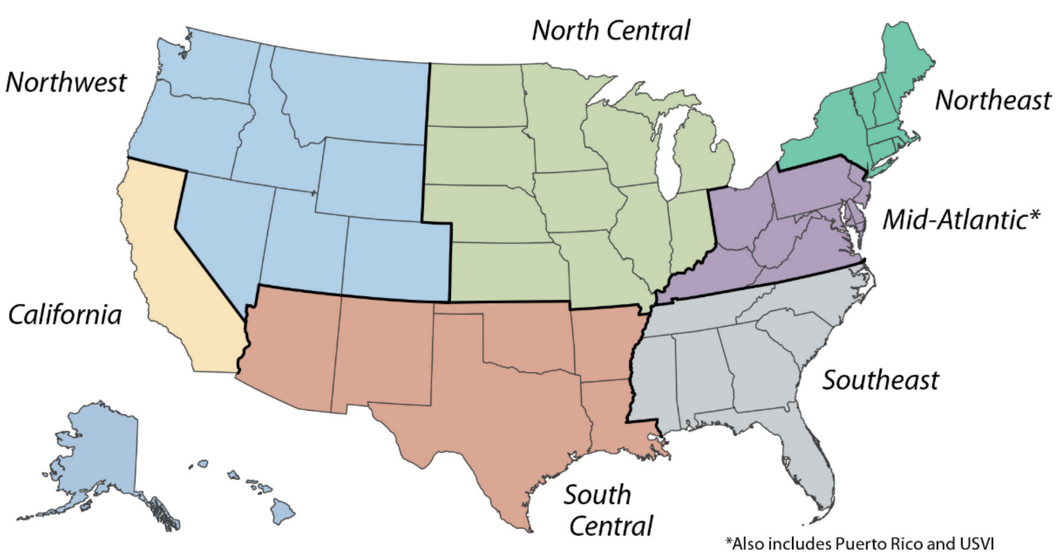

Figure 9. Clean Cities and Communities regions.

Source: Clean Cities and Communities Coalition Network (2024b)

As depicted in Figure 10, the California region still maintains the largest share of the country's public EV charging ports (26.7%). In Q1, the Northeast region exhibited the most substantial percentage growth from Q4 2023 (6.9%), but the California region grew the most based on the actual number of new EV charging ports (1,696). Growth in California is mainly attributed to new L2 installations on the ChargePoint, Blink, and Shell Recharge networks, along with the addition of DC fast EV charging port installations on the ChargePoint and Tesla Supercharger networks. Similarly to Q4 2023, the expansion of public DC fast EV charging ports in Q1 2024 outpaced that of Level 2 EV charging ports in all Clean Cities and Communities regions (Clean Cities and Communities Coalition Network 2024b) (Table 3).

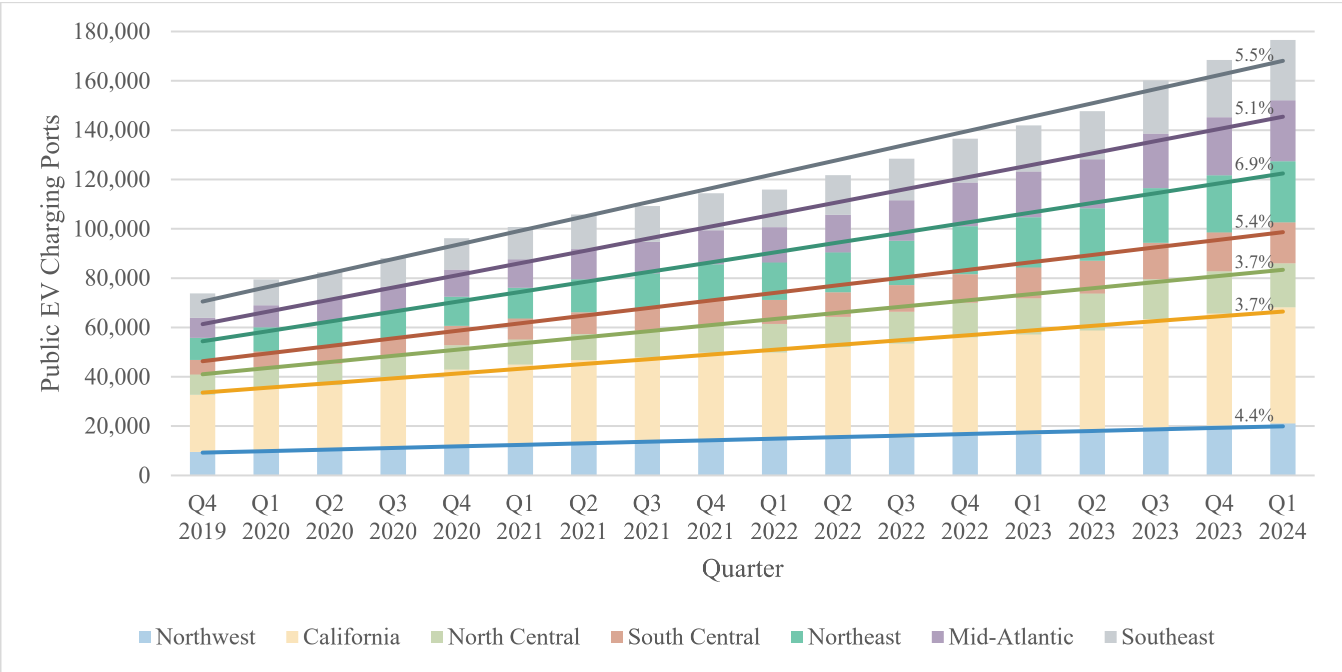

Figure 10. Quarterly growth of public EV charging ports by Clean Cities and Communities region.

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

Table 3. Growth of Public L2 and DC Fast EV Charging Ports by Clean Cities and Communities Region in Q1 2024

Clean Cities and Communities Region	Level 2 EV Charging Port Growth	DC Fast EV Charging Port Growth
California	3.0%	6.4%
Mid-Atlantic	4.1%	8.4%
North Central	2.7%	6.8%
Northeast	6.4%	9.6%
Northwest	2.5%	11.4%
Southeast	4.3%	9.5%
South Central	4.2%	8.3%

2.1.4 By State

To track the growth of EV charging ports by state, the Station Locator team calculated the number of public EV charging 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 registration data are based on Experian's registration information as of Dec. 31, 2023 (Experian Information Solutions 2024a).

In Q1, Rhode Island, Connecticut, Montana, Georgia, and South Carolina were the five states with the most significant percentage growth of EV charging ports per 100 EVs, all surpassing the growth rate of the United States as a whole (4.8%) (Table 4). The growth seen in Rhode Island is largely due to new Level 2 EV charging port installations on the ChargePoint and FLASH networks, while the growth in Connecticut was driven by new Level 2 EV charging port installations on a variety of networks, most notably ChargePoint and FLO. Finally, the growth in Montana is largely due to new installations on both the Tesla Supercharger and Tesla Destination networks.

Table 4. Top Five States With the Largest Growth of EV Charging Ports per 100 EVs in Q1 2024.[13]

State	EV Charging Ports per 100 EVs in Q4 2023	EV Charging Ports per 100 EVs in Q1 2024	Growth of EV Charging Ports per 100 EVs in Q1 2024
Rhode Island	7.1	7.9	12.6%
Connecticut	4.7	5.3	11.7%
Montana	5.4	6.0	11.3%
Georgia	4.8	5.2	8.9%
South Carolina	4.8	5.2	7.7%

2.1.5 By Housing Density

To better understand where EV charging infrastructure is being deployed, the Station Locator team analyzed the growth of EV charging 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 account for only approximately 1.3% of the United States' land area, whereas suburban and rural tracts account for 6.2% and 92.6%, respectively.

As shown in Figure 11, public EV charging ports are predominantly located in suburban census tracts, followed by urban and rural tracts. DC fast EV charging ports showed the largest growth by percentage across all density categories compared with Level 2 EV charging ports, while Level 1 EV charging ports stagnated in suburban and rural areas and increased moderately in

[13] See Appendix A for the growth of EV charging ports per 100 EVs in all states in Q1.

urban areas. DC fast EV charging ports grew by the largest percentage in suburban areas (8.7%), followed by urban and rural areas (7.4% and 6.5%, respectively).

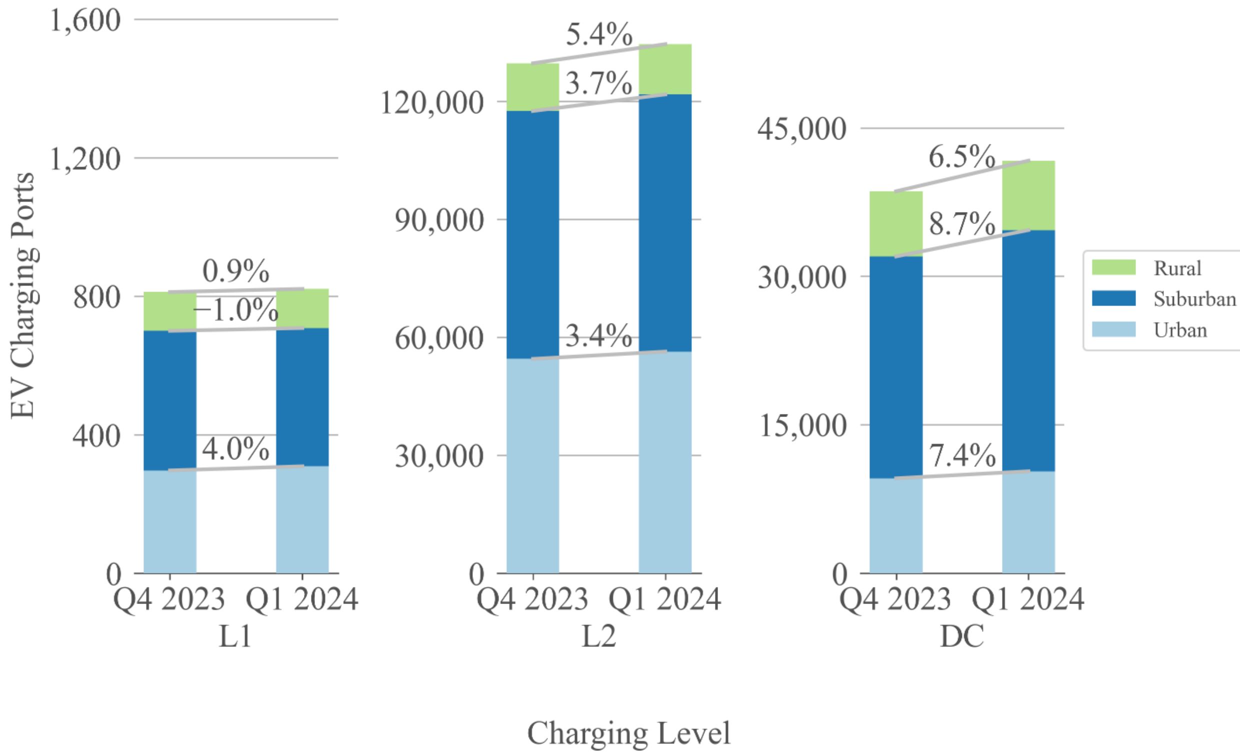

Figure 11. Q1 2024 growth of public EV charging ports by neighborhood type and charging level.

Note: These graphs are not to scale.

2.1.6 By DAC Designation

"Executive Order 14008: Tackling the Climate Crisis at Home and Abroad," issued in 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. 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 DACs. This section focuses on the growth of EV charging 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.

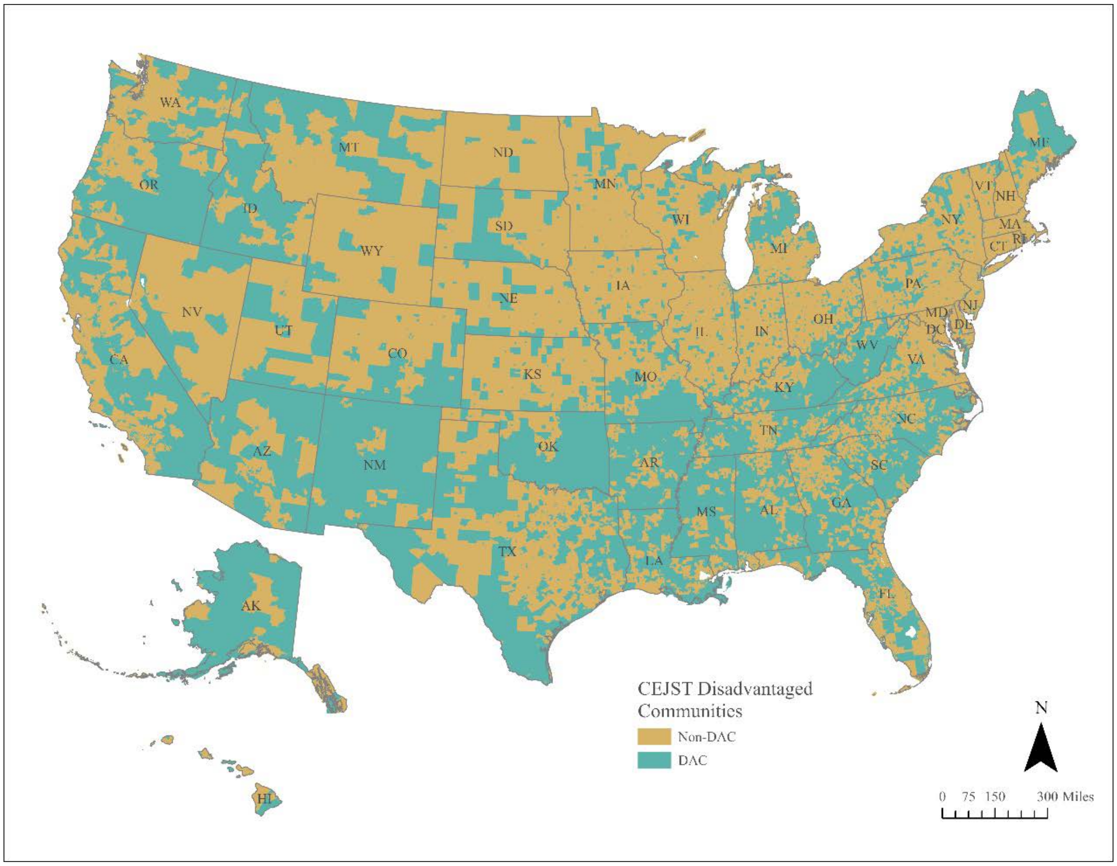

Figure 12. DACs across the United States.

Note: Alaska and Hawaii are not to scale.

The Station Locator team used the Council on Environmental Quality's Climate and Economic Justice Screening Tool for this section of the analysis. GIS shapefiles with these data are hosted by the Council on Environmental Quality (2024). The DAC shapefile was prepared by aggregating several social, economic, and environmental features into a spatial dataset. The data used by this analysis account for census tract-level indicators under several categories of burdens: climate change, energy, health, housing, legacy pollution, transportation, workforce development, and water and wastewater.

Overall, 24.2% of public EV charging ports across all charging levels are in DACs, in line with 24.2% from the previous quarter. As shown in Figure 13, the growth of DC fast and Level 2 EV charging ports in non-DACs slightly outpaced growth in DACs. There was a slight increase of L1 ports in both DACs and non-DACs.

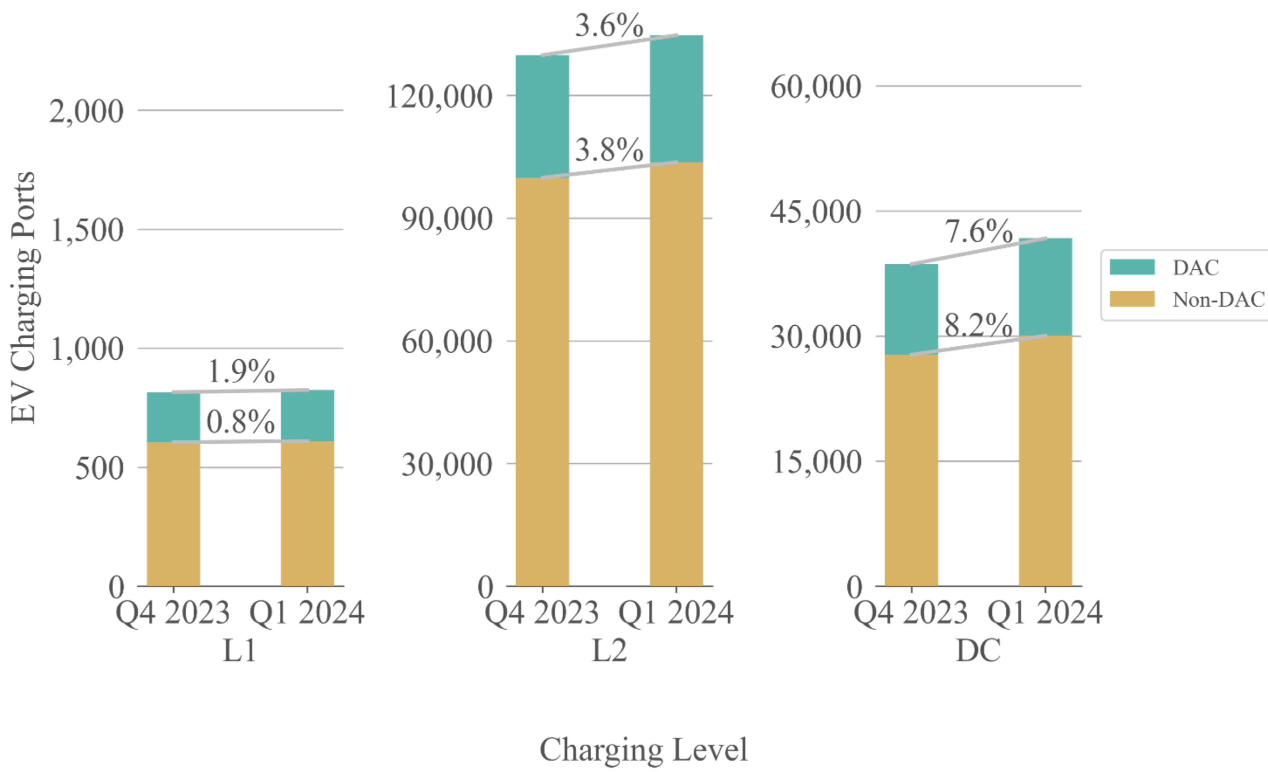

Figure 13. Q1 2024 growth of public EV charging ports by DAC designation and charging level.

Note: These graphs are not to scale.

2.2 Private Charging Trends

In Q1 2024, the number of private EV charging ports in the Station Locator experienced a 3.2% increase compared to the preceding quarter. Specifically, between Q4 2023 and Q1 2024, private EV charging ports increased from 21,620 to 22,305. The following sections break down the growth of private EV charging 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 charging stations may not necessarily be shared publicly. The Station Locator team therefore relies on Clean Cities and Communities 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

The vast majority of private EV charging ports in the Station Locator are L2, comprising 88.0% of all private EV charging ports (Figure 14). In Q1, the growth of private EV charging ports was driven primarily by the addition of 671 Level 2 EV charging ports, representing an increase of 3.5% (Figure 14). More than half of the new private Level 2 EV charging ports were installed on the Livingston Energy Group network, and the majority of these were in Connecticut and New York. Although private Level 2 EV charging ports grew by the largest number of new installations in Q1, private DC fast EV charging ports grew by the largest percentage (18.9%), representing the addition of 71 EV charging ports. This increase was primarily driven by a large update provided by Nissan, which resulted in the addition of 58 private DC fast EV charging ports at Nissan dealerships to the Station Locator. Meanwhile, Level 1 EV charging ports decreased by 57, or 2.5%.

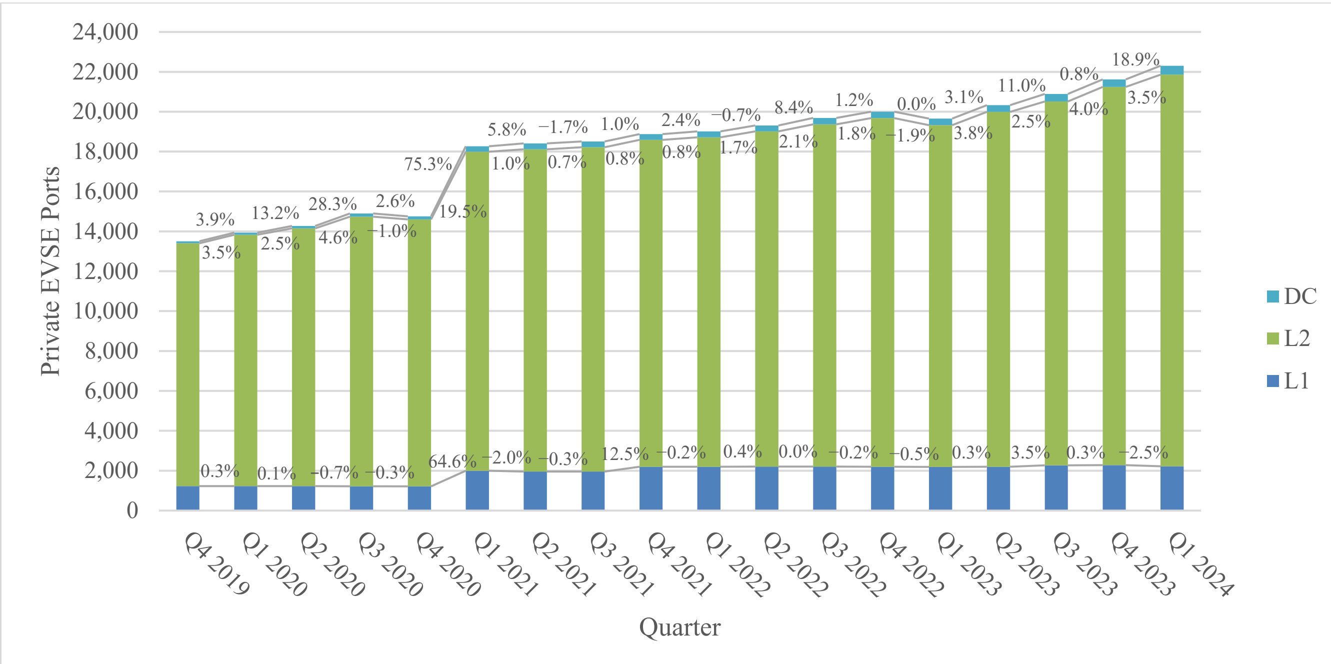

Figure 14. Quarterly growth of private EV charging ports by charging level.

Note: Figure excludes legacy EV charging ports that are not classified by charging level and are no longer manufactured. As of Q1, there were two private legacy EV charging 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 EV charging 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 vast majority (95.4%) of private workplace EV charging ports are L2 (Figure 15). This is expected because employees typically use workplace chargers while their vehicles are parked for an extended period at work, making rapid charging less necessary. As previously noted, data on private workplace charging ports in the Station Locator are likely underrepresented.

In Q1, 91 Level 2 EV charging ports were added to the Station Locator, representing a growth rate of 0.9% (Figure 15). New private workplace Level 2 EV charging ports were added across California, Massachusetts, Utah, Colorado, Arizona, New York, Pennsylvania, and Virginia. The majority of the newly added Level 2 EV charging ports were either non-networked or affiliated with the ChargePoint and SWTCH Energy networks. Meanwhile, 12 private workplace DC fast charging EV charging ports were added to the Station Locator, representing a growth rate of

15.4% and bringing the total number of DC fast EV charging ports to 90. Almost all of the Q1 additions (10) are located on the University of California San Diego's campus and are on the PowerFlex network. Finally, Level 1 EV charging saw a decrease of 42 EV charging ports, or 9.3%.

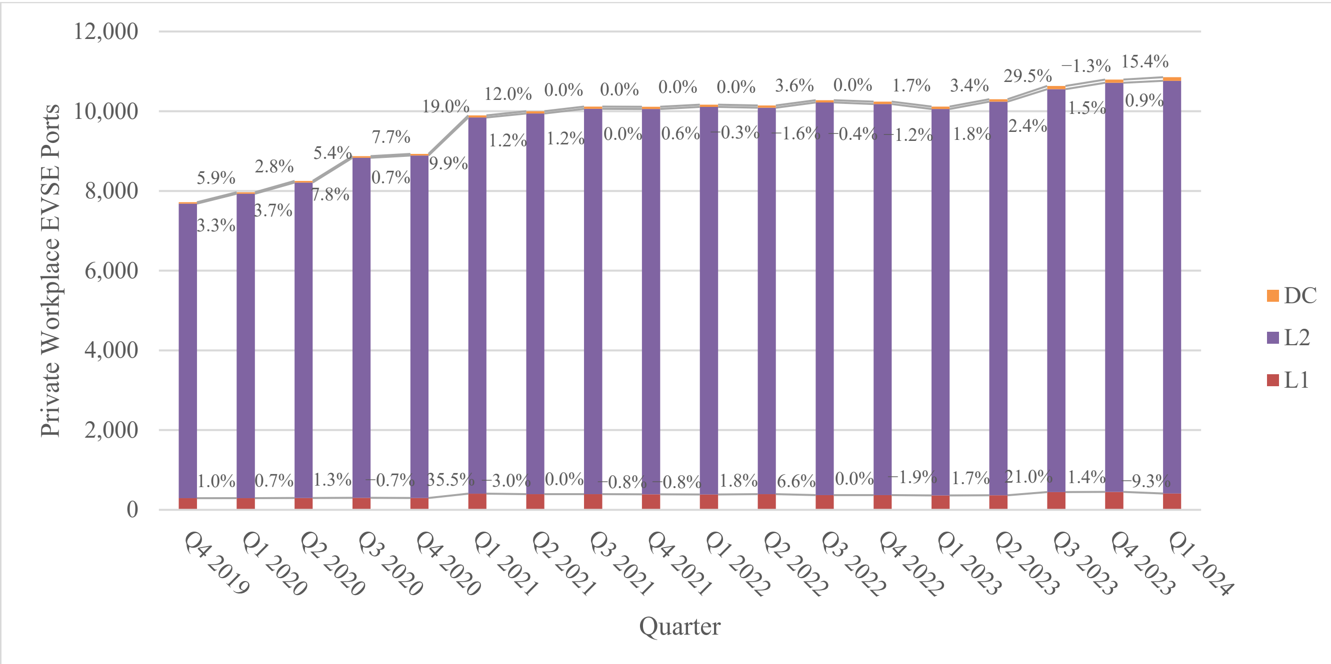

Figure 15. Quarterly growth of private workplace EV charging ports by charging level.

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 prioritize capturing private charging infrastructure installed at multifamily housing that is available for resident use only. As of Q1, EV charging ports at multifamily housing constitute 11.0% of private EV charging ports in the Station Locator. As shown in Figure 16, multifamily housing EV charging ports in the Station Locator are either L1 or L2, with the overwhelming majority (99.3%) being L2. While the number of L1 multifamily housing EV charging ports remained unchanged between Q4 2023 and Q1 2024, L2 multifamily EV charging ports increased by 20.1% (Figure 16). This growth is attributed to the addition of 408 new Level 2 EV charging ports, primarily in New York and Connecticut.

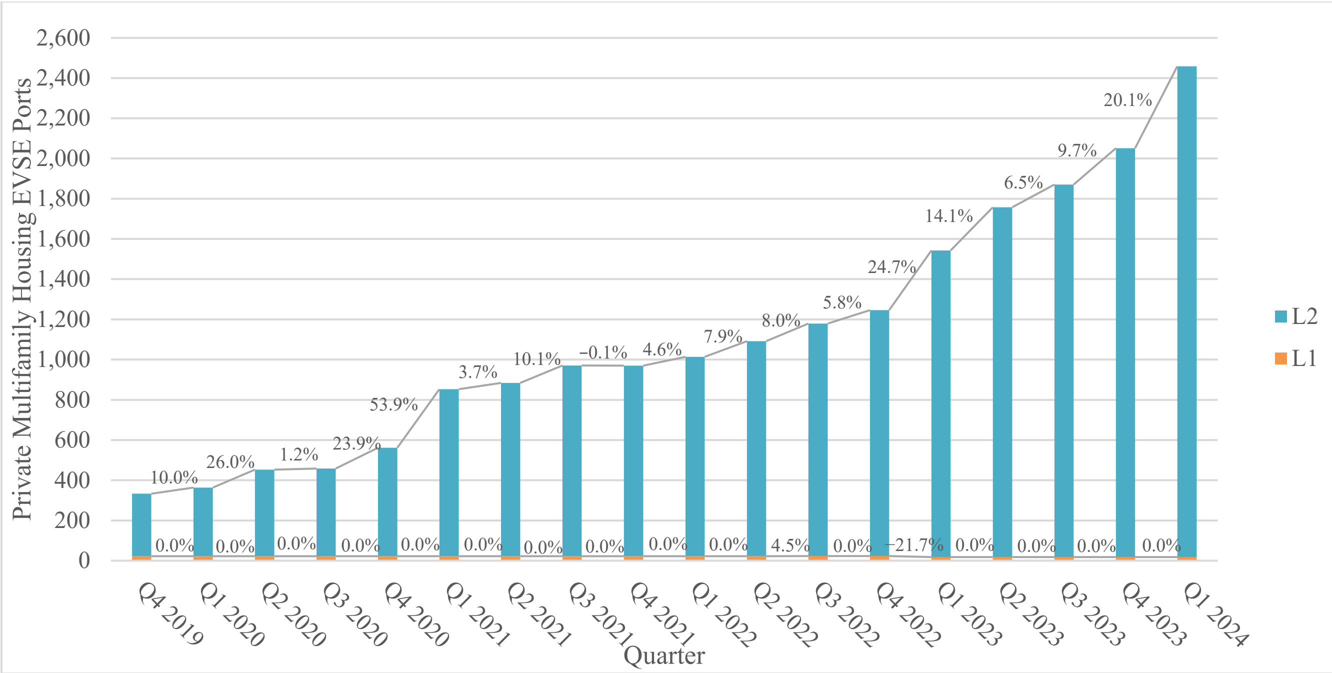

Figure 16. Quarterly growth of private multifamily housing EV charging ports by charging level.

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 through outreach to station owners and operators. If they are, the team categorizes the types of vehicles that charge at the station based on Federal Highway Administration weight classes (i.e., light-duty, medium-duty, or heavy-duty vehicles). As of Q1 2024, the team has collected this information for 87.1% of private EV charging ports in the Station Locator, of which 37.3% are being used for fleet-charging purposes. Note that some fleet EV charging ports are also used by employees and are therefore counted as workplace EV charging ports in Section 2.2.2 as well.

Figure 17 displays the breakdown of these EV charging ports by fleet type and charging level. The fleet type indicates the largest vehicle type that uses the station as of Q1 based on the types of vehicles in the fleet, though smaller vehicle types may charge at the station as well. The majority of EVs on the road are light-duty vehicles, such as sedans, SUVs, and pickup trucks; unsurprisingly, the majority of fleet-charging EV charging ports are used to charge light-duty vehicles (Figure 17). Additionally, the majority of fleet-charging EV charging ports are L2 (74.5%).

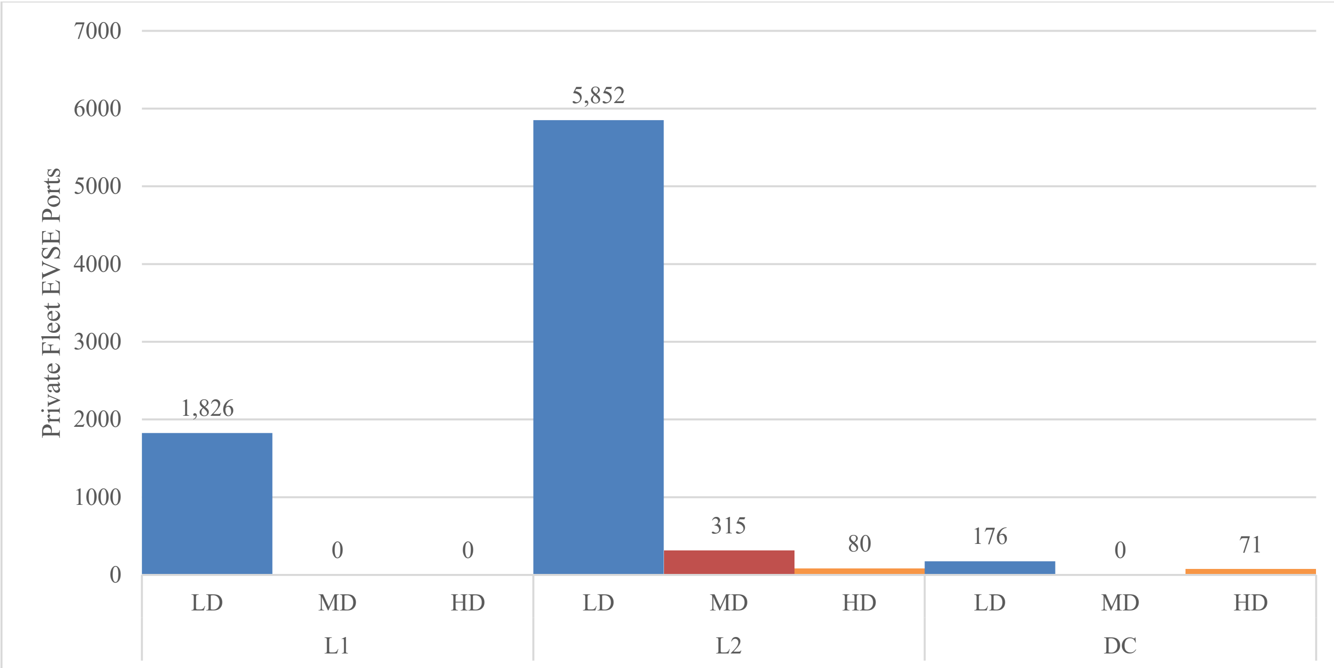

Figure 17. Breakdown of private fleet EV charging ports by charging level and fleet type in Q1 2024.

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

2024 kicked off with a number of substantial funding initiatives geared toward expanding the country's EV charging infrastructure. First, the Joint Office of Energy and Transportation celebrated the inauguration of additional stations funded by the NEVI Formula Grant Program across the United States, including in Hawaii, Maine, and Pennsylvania, following Ohio's inaugural NEVI-funded EV charging station last quarter (Joint Office of Energy and Transportation 2024a).

Second, the Bipartisan Infrastructure Law's Charging and Fueling Infrastructure Discretionary Grant Program allocated $623 million to 22 states and Puerto Rico, facilitating the development of 47 EV charging and alternative fuel infrastructure projects (Federal Highway Administration 2024a). These projects are strategically aimed at filling infrastructure gaps, particularly in underserved areas, contributing toward the Biden administration's Justice40 Initiative that aims for 40% of federal investment benefits to reach DACs (U.S. Department of Transportation 2024).

Third, the NEVI Formula Program set aside 10% of its funds, reserved for the secretary of transportation, to assist states in enhancing their EV charging infrastructure (Federal Highway Administration 2024b). This funding has kickstarted the Electric Vehicle Charger Reliability and Accessibility Accelerator Program, distributing $150 million across 20 states to enhance approximately 4,500 existing EV charging ports, an essential stride toward the goal of developing 500,000 EV charging stations nationwide by 2030.

Building on this momentum, the Biden-Harris administration launched the first-ever national strategy to accelerate the deployment of zero-emission infrastructure for freight trucks, highlighting a strategic approach to decarbonize the freight sector (DOE 2024). Central to this strategy is the designation of new national EV freight corridors by the Federal Highway Administration. These corridors, identified along the National Highway Freight Network and other critical roadways, are crucial for establishing a convenient and reliable EV charging network tailored for medium- and heavy-duty vehicles. The strategy is structured to unfold in four phases from 2024 to 2040, starting with establishing priority hubs based on freight volumes and culminating in linking regional corridors for nationwide access. This approach not only aims to improve air quality and public health in communities affected by diesel emissions, but also aligns with economic and environmental objectives by fostering clean commerce and supporting the national goal of net-zero emissions by 2050.

Furthering national efforts to support medium- and heavy-duty electrification, the U.S. Environmental Protection Agency selected 67 applicants to receive nearly $1 billion through its Clean School Bus Program, aiding 280 school districts in acquiring more than 2,700 clean school buses to significantly reduce transportation-related emissions (U.S. Environmental Protection Agency 2024). Meanwhile, the Federal Transit Administration unveiled nearly $1.5 billion in funding to help modernize transit fleets with low- and no-emission buses, financed by the Bipartisan Infrastructure Law (Federal Transit Administration 2024). As school districts and transit agencies transition to electric fleets, it is anticipated that there will be a corresponding increase in private EV charging infrastructure.

In terms of fleet electrification, a notable milestone was achieved by the U.S. Postal Service (USPS) with the unveiling of its first EV charging stations at its South Atlanta Sorting and Delivery Center (USPS 2024). This marks the start of a significant initiative to outfit centers across the nation to support a fleet of more than 66,000 USPS electric delivery vehicles, as part of the $40 billion Delivering for America plan. The initiative is bolstered by the Inflation Reduction Act, highlighting the USPS's role in leading the federal shift toward sustainable technology.

To support the growth and address common challenges in EV charging, the National Charging Experience (ChargeX) Consortium[14] published a new report, *Best Practices for Payment Systems at Public Electric Vehicle Charging Stations*, which delves into various payment methods and offers solutions to issues such as networks, integration, hardware robustness, customer experience, and maintenance (Moriarty and Smart 2024).

State initiatives also made headlines in Q1, with the California Energy Commission approving a $1.9 billion plan to significantly expand the state's EV charging infrastructure (California Energy Commission 2024). This plan aims to add 40,000 new chargers in the state as part of a larger goal to establish a statewide network of 250,000 public chargers.

Transitioning from these state and federal advancements, a new collaborative venture named IONNA, formed by automotive giants BMW, General Motors, Honda, Hyundai, Kia, Mercedes-Benz, and Stellantis, has emerged to further transform North America's electric transportation landscape (IONNA 2024). IONNA aims to deploy at least 30,000 renewable and high-powered chargers across the continent, beginning this year. This network will feature charging stations outfitted with both J3400 and CCS connectors, and will enhance the user experience by integrating amenities such as restrooms, food service, and retail operations nearby.

Finally, the Station Locator data collection and management processes will continue to impact future EV charging 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, EV charging ports, and connectors (EVRoaming Foundation 2020). The Station Locator therefore counts the number of EV charging ports at each station location. As of Q1, all manually collected data, as well as EV charging ports on the Blink, BP Pulse, ChargePoint, ChargeUp, Electrify America, EV Connect, EVgo, EV Range, FLASH, FLO, Francis Energy, OpConnect, Rivian Adventure Network, Rivian Waypoints, Shell Recharge, 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 EV charging 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.

[14] The ChargeX Consortium is an initiative established to enhance public charging reliability and usability, funded by the Joint Office of Energy and Transportation, and comprises experts from Argonne National Laboratory, Idaho National Laboratory, NREL, and other industry stakeholders.

4 Conclusion

This report summarizes the changes in EV infrastructure in the Station Locator in Q1 2024, covering the growth of public EV charging by charging level, network, region, state, housing density, and DAC designation. Additionally, this report analyzes the growth of private EV charging based on charging level and use type (i.e., workplace, multifamily housing, and fleet). Amid the increase in EV registrations and national interest paid to the deployment of EV charging infrastructure, this report summarizes areas of growth and opportunity against national targets and growing demand for both public and private EV charging infrastructure. This report is intended to complement other national efforts to increase charging accessibility, reliability, and convenience for Americans utilizing the national EV charging portfolio.

Overall, there was a 4.6% increase in the number of EV charging ports in the Station Locator in Q1, including a 4.8% increase in public EV charging ports and a 3.2% increase in private EV charging ports. Consistent with past reports, public L2 charging infrastructure continues to make up the majority of EV charging ports in the Station Locator (88.8%), but public DC fast EV charging ports continue to grow at a greater rate than Level 2 EV charging ports (8.2% versus 3.8%). This was also seen in private EV charging ports, where the total number of new Level 2 EV charging ports outpaced the total number of DC fast EV charging ports, but DC fast EV charging ports increased by a larger percentage (18.9% versus 3.5%). Across Clean Cities and Communities regions, California continues to house the largest percentage of total EV charging ports in the Station Locator (26.7%), but the highest percentage growth in EV charging ports occurred in the Northeast region (6.9%).

Based on NREL's report, *The 2030 National Charging Network*, which projects the required number of public EV charging ports to support 33 million EVs on the road by 2030, the current availability of DC fast and Level 2 EV charging ports to meet the projected requirements is 12.1% and 12.6%, respectively. It is important to note that 60.4% of public DC fast EV charging ports and 7.6% of public Level 2 EV charging ports in the Station Locator belong to the Tesla Supercharger and Destination networks and are therefore only readily accessible (i.e., without an adapter) to Tesla vehicles. When public EV charging ports on the Tesla networks are excluded, the number of DC fast and Level 2 EV charging ports currently installed to meet the projected 2030 requirements decreases to 7,640 (4.2%) and 124,078 (11.6%), respectively. However, with the adoption of the J3400 charging standard by vehicle and charging hardware manufacturers, the Station Locator team expects to see these numbers increase over the next couple of years, especially for DC fast EV charging ports.

Since the first iteration of this report in Q1 2020, the total number of EV charging ports in the Station Locator has grown by 128%, or 111,545 EV charging ports. Of these, 73% are Level 2 EV charging ports and 26% are DC fast EV charging ports.

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. EV Charging Ports Growth by State

Table A-1. Q1 2024 Growth of Public EV Charging Ports per 100 EVs by State

State	EV Charging Ports per 100 EVs in Q4 2023	EV Charging Ports per 100 EVs in Q1 2024	Growth of EV Charging Ports per 100 EVs in Q1 2024
AK	3.4	3.6	5.2%
AL	5.4	5.7	5.0%
AR	8.5	8.6	1.8%
AZ	3.2	3.3	3.1%
CA	2.9	3.0	3.7%
CO	4.5	4.7	3.3%
CT	4.7	5.3	11.7%
DC	10.4	11.0	6.5%
DE	4.8	5.1	5.5%
FL	3.3	3.4	4.3%
GA	4.8	5.2	8.9%
HI	2.8	2.9	2.8%
IA	5.9	6.2	5.1%
ID	3.5	3.7	6.5%
IL	2.7	2.8	3.7%
IN	4.1	4.4	6.7%
KS	7.5	7.6	1.5%
KY	5.1	5.0	−0.6%
LA	5.9	6.2	5.2%
MA	6.4	6.9	7.6%
MD	5.2	5.3	3.7%
ME	7.4	7.7	4.2%
MI	4.5	4.6	2.8%
MN	3.9	4.1	3.4%
MO	7.3	7.6	3.8%
MS	7.8	7.9	1.5%
MT	5.4	6.0	11.3%
NC	4.7	4.9	4.1%
ND	12.9	13.1	1.5%
NE	5.8	5.9	2.5%
NH	3.6	3.7	2.7%
NJ	2.2	2.3	6.1%

State	EV Charging Ports per 100 EVs in Q4 2023	EV Charging Ports per 100 EVs in Q1 2024	Growth of EV Charging Ports per 100 EVs in Q1 2024
NM	4.7	5.0	6.6%
NV	3.6	3.8	7.4%
NY	5.3	5.6	5.8%
OH	5.3	5.6	5.8%
OK	2.7	2.8	1.4%
OR	3.5	3.7	4.0%
PA	4.3	4.6	6.5%
RI	7.1	7.9	12.6%
SC	4.8	5.2	7.7%
SD	8.3	8.6	3.9%
TN	5.0	5.2	5.0%
TX	3.3	3.6	7.2%
UT	4.5	4.7	3.6%
VA	4.1	4.2	4.1%
VT	7.5	7.8	3.6%
WA	3.2	3.3	4.6%
WI	4.0	4.2	5.1%
WV	9.9	10.6	6.4%
WY	13.4	13.7	2.9%

Appendix B. EV Charging Data Sources

As previously mentioned, the Station Locator team 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 EV charging 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 and Communities coalition 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. Networks also 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
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 Adventure Network (OCPI), Rivian Waypoints (OCPI)
September 2022	EV Connect (OCPI)
December 2022	Blink (OCPI), SemaConnect (OCPI)
January 2023	Volta (OCPI)
April 2023	FLASH (OCPI)
September 2023	EV Range (OCPI)
October 2023	ChargeUp (OCPI), FLO (OCPI)
November 2023	Francis Energy (OCPI)
January 2024	BP Pulse (OCPI)

As of the end of Q1, there were 70,782 available and temporarily unavailable public and private charging stations in the database that were available on the Station Locator or accessible via API or data download (AFDC 2024b). Of those, approximately 74.6% 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 and Communities 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 Q1, the Station Locator team received an updated list of stations from the EvGateway network. 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 and Communities 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.