Electric Vehicle Charger Selection Guide

Updated October, 2019

Minor Update

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1 Introduction

This guide was funded under multiple grants from the California Energy Commission (CEC). The goal of this guide is to help site hosts and others learn about, evaluate and compare the features of EV charging equipment (available as of September 2019) to assist them in selecting a charger for their application.

Section 2 introduces Electric Vehicle Charger (EVC) equipment, describes how it works, and discusses purchasing considerations. Section 3 includes a table of EVC features available from a variety of commercially available products in the United States. Information on EVC features was collected by sending specification sheets of predetermined criteria to EVC manufacturers with a request for an email response with completed specifications for currently available AC charger models[1]. Additional information, including that for DC chargers[1], was collected using publicly available technical specifications. As funding allows, this guide will be updated periodically as product offerings evolve.

2 Selecting an Electric Vehicle Charger: Making Choices

While there are many different EVCs to choose from, a few questions about what you need in an EVC can make the decision easier:

1. What type of charging do you want to provide?
2. Do you want a networked charger or a stand-alone charger?
3. Do you wish to collect payment from EV drivers, and what costs of ownership are you willing to pay?

The following sections provide information to help answer these questions, along with some approximate costs associated with installing EVCs.

There are two analogous terms used to describe equipment that charges electric vehicles:

- Electric Vehicle Supply Equipment (EVSE)
- Electric Vehicle Charger (EVC)

This guide uses "Electric Vehicle Charger," or EVC, as it describes the function more clearly and also aligns with terminology used in the California Building Code.

See the end of this guide for a glossary of common electric vehicle charging terms.

2.1 Types of EV Charging

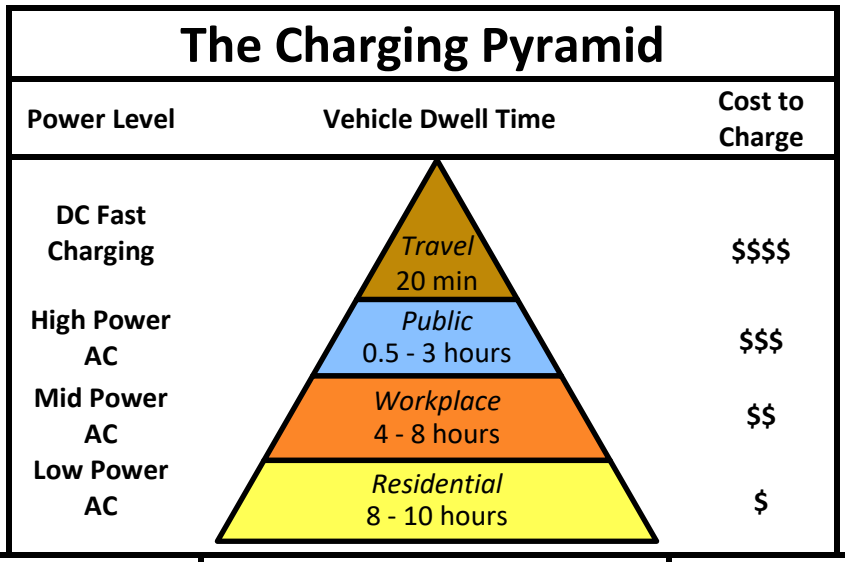
Chargers are generally classified in terms of the power they can provide, designated as "levels":

- Level 1 AC charging uses a standard 120 volt AC electric circuit.
- Level 2 AC charging uses a 208/240 volt AC electric circuit.
- Direct-current fast charger (DCFC), sometimes referred to as a Level 3 DC charging, uses a 3-phase 480 volt AC electric circuit but delivers direct current (DC) to the vehicle.

The charge times will vary depending on the charger, the on-board vehicle charging equipment, and the vehicle's battery capacity and state of charge. The different charging levels serve different consumer needs: DCFCs best suit

[1] AC refers to chargers that provide alternating current (AC) voltage charging. DC refers to chargers that provide direct current (DC) voltage charging. See Section 2.1 for more information.

long-distance trips where time is a premium, while slower chargers work best at locations where people will be parked for long periods. The charging pyramid (Figure 1) illustrates charging levels, typical vehicle dwell times, and approximate cost.



Low Power AC (Level 1)	Mid-High Power AC (Level 2)	DC Fast Charging (DCFC)
• 120 Volts AC, 12-16 A • 2-5 miles of range per hour of charge • Typical EVC cost: $300-$600 • Typical installation cost: $0	• 208/240 Volts AC, up to 80 Amps • 10-20 miles of range per hour of charge • Typical EVC cost: $500 - $700 for home, $2,000-$8,000 for business • Typical installation cost: $1,200 - $2,000 for home, $4,000-$7,000 for business	• 200 - 500 VDC, up to 350 A • 60-80 miles of range per hour of charge • Typical EVC cost: $12,000 - $35,000 • Typical installation cost: $17,000 - $50,000 per charger

- Charging pyramid courtesy of: Zero-Emission Vehicles in California: COMMUNITY READINESS GUIDEBOOK, accessible at http://opr.ca.gov/docs/ZEV_Guidebook.pdf.
- Costs estimates from two sources: Department of Energy Office of Energy Efficiency and Renewable Energy Fact of the Week #910, and Agenbroad, Josh and Ben Holland. "Pulling Back the Veil on EV Charging Station Costs", Rocky Mountain Institute, April 29, 2014.
- Voltage and amperage ratings based on technical specifications of SAE J1772 and CHAdeMO standards.

Figure 1: Comparison of charging levels, time, and typical installation cost

Chargers are also classified by the kind of connector on the charging cord. There are currently two competing standards sold in the United States: SAE J1772, developed by SAE International, and CHAdeMO, developed by an organization of the same name. The connector inlets can be seen in

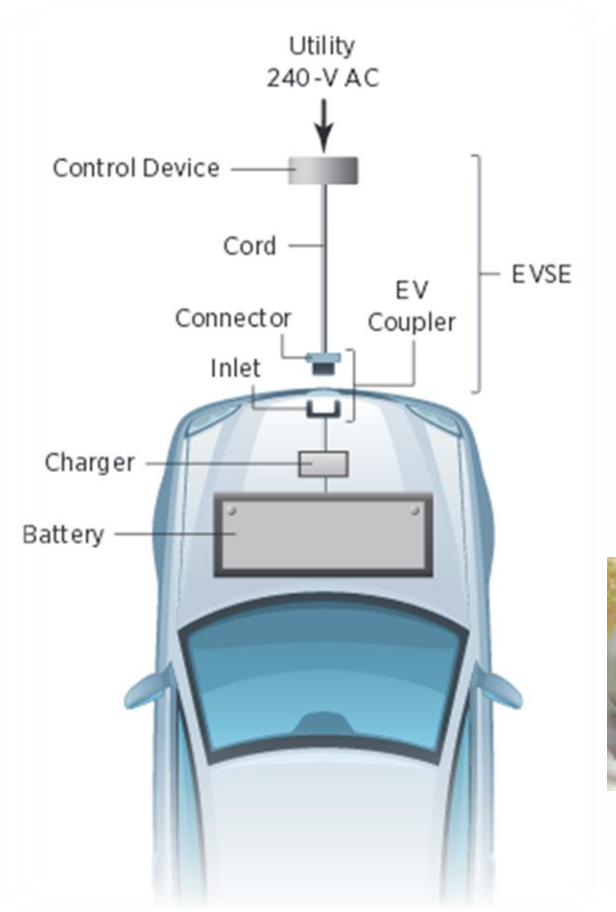
Figure 2. The SAE J1772 standard covers both AC (J1772) and DC (J1772-CCS)[2] charging, while the CHAdeMO connector is only used for DCFC charging. Tesla also has a proprietary connector for their charging stations exclusively available to Tesla drivers, and is not covered here. In the US as of the

[2] CCS stands for Combined Charging System.

release of this guide, CHAdeMO charging comprises the largest share of DCFC stations, while J1772 is the main standard for Level 1 and Level 2 charging, with a smaller share of DCFC charging. The SAE J1772 standard is expected to dominate the U.S. market in the future.

Not every car will be able to take advantage of an EVC's full power output. For example, many vehicles, particularly older models, are incompatible with DC fast charging and do not have DCFC charging ports. In addition, for all charging levels, the limiting component can either be the vehicle on-board equipment or the EVC. While all external charging devices are commonly called "chargers" (including in this guide), Level 2 chargers merely provide an electric current – the actual "charger" that manages energy flow into the battery is located inside the vehicle, as shown in

Figure 2. Different vehicles allow different Level 2 charging rates depending on their internal charger. Early models may only be capable of about 3 kW of charging capacity, while many other PEVs can charge at approximately 7 kW and still others can charge at rates as high as 19 kW. Vehicles continue to evolve, and as of 2019 charging rates for high-end EVs are emerging at 250 kW and beyond.



AC (Level 2) charging schematic. In this diagram, EVSE means the same as EVC. Source used with permission from: http://www.afdc.energy.gov/pdfs/51227.pdf

CHAdeMO DC receptacle (left) and J1772 AC standard receptacle (right). Source used with permission from: https://images.nrel.gov

SAE J1772 (left) and SAE J1772-CCS (right). Source used with permission from Michael Hicks / Flickr "mulad" / CC-BY-2.0.

Figure 2: EVC schematic and connector inlet image

One of the largest factors in determining the type of charging is cost. While maintenance and accessory costs can be significant (and will be explored in more detail in Section 2.3), equipment and installation are the largest cost components, and vary the most between different level chargers. Level 2 charging equipment, the most common for public charging, ranges from $500 to $8,000[3], depending on features. Incentives can help reduce the upfront cost; for example, the Northern California Incentive Project will be putting $4 million towards purchase and installation of eligible EV chargers. Some states provide EVC and battery-only electric vehicle (BEV) incentives: Oregon has a $300 Clean Ride Rebate that can be used to help offset the cost of charging infrastructure at your business.

Installation costs are highly variable: the type of site host, wiring, number of circuits and EVC units being installed, and trenching are all key factors unique to each installation. The need for and cost of other components—such as EVC parking spot signs, bollards, and wheel stops—will vary depending on local requirements. Overall, the installation costs for a Level 2 station could range from $1,200 - $7,000 per charger[3]. With more expensive equipment and more demanding electric service requirements, DCFC charging stations typical cost substantially more to purchase and install compared to a Level 2 station.

2.2 Stand-Alone vs. Networked Chargers

A service network provides oversight and services to support one or more EVCs. Services are available to EV drivers as well as site hosts or network administrators, with different fee structures aimed at each. The simplest EVCs, frequently referred to as stand-alone or "dumb" chargers, do not have network access – they are essentially electrical outlets with circuitry to enable communication and safe charging with the vehicle, as outlined in Figure 3. Without network access, stand-alone chargers cannot process payment, and are generally reserved for residential or fleet applications.

An EVC network adds a variety of capabilities. For drivers, services may include payment options, real-time station location and availability information, and options such as reservations, messaging, and summary reports. Site host services include payment management, customer support, station status, data reporting, and typically access to a network "dashboard." Capabilities are emerging, such as demand response and similar features, to help manage power consumption at various times of the day.

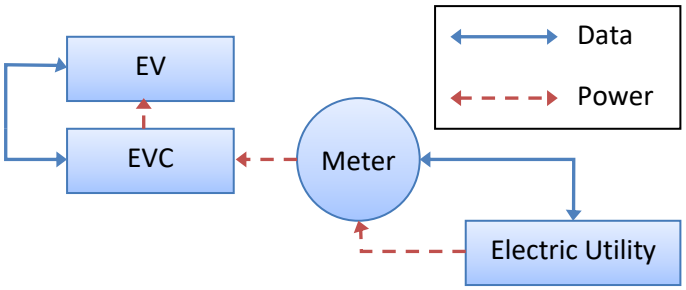


Figure 3: EVC Stand-alone "dumb-charger" configuration

EVC selection is a balance between the preferred ownership model and realistic availability of services at the desired location. Stand-alone chargers have lower installation costs, simpler designs, and no recurring fees for features such as payment processing and cloud connectivity. They may also be the

[3] Costs estimates from two sources: Department of Energy Office of Energy Efficiency and Renewable Energy Fact of the Week #910, and Agenbroad, Josh and Ben Holland. "Pulling Back the Veil on EV Charging Station Costs", Rocky Mountain Institute, April 29, 2014.

only viable option in locations with poor cell reception, or at low-use sites where network fees would likely exceed the cost of allowing no-cost access. Conversely, networked EVCs allow for payment options, notification of charging station status, and remote diagnostic capabilities.

For those who wish to install a networked charger, service networks generally fall into two categories from the perspective of the vehicle owner using the EVC:

- Subscription-only access: drivers subscribe to the service network, which typically requires an initial deposit and periodic deposits to keep a payment account active. Drivers connect their vehicles and use a dedicated RFID card or smart phone app to initiate a charging session and complete an electronic payment transaction. These services may include a subscription fee, charging session fees, incremental fee based on the amount of electricity consumed, or some combination of the above fees.
- Open access: these service networks provide a dedicated subscription, but also accept universal payment methods such as credit cards. **In California, all publicly available charging stations must be open access:** California Health and Safety Code Section 44268.2 states that public charging station customers "shall not be required to pay a subscription fee in order to use the station, and shall not be required to obtain membership in any club, association, or organization as a condition of using the station." The specification tables in Section 3 of this guide explicitly state which charging stations are open access.

Networked chargers include several components beyond conventional charging hardware to enable the interchange of money and data, as well as data connections beyond the electric utility (Figure 4). These additional components/connections include:

- Communication: cell service or Internet connection provides access for data exchange.
- Network administrator: dedicated staff to routinely monitor station status, issue repair requests, track station usage, and maintain onsite hardware and software.
- Manufacturer or Network Service Center: central hub or operations center for all networked charging stations to provide customer support, manage data communication and reporting, monitor station status, and perform remote diagnosis and system updates.
- Transaction processor: Third-party group to manage financial transactions between EVC customers and financial institutions.
- Bank: financial institute that manages customer funds and releases payment for charging sessions and subscription account deposits.

Networks also provide a variety of customer dashboards for site hosts to monitor their site and obtain information about station status, usage patterns, revenue, greenhouse gas savings, and other details, as illustrated in Figure 5. Typically, the EVC owner pays a recurring fee for the network service.

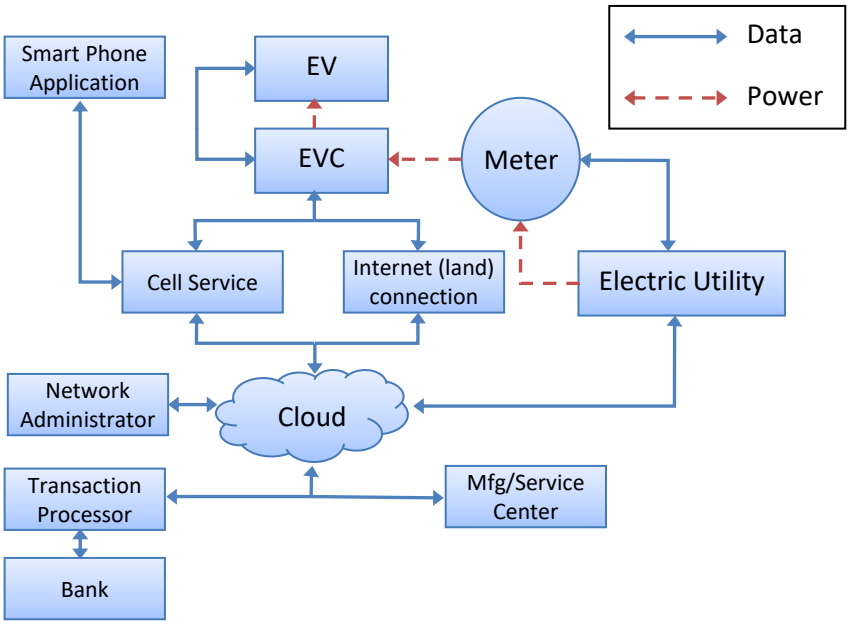


Figure 4: EVC Network with payment capability

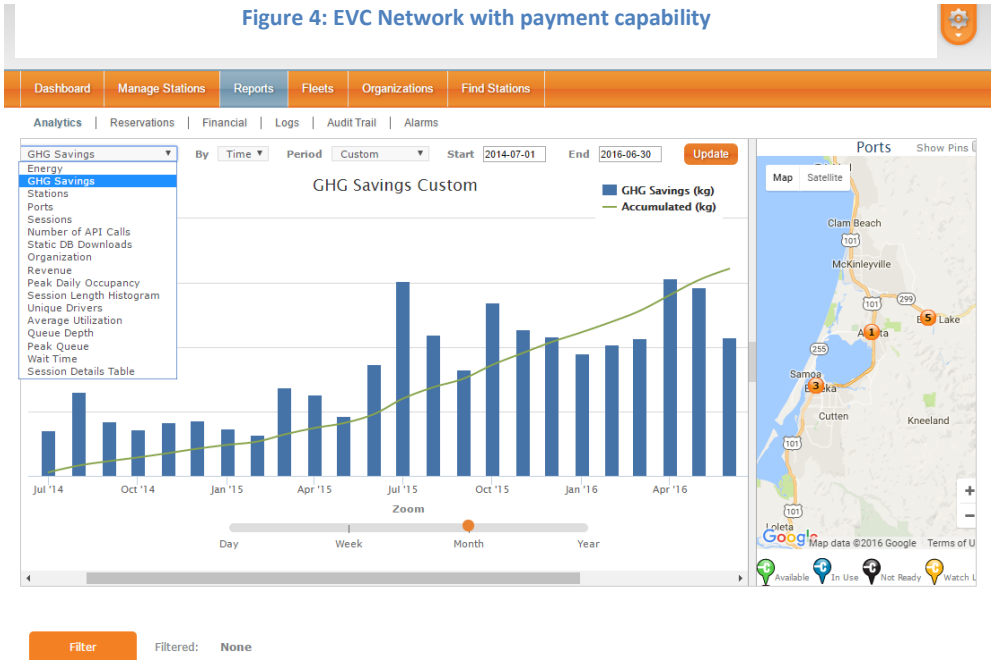


Figure 5: Example of a network dashboard

From an EVC host point of view, unless it is a workplace installation or similar ownership model, a charging station is primarily operated through a network management team and associated software. Most EVCs are connected by default to a manufacturer's service network that provides diagnostic and customer support for a fee. The site offerings and user experience will vary depending on location, cell or network access, and more. There are also cases in which the service network and site host both manage and maintain the charging station network.

One additional thing to consider about networked EVCs is whether or not the EVCs are compliant with Open Charge Point Protocol (OCPP).[4] OCPP-compliant hardware and software is designed to function together regardless of manufacturer. Typically, this allows EVC site hosts to mix and match charging stations, while choosing the network provider of their choice without issues of interoperability and compatibility between various chargers and the network. However, some OCPP-compliant products are not fully interchangeable – such as hardware that is technically OCPP-compliant, but only functions with the software provided by the manufacturer. Section 3 of this guide identifies truly interchangeable OCPP products with the "Cross-Vendor Hardware/Software Compatibility" specification.

2.3 Owner and Customer Payment

For many, the most important criterion in selecting an EVC is cost. While the equipment costs are generally straightforward, ongoing operational costs can be more complicated. Depending on the complexity of the network and business model, site owners may face multiple fees for different network components. For example, a location may include a monthly cell service fee, monthly utility meter fee, electric bill, and service network subscription. Some networks may bundle these fees into a per-charging session fee, either as a flat rate or as a portion of the total session cost. While not every charger will have the same fees, any installation will incur some of the costs below:

Owner energy costs

All EVCs require the owner to purchase electricity. This includes both the per-kWh charge for electricity directly used by the charger, and potential demand charges if the charger increases your peak demand.

High-cost scenario: The lowest power chargers rated at 2kW – they are unlikely to incur a demand charge, but could potentially use up to 48 kWh per day. DC fast chargers typically require 25kW and up, potentially use thousands of kWh in a day, and are more likely to incur demand charges.

As of fall 2019, the California Public Utilities Commission has approved a new commercial EV charging rate for PG&E. The new charging rate is subscription-based, and aims to increase charging station profitability by eliminating demand charges. Commercial entities will be allowed to choose the amount of power they need for their charging stations and pay a flat monthly fee. Within this structure, there will be two rates: one for customers with charging up to 100 kW and one for customers with charging over 100 kW.

Owner networking fees

If you wish to purchase a smart charger, most require subscription fees to access the network. Network subscriptions are typically on an annual or multi-year basis.

High-cost scenario: While prices will vary depending on the network, typical charges are between $250-$300/charging port/year. A bank of 5 dual-port chargers could cost approximately $3,000/year.

Owner credit card processing fees

While most charger networks include a subscription-based payment process (similar to a "gas card" card lock service), most smart chargers will still accept credit cards (and the subsequent processing fees) in

[4] Greenlots. "Open vs. Closed Charging Stations: Advantages and Disadvantages." September 2018.

order to be accessible to the largest portion of the market. Some networks will handle all financial transactions for you, paying the processing fees themselves – and generally offsetting the cost in the network fee structure. If the network does not cover processing fees, the EVC owner will be responsible – such fees are typically a small percentage of the total transaction value.

High-cost scenario: Revenues from charger transactions will be reduced by a few percent.

Owner maintenance costs

Though actual charger upkeep can be minimal depending on the complexity of the equipment, repairing broken chargers could prove costly if not under warranty. For most, the warranty price will be the majority of the maintenance cost. Warranty pricing will differ based on the equipment and terms of coverage - some provide renewable warranties, others are fixed-term. Some manufacturers will include the warranty price in the equipment cost.

Furthermore, general maintenance costs should be considered. These include basic cleaning, damage repair, etc. An average cost of $400 per EVC per year is often assumed.[5]

More complex systems have more dependencies and higher potential costs. For example, cell service companies periodically update their service, such as from 3G to 4G, which can require new hardware upgrades to maintain network connection. Similar situations can arise with payment systems.

High-cost scenario: Annual extended warranties for DC fast chargers can cost over $800/charger/year. Less powerful chargers may have a fixed length warranty for half as much, but will leave you responsible for repair charges after the term is over. In addition, $400/charger/year for general maintenance.

Customer payment

For those looking to generate revenue from an EVC, most networks allow EVC owners to set their own pricing. Pricing is typically based on the amount of energy charged (similar to a utility bill), the time spent using the charger (similar to a parking meter), or as a flat per-charging-session fee. The fee structure you choose will have consequences for the driver. For example, a flat per-session fee will benefit those who can charge the most energy per session – either with longer charge sessions or with fast charger capability. Time-based fees benefit those who charge at a fast rate. Service networks may also support custom pricing strategies, such as including a time-based “parking meter” rate in addition to the charging fees to encourage people to move their vehicles once charging is complete. Customer payment typically involves using an RFID card obtained through registering with a network, or a credit card.

3 EV Charger Specifications

Once you’ve determined your specific EVC needs, you need to investigate the available EVC feature options. Key criteria to consider are:

[5] Chittenden County RPC. Electric Vehicle Charging Station Guidebook: Planning for Installation and Operation. June, 2014

1. User payment options
2. Commercial maturity
3. Standard warranty length
4. Power rating (in kW) available per plug
5. Theft deterrence features
6. Dual plug with high power capability option

Prioritization of equipment features will also differ depending on the EVC owner and/or EVC location. Furthermore, these criteria are not the only important criteria. The specification tables in Section 3.1 of this guide breaks down different categories based on Hardware (electrical and mechanical), Management Software, Payment System, and Manufacturer Information. An explanation of the parameters that are covered in the specification tables is presented below:

- Hardware - Electrical

***Number Charging Ports/Type*: The number of EVs that can charge simultaneously and the connector type (e.g. J1772, CHAdeMO, see**

  - Figure 2 for examples).
  - *Input Power*: Power circuit required to support the charger.
  - *Output Power*: Maximum power deliverable to an electric vehicle. Given as a kW rating and as an estimated miles of range added per hour of charging time.
  - *Cross Vendor Software Compatibility*: Can this charger use other manufacturer's software?
  - *Operating Conditions*: Temperature and humidity operating limits[6].

- Hardware - Mechanical
  - *Mounting*: Either pedestal or wall.
    - *Pedestal*: Hard-wired to a permanent pole or box. Typically mounted on a sidewalk or a concrete base.
    - *Wall*: Either hard-wired or temporarily wired to an existing wall. Typically includes a mounting plate.
  - *Cable*: Cable management strategy (e.g. coil, retractable, etc.).
  - *Number of Charging Ports/Type*: The number of EVs that can charge simultaneously, and the connector type (e.g. J1772, CHAdeMO).
  - *Theft*: Systems available to reduce theft or vandalism.
  - *Power Input Ratings*: Power circuit required to support charger.
  - *Operating Conditions*: Temperature and humidity operating limits.

[6] Not usually an issue outside of extreme climates.

- Management software:
    - *Network capable*: Charger utilizes network management software.
    - *Remote management*: Charger information and settings can be accessed remotely.
    - *Cross Vendor Hardware Compatibility*: Other chargers can use this software.
    - *Network protocol*: Protocol for communication between EVC and network.
    - *Demand Response Capability*: Ability to adjust power output in response to grid demand.
    - *Data reporting*: Available data generated by charger.

- Payment System:
    - *Open Access*: Can any customer charge (yes) or is a service subscription required (no)?
    - *Customer payment*: Possible customer payment methods.
    - *Price Setting Option*: Potential fee structures the owner can set.
    - *Owner payment*: Expected network and maintenance fees paid by station owner.

- Manufacturer/Certification Information:
    - *Listings*: Product testing certifications (e.g. UL, ETL, etc.).
    - *Accessibility Features*: Device features intended to increase access for handicapped users.
    - *First Entry to EVSE Market*: Date of first product the manufacturer released to the EVSE market.
    - *Installation Rating*: Product installation certifications (e.g. NEMA).
- Network-only Providers
    - *System Features*: Network features designed to provide customers with information about the network and its operation, as well as improved functionality for charging station users.
    - *Turnkey Installation Services*: Will this company walk customers through every step of the process in buying, installing, and operating a charging station?
    - *Mobile App for Drivers*: Does this network have its own mobile app for drivers to provide extra functionality such as reserving stations, paying session fees, or monitoring charging status?
    - *Real-time Support*: Is real-time support provided to changing station owners or users in need of assistance (often done via an 800 number listed on the charging station itself)?
    - *OCPP Supported*: Can this network provider's software operate on any charging stations that are OCPP compliant?
- Turnkey Providers
    - *Service:* A summary of the exact service the company provides.
    - *Services Offered:* What particular parts of the charging station purchasing, installation, and monitoring process will this company assist customers with?

3.1 EVC Specification Tables

These tables give an overview of the various charging station equipment available as of September 2019. Exact pricing and warranty will differ depending on the exact sub-model and accessories included. While we have made every effort to ensure the information in these tables is accurate, they should not be considered a final authority on EVC specifications—contact vendors to get the most current information. For pricing and other detailed information, contact a sales representative. For images of the chargers, see Section 6.

DC Fast Charger Vendor		This vendor sells DC Fast Chargers as well as Level 2 chargers. DC Fast Chargers can fully charge most Battery Electric Vehicles in 20-60 minutes but are more expensive to install and operate.
Turnkey Service Provider		This company provides turnkey services, meaning they will assist customers with every step of the process of installing home or commercial chargers. This could include assistance with services like site assessments, charger model selection, site permitting, on-site installation by electricians or certified installers, staff training on charger operation, station monitoring and reporting, billing, maintenance, and marketing.
OCPP Compliant		The EV Charging Stations sold by this vendor are compliant with Open Charge Point Protocol, or OCPP. OCPP is an internationally recognized initiative meant to create an open application protocol allowing hardware and network management software from different EVCS vendors to communicate with each other. This cross-vendor compatibility allows customers to mix and match their providers and thereby optimize cost and continue to operate their EV charging stations even as vendors change.
Network Capable		This vendor sells charging stations that can be connected to a network for monitoring, billing, and other features.
Network Only Provider		This company does not sell EV charging station hardware. Instead, they install their own network management software onto hardware from other vendors and then use that software to manage station use and provide other network services.
App Enabled		This vendor sells charging stations that can be connected to cell phone applications to allow charging station monitoring for station owners, as well as station locating and session starting/payment for station users.
Credit Card Enabled		This vendor sells charging stations that allow users to pay with most major credit cards.
RFID Enabled		This vendor sells charging stations that have RFID-reading capabilities, for use as a payment option or to restrict access to the charger by requiring an RFID card in order to charge.
United States-based		This company is headquartered in the United States and primarily serves the US market.

EVCS Vendor Overview							
Vendor	**Categories**	**Vendor**	**Categories**	**Vendor**	**Categories**	**Vendor**	**Categories**
ABB	OCPP	Electrify America		Kitu Systems		Tellus Power Inc.	OCPP
ABM		eMotorWerks		Leviton		Tritium	OCPP
AddEnergie Technologies		EV Box	OCPP	Liberty Plug-Ins		U-Go	
Andromeda Power LLC	OCPP	EV Connect		MOEV, Inc.		Verdek	
Blink	OCPP	EverCharge		National Car Charging		Video Voice Data Communi-cations	
Bosch		EVgo	OCPP	OPConnect		Volta	
BTCPower	OCPP	EVoCharge	OCPP	Plugless Power	Only for Tesla Model S, BMW i3, Nissan LEAF, and Chevy Volt	Wattzilla	
Charge Bliss		EVSE LLC		PowerCharge	OCPP	Webasto	
ChargePoint	OCPP	FLO		Schneider	OCPP	Wirelane	
Clipper Creek		Go Electric Stations SRLS		SemaConnect	OCPP	Zero-Impact Solutions	
Driivz		Greenlots		Shell New Energies			
EDF Renewables		Juice Bar		Shorepower Technologies			
Efacec	OCPP	KEBA	OCPP	Siemens	OCPP		

Hardware – Electrical							
Manufacturer	**Model**	**# Charging Ports/Type**	**Input Power**	**Output Power**		**Cross Vendor Software Compatibility**	**Operating conditions (°F)**
				kW	**miles range / hrs charging***		
Level 2 EVC							
AddEnergie Technologies	CoRe+	1-2/J1772	208/240VAC; 40A	1.2-7.2	4-24	No	-40 to 122
Blink	IQ 200	1-2/J1772	208/240VAC; 12-30A	7.68	26	OCPP 1.5, 1.6 compliant	-22 to 122
Bosch	EV800	1-2/J1772	96-264VAC; 30A	7.2	24	Non-networked	-40 to 122
BTC Power	30A/40A/70A	1-2/J1772	208/240VAC; 30A, 40A, 70A options	7.2 – 16.8	24-56	OCPP 1.5, 1.6 compliant	-22 to 140
ChargePoint	CT4000	1-2/J1772	208/240VAC; 30A circuit	7.2	24	No	-40 to 122
Clipper Creek	LCS / HCS / CS	1/J1772	208/240 VAC; 50A	2.88 – 19.2	9.6-64	CS models can use Liberty Plugins control system	-22 to 122
Efacec	Public	2/J1772	208/240 VAC 30 A / each output	7.2	24	OCPP 1.5, 1.6 compliant	-13 to 122 or -31 to 122
eMotorWerks	JuiceBox	1/J1772	110-240 VAC; 32-40A	7.7 – 9.6	26-32	No	-40 to 149
EV Box	BusinessLine	1-2/J1772	208/240 VAC; 32A	Up to 7.4	25	OCPP 1.2, 1.5, 1.6S, 1.6J compliant	-22 to 122
EVoCharge	EVSE, iEVSE, iEVSE Plus	1-2/J1772	208/240VAC; 32A	7.7	26	OCPP compliant	-22 to 122
EVSE LLC	3704 AutoCoil	1-2/J1772	208/240VAC; 30A	7.2	24	OCPP compliant	-22 to 122
Juice Bar	Mini Bar	1-2/J1772	208/240VAC; 40A	7.7	26	Greenlots SKY/OCPP compliant	-22 to 122
KEBA	KeContact P30	1/J1772	208/240VAC; 32A	7.4-22	25-73	OCPP compliant	-22 to 122
Leviton	Evr-Green	1/J1772	208/240VAC; 30A	7.2	24	Non-networked	-22 to 122
MOEV	Quad 2.4	4/J1772	208/240VAC; 32A shared among 4 ports	7.2	24	No	-22 to 122
OPConnect	Level 2	1-2/J1772	208/240VAC; 40A	7.7	26	No	-22 to 131
Plugless Power	Gen 2	J1772 emulation	208/240 VAC	7.2	24	Non-networked	-22 to 122
PowerCharge	Pro Series	1-2/J1772	208/240 VAC; 16A/30A/40A	3.3-9.6	11-32	OCPP compliant	-22 to 131
Schneider	EVlink Parking	1-2/J1772	220/240VAC; 32 A	7.4-22	25-73	OCPP compliant	-22 to 104
SemaConnect	Series 6	1-2/J1772	208/240VAC; 30A	7.2	24	SemaConnect Network, OCPP compliant	-22 to 122

Hardware – Electrical							
Manufacturer	**Model**	**# Charging Ports/Type**	**Input Power**	**Output Power**		**Cross Vendor Software Compatibility**	**Operating conditions (°F)**
				kW	**miles range / hrs charging***		
Level 2 EVC							
Shorepower Technologies	ePump	1-4/J1772	208/240VAC; 100A	7.2	24	Uses OPConnect software network	-4 to 140
Siemens	VersiCharge	1/J1772	208/240VAC; 40A circuit	1.8 – 7.2	6-24	OCPP compliant	-22 to 122
Tellus Power	Level 2	1-2/J1772	208/240VAC; 40A	7.2	24	Tellus Network, OCPP compliant	-30 to 130
Wattzilla	QuadZilla	4/J1772	208/240VAC; 80A	15	50	Non-networked	-31 to 140
Webasto	TurboDX	1/J1772	208/240VAC; 16A/32A	3.8-7.7	13-26	Non-networked	-40 to 131
Wirelane	EV Charger	1-2/J3068	230-400VAC, 16A/32A	3.68-22	12-73	OCPP compliant	-13 to 104
DCFC EVC							
ABB	Terra 54HV	1/CHAdeMO + 1/SAE CCS	480 VAC, 80A	50	167	OCPP compliant	-31 to 131
AddEnergie Technologies	SmartDC-V2	1/CHAdeMO + 1/J1772	480 VAC, 67A	54	180	FLO Network	-40 to 104
Andromeda Power LLC	ORCA Air	1/CHAdeMO + 1/J1772	250-350 VAC, 222A	50	167	ORCA-NET, OCPP compliant	-22 to 122
Blink	DC Fast Charger	1/CHAdeMO + 1/SAE CCS	208-480 VAC, 200-89A	30-60	100-200	OCPP 1.5, 1.6J compliant	-4 to 122
Bosch	EV2000	1/J1772 SAE DC Combo	277 VAC, 165A	25	83	OCPP compliant	-22 to 122
BTCPower	50kW DC Fast Charger	1/CHAdeMO + 1/SAE CCS	480 VAC, 72A	50	167	BTCP Network, OCPP 1.5, 1.6 compliant	-22 to 122
ChargePoint	CPE200	1/CHAdeMO + 1/SAE CCS	480 VAC, 80A	63	210	OCPP supported	-35 to 120
Efacec	QC45	1/CHAdeMO + 1/SAE CCS	480 VAC, 64A	50	167	OCPP 1.5 compliant	-13 to 122 or -31 to 122
EV Box	Troniq 50	1/CHAdeMO + 1/SAE CCS	400VAC, 63A	50	167	OCPP compliant	-22 to 122
Juice Bar	Energy Bar QC45	1/CHAdeMO + 1/SAE CCS	480 VAC, 64A	50	167	Greenlots SKY OCPP compliant	13 to 122 or -31 to 122
OPConnect	Standard/Slim Line DC Fast Charger	1/CHAdeMO + 1/SAE CCS	480 VAC	50	167	OPConnect	-22 to 122

Hardware – Electrical							
Manufacturer	**Model**	**# Charging Ports/Type**	**Input Power**	**Output Power**		**Cross Vendor Software Compatibility**	**Operating conditions (^{o}F)**
				kW	**miles range / hrs charging***		
DCFC EVC							
Schneider	EVlink DC Fast	1/CHAdeMO or 1/CHAdeMO + 1/SAE CCS	500VAC, 125A	24 max	80	OCPP compliant	-22 to 122
Tellus Power	DC 150	3/GBT	400VAC, 289A	187	623	Tellus network, OCPP compliant	-4 to 131
Tritium	Veefil^{RT}	1/CHAdeMO + 1/SAE CCS	380-480VAC	50	167	OCPP compliant	-31 to 122

* - based on 30 kWh/100 mile fuel efficiency for standard 2016 Nissan Leaf, as reported at www.fueleconomy.gov. Reflects optimal driving conditions.

Hardware – Mechanical							
Manufacturer	**Model**	**Mounting**	**Cable Management**	**# Charging Ports/Type**	**Theft Deterrence**	**Power Rating input(s)**	**Operating conditions (°F)**
Level 2 EVC							
AddEnergie Technologies	CoRe+	Wall or Pedestal	Coil Rack	1-2/J1772	Not specified	208/240VAC; 40A	-40 to 122
Blink	IQ 200	Wall or Pedestal	Coil Rack	1/J1772	Not specified	208/240VAC; 12-30A	-22 to 122
Bosch	EV800	Wall or Pedestal	Coil Rack	1-2/J1772	Not specified	96-264VAC; 30A	-40 to 122
BTC Power	30A/40A/70A	Wall or Pedestal (70A pedestal only)	Coil Rack or Cord Retractor	1-2/J1772	Not specified	208/240VAC; 30A, 40A, 70A options	-22 to 140
ChargePoint	CT4000	Wall or Pedestal	Cable Hanger	1-2/J1772	Locking charger holster	208/240VAC; 30A circuit	-40 to 122
Clipper Creek	LCS / HCS / CS	Wall or Pedestal	Cable Wrap, retractable coils available	1/J1772	Lockable connector, HCS allows key-based access	208/240 VAC	-22 to 122
Efacec	Public	Wall or Pedestal	Cable Hanger	2/J1772	Bolted to wall or pole mount	208/240 VAC 30 A	-13 to 122 or -31 to 122
eMotorWerks	JuiceBox	Wall or Pedestal	Coil Rack, cable hangers available	1/J1772	Optional locking bracket	110-240 VAC; 32-40A	-40 to 149
EV Box	BusinessLine	Wall or Pedestal	Coil Rack	1-2/J1772	Bolted to wall or pole mount	208/240 VAC, 32A	-22 to 130
EVoCharge	EVSE/iEVSE/ iEVSE Plus	Wall or Pedestal	Retractable Reel with auto-rewind & lock features. Wall or pole Mounted.	1-2/J1772	Tamper proof mounting fasteners	208/240VAC; 32A	-22 to 122
EVSE LLC	3704 AutoCoil	Wall or Pedestal	Retractable cable	1-2/J1772	Not specified	208/240VAC; 30A	-22 to 122
Juice Bar	Mini Bar	Wall or Pedestal	Coil Rack	1-2/J1772	2 key secure lock for internal components	208/240VAC; 40A	-22 to 122
KEBA	KeContact P30	Wall or Pedestal	Coil Rack (optional)	1/J1772	Not specified	208/240VAC; 32A	-22 to 122
Leviton	Evr-Green	Wall or Pedestal	Coil Rack	1/J1772	Charging connector includes safety locking features to be used with a small padlock	208/240VAC; 30A	-22 to 122

Hardware – Mechanical							
Manufacturer	**Model**	**Mounting**	**Cable Management**	**# Charging Ports/Type**	**Theft Deterrence**	**Power Rating input(s)**	**Operating conditions (°F)**
Level 2 EVC							
MOEV	Quad 2.4	Wall or Pedestal	Coil Rack	4/J1772	Padlock latch	208/240VAC; 32A	-22 to 122
OPConnect	Level 2	Wall or Pedestal	Coil Rack	1-2/J1772	Not specified	208/240VAC; 40A	-22 to 131
Plugless Power	Gen 2	Parking pad/Wall control panel	N/A	J1772 emulation, interlocked to prevent simultaneous inductive/conductive charging	Automatic detection and charging lockout if metallic materials on parking pad.	208/240VAC	-22 to 122
PowerCharge	Pro Series	Wall or Pedestal	Coil Rack	1-2/J1772	Optional cord retractor	208/240VAC; 16A/30A/40A	-22 to 131
Schneider	EVlink Parking	Wall or Pedestal	Coil Rack	1-2/J1772	Key lock to prevent cable theft and stopping/starting session	208/240VAC, 32A	-22 to 104
SemaConnect	Series 6	Wall or Pedestal	Coil Rack	1-2/J1772	Not specified	208/240VAC; 30A	-22 to 122
Shorepower Technologies	ePump	Pedestal	Coil Rack	1-4/J1772	Overcurrent & GFCI protection; car-to-cord safety detection; locking cord and access doors (optional)	208/240VAC; 100A	-4 to 140
Siemens	VersiCharge	Wall or Pedestal	Coil Rack	1/J1772	Charger locks to pedestal mount	208/240VAC; 40A circuit	-22 to 122
Tellus Power	Level 2	Wall or Pedestal	Cable Hanger	1-2/J1772	Not specified	208/240VAC; 40A	-30 to 130
Wattzilla	QuadZilla	Pedestal	Retractable Cable	4/J1772	Not specified	208/240VAC; 80A	-40 to 131
Webasto	TurboDX	Wall or Pedestal	Coil Rack	1/J1772	Not specified	208/240 VAC; up to 32A	-40 to 131
Wirelane	EV Charger	Wall or Pedestal	N/A, cable provided by customer	1-2/J3068	Not specified	230-400VAC, 16A/32A	-13 to 104
DCFC EVC							
ABB	Terra 54HV	Pedestal	Cable Hanger	1/CHAdeMO + 1/SAE CCS	Optional pin code authorization	480 VAC, 80A	-31 to 131

Hardware – Mechanical							
Manufacturer	**Model**	**Mounting**	**Cable Management**	**# Charging Ports/Type**	**Theft Deterrence**	**Power Rating input(s)**	**Operating conditions (°F)**
DCFC EVC							
AddEnergie Technologies	SmartDC-V2	Pedestal	Cable Hanger	1/CHAdeMO + 1/J1772	Not specified	480 VAC, 67A	-40 to 104
Andromeda Power LLC	ORCA Air	Pedestal	Cable Hanger	1/CHAdeMO + 1/J1772	Not specified	350 VAC, 222A	-22 to 122
Blink	DC Fast Charger	Pedestal	Cable Hanger	1/CHAdeMO + 1/SAE CCS	Not specified	208-480 VAC, 200-89A	-4 to 122
Bosch	EV2000	Wall or Pedestal	Coil Rack	1/J1772 SAE DC Combo	Can be turned off with a key	277 VAC, 165A	-22 to 122
BTCPower	50kW DC Fast Charger	Pedestal	Cable Hanger	1/CHAdeMO + 1/SAE CCS	Not specified	480 VAC, 72A	-22 to 122
ChargePoint	CPE200/250	Pedestal	Cable Hanger	1/CHAdeMO + 1/SAE CCS	Not specified	480 VAC, 80A	-35 to 120
Efacec	QC45	Pedestal	Cable Hanger	1/CHAdeMO + 1/SAE CCS	Bolted to wall	480 VAC, 64A	-13 to 122 or -31 to 122
EV Box	Troniq 50	Pedestal	Cable Hanger	1/CHAdeMO + 1/SAE CCS	Not specified	400 VAC, 63A	-22 to 122
Juice Bar	Energy Bar QC45	Pedestal	Cable Hanger	1/CHAdeMO + 1/SAE CCS	Not specified	480 VAC, 64A	-13 to 122 or -31 to 122
OPConnect	Standard/Slim Line DC Fast Charger	Pedestal	Cable Hanger	1/CHAdeMO + 1/SAE CCS	Not specified	480 VAC	-22 to 122
Schneider	EVlink DC Fast	Wall or Pedestal	Coil Rack	1/CHAdeMO or 1/CHAdeMO + 1/SAE CCS	Not specified	500VAC, 125A	-22 to 122
Tellus Power	DC 150	Pedestal	Cable Hanger	3/GBT	Not specified	400VAC, 289A	-4 to 131
Tritium	Veefil^{RT}	Pedestal	Cable Hanger	1/CHAdeMO + 1/SAE CCS	Not specified	480VAC	-31 to 122

Management Software							
Manufacturer	**Model**	**Network-capable**	**Remote Management**	**Cross Vendor Hardware Compatibility**	**Network Protocol**	**Demand response capability**	**Data Reporting**
Level 2 EVC							
AddEnergie Technologies	CoRe+	Yes	Yes	N/A	FLO	Yes	Yes
Blink	IQ 200	Yes	Yes	Yes	OCPP	Yes	Yes
Bosch	EV800	No	N/A	N/A	N/A	N/A	N/A
BTC Power	30A/40A/70A	Yes	Yes	Yes	OCPP	Yes	Energy use, session duration, user cost. By transaction or monthly.
ChargePoint	CT4000	Yes	Yes	Yes	OCPP	Yes	Energy use, session duration, user cost. By transaction.
Clipper Creek	LCS / HCS / CS	CS only	CS only	N/A	N/A	N/A	N/A
Efacec	Public	Yes	Yes	Yes	OCPP	Yes, automated through OpenADR	Energy use, session duration, payment details, customer cost. By transaction.
eMotorWerks	JuiceBox	Yes	Yes	Yes	OpenADR compliant	Yes	Energy use, TOU scheduling, charging history, payment information
EV Box	BusinessLine	Yes	Yes	N/A	OCPP	Yes, automated through OpenADR	Energy use, session duration, payment details, customer cost. By transaction.
EVoCharge	EVSE/iEVSE/ iEVSE Plus	Yes	Yes	N/A	OCPP	Yes	Yes
EVSE LLC	3704 AutoCoil	Yes	Yes	N/A	OCPP	Yes	Energy use, session duration, payment details, customer cost. By transaction.
Juice Bar	Mini Bar	Yes, not mandatory	Yes	N/A	OCPP	Not specified	Usage data by session
KEBA	KeContact P30	Yes (c-series & x-series)	Yes (c-series & x-series)	N/A	OCPP	Yes	Yes
Leviton	Evr-Green	No	N/A	N/A	N/A	N/A	N/A
MOEV	Quad 2.4	Yes	Yes	Yes	MOEV Cloud	Yes	Energy use, microgrid energy resources, electricity demand, price information.
OPConnect	Level 2	Yes	Yes	Yes	OPConnect	Yes	Energy use
Plugless Power	Gen 2	No	N/A	N/A	N/A	N/A	N/A

Management Software							
Manufacturer	**Model**	**Network-capable**	**Remote Management**	**Cross Vendor Hardware Compatibility**	**Network Protocol**	**Demand response capability**	**Data Reporting**
Level 2 EVC							
PowerCharge	Pro Series	Yes	Yes	Yes	OCPP	Yes	Yes
Schneider	EVlink Parking	Yes, not mandatory	Yes	N/A	OCPP	Yes	Energy use, session duration, customer cost, gasoline and GHG savings. By transaction.
SemaConnect	Series 6	Yes	Yes	Yes	SemaConnect Network, OCPP	Yes	Yes
Shorepower Technologies	ePump	Yes, not mandatory	Yes	Yes	OpenADR 2.0b	Yes, OpenADR 2.0b	Usage, access times, energy consumed and billed.
Siemens	VersiCharge	Yes	Yes	N/A	OCPP	Yes, automated through OpenADR	Energy use, session duration, payment details, customer cost. By transaction.
Tellus Power	Level 2	Yes	Yes	Yes	Tellus Network, OCPP	Yes	Yes
Wattzilla	QuadZilla	No	N/A	N/A	N/A	N/A	N/A
Webasto	TurboDX	No	N/A	N/A	N/A	N/A	N/A
Wirelane	EV Charger	Yes	Yes	N/A	OCPP	Not specified	Yes
DCFC EVC							
ABB	Terra 54HV	Yes	Yes	Yes	OCPP	Add-on available	Yes
AddEnergie Technologies	SmartDC-V2	Yes	Yes	No	FLO	Yes	Yes
Andromeda Power LLC	ORCA Air	Yes	Yes	Yes	ORCA-NET, OCPP	Yes, user-selected modes	Yes
Blink	DC Fast Charger	Yes	Yes	Yes	Blink, OCPP	Yes via 3rd-party software	Yes
Bosch	EV2000	Yes	Yes	Yes	OCPP	Not specified	Yes
BTCPower	50 kW DC Fast Charger	Yes	Yes	Yes	BTCP Network, OCPP	Not specified	Yes
ChargePoint	CPE200/250	Yes	Yes	Yes	OCPP	Not specified	Energy use, session duration, customer cost, gasoline and GHG savings. By transaction.

Management Software							
Manufacturer	**Model**	**Network-capable**	**Remote Management**	**Cross Vendor Hardware Compatibility**	**Network Protocol**	**Demand response capability**	**Data Reporting**
DCFC EVC							
Efacec	QC45	Yes	Yes	Yes	OCPP	Yes, automated through OpenADR	Energy use, session duration, payment details, customer cost. By transaction.
EV Box	Troniq 50	Yes	Yes	Yes	OCPP	Not specified	Yes
Juice Bar	Energy Bar QC45	Yes	Yes	Yes	OCPP	Yes, automated through OpenADR	Energy use, session duration, payment details, customer cost. By transaction.
OPConnect	Standard/Slim Line DC Fast Charger	Yes	Yes	Yes	OPConnect	Yes	Yes
Schneider	EVlink DC Fast	Yes	Yes	N/A	OCPP	Yes	Energy use, session duration, payment details, customer cost. By transaction.
Tellus Power	DC 150	Yes	Yes	Yes	Tellus Network, OCPP	Yes	Energy use, revenue, individual charger reports.
Tritium	Veefil^{RT}	Yes	Yes	N/A	OCPP	Yes	Yes

Payment System					
Manufacturer	**Model**	**Open Access**	**Customer Payment**	**Price Setting Option**	**Owner Payment**
Level 2 EVC					
AddEnergie Technologies	CoRe+	Yes	RFID card, mobile app	Set by FLO network	Varies
Blink	IQ 200	Yes	Blink InCard, mobile app, and “800” number	Set by Blink network	Varies
Bosch	EV800	Yes	N/A	N/A	N/A
BTC Power	30A/40A/70A	Yes	RFID or credit card	Price by duration, energy, or session. Time-variable pricing available.	Network fees, subscription plans available
ChargePoint	CT4000	Yes	Chargepoint or RFID card, “800” number	Price by duration, energy, or session. Time and user-variable pricing available.	Chargepoint network plan, fees by port. Various subscriptions lengths.
Clipper Creek	LCS / HCS / CS	Yes	Requires external device	N/A	CS may require Liberty Plugin subscription
Efacec	Public	Yes	RFID, mobile app, and call center	Price by duration, energy, or session. Time and user-variable pricing available.	Hardware maintenance and warranty bundled pricing available
eMotorWerks	JuiceBox	Yes	Smart phone app	Price by duration, energy, or session. Flexible pricing available.	Yearly subscription
EV Box	BusinessLine	Yes	RFID, mobile app, and call center	Price by duration, energy, or session. Time and user-variable pricing available.	Hardware maintenance and warranty bundled pricing available
EVoCharge	30A EVoReel EVSE/iEVSE	Yes	RFID and mobile app, optional magnetic stripe/chip based card, Google Wallet/Apple Pay	Price by duration, energy, or session. Time and user-variable pricing available.	Monthly and annual network options
EVSE LLC	3704 AutoCoil	Yes	RFID and mobile app, optional magnetic stripe/chip based card, credit cards	Price by duration, energy, or session. Time and user-variable pricing available.	Network fees, subscription plans available
Juice Bar	Mini Bar	Yes	QR scan, mobile app, and “800” number available 24/7	Price by duration, energy, or session. Time and user-variable pricing available.	Some network fees, multi-year subscription discounts available
KEBA	KeContact P30	Yes	RFID (optional), smart phone app	Price by energy consumption.	Fees will vary based on network provider
Leviton	Evr-Green	Yes	N/A	N/A	N/A

Level 2 EVC					
MOEV	Quad 2.4	Yes	Smart phone app, QR code	Price set by owner.	Network fees for Driver app, cloud software
OPConnect	Level 2	Yes	Smart phone app	Price set by owner	Network fees will vary
Plugless Power	Gen 2	Yes	N/A	N/A	N/A
PowerCharge	Pro Series	Yes	Major credit cards, RFID, smart phone app	Price by duration, per kWh, or any custom combinations	Network fees will vary
Schneider	EVlink Parking	Yes	RFID, mobile app	Price by duration, energy, or session. Time and user-variable pricing available.	Network fees will vary
SemaConnect	Series 6	Yes	RFID, mobile app, and “800” number	Price by energy or duration. Time and user-variable pricing available.	Monthly network fee, available in multi-year packages
Shorepower Technologies	ePump	Yes	Major credit cards, user cards, and RFIDs	Price by duration	Annual network fee, 15% transaction fee
Siemens	VersiCharge	Yes	Mobile app and call center	Price by duration, energy, or session. Time and user-variable pricing available.	Hardware maintenance and warranty bundled pricing available
Tellus Power	Level 2	Yes	RFID, mobile app	Price set by owner	Network fees will vary
Wattzilla	QuadZilla	Yes	N/A	N/A	N/A
Webasto	TurboDX	Yes	N/A	N/A	N/A
Wirelane	EV Charger	Yes	RFID, call center, QR code, mobile app	Price set by owner	Network fees will vary
DCFC EVC					
ABB	Terra 54HV	Yes	Major credit cards, credit card smart phone apps	User-variable pricing available.	Service and maintenance packages available.
AddEnergie Technologies	SmartDC-V2	Yes	RFID card, smart phone app	Set by FLO network	Varies
Andromeda Power LLC	ORCA Air	Yes	Major credit card, RFID card	Price set by owner	Varies
Blink	DC Fast Charger	Yes	Major credit cards, RFID card, smart phone app	Set by Blink network	Membership fee required to access Blink Network
Bosch	EV2000	Yes	RFID card, smart phone app	Price set by owner	Varies
BTCPower	50 kW DC Fast Charger	Yes	Major credit cards, RFID card	Price set by owner	Varies
ChargePoint	CPE200/250	Yes	Chargepoint or RFID card, “800” number	Price by duration, energy, or session. Time and user-variable pricing available.	Chargepoint network plan/port/year, various subscriptions lengths.

DCFC EVC					
Efacec	QC45	Yes	RFID, smart phone app, call center	Price by duration, energy, or session. Time and user-variable pricing available.	Hardware maintenance and warranty bundled pricing available.
EV Box	Troniq 50	Yes	RFID, mobile app, and call center	Price by duration, energy, or session. Time and user-variable pricing available.	Hardware maintenance and warranty bundled pricing available
Juice Bar	Energy Bar QC45	Yes	QR scan, mobile app, and “800” number available 24/7	Price by duration, energy, or session. Time and user-variable pricing available.	Some network fees, multi-year subscription discounts available
OPConnect	Standard/Slim Line DC Fast Charger	Yes	Major credit cards, smart phone app	Price set by owner	Network fees will vary
Schneider	EVlink DC Fast	Yes	RFID, mobile app	Price by duration, energy, or session. Time and user-variable pricing available.	Network fees will vary
Tellus Power	DC 150	Yes	RFID, mobile app	Price by hour, kWh, driver, etc.	Network fees will vary
Tritium	Veefil^{RT}	Yes	RFID, mobile app	Price set by owner	Network fees will vary

Manufacturer/Certification Information					
Manufacturer	**Model**	**Listings**	**Accessibility Features**	**First Entry to EVSE Market**	**Installation Rating**
Level 2 EVC					
AddEnergie Technologies	CoRe+	CSA certified for US & Canada	Not specified	2009	NEMA 4X
Blink	IQ 200	NEC 625, Ul and Ulc to 2594	Insertion force: 45N<F<80N Control height: 24" – 48"	2012	Outdoor Rated, NEMA 3R
Bosch	EV800	NEC 625, ETL, cETL	Not specified	2013	NEMA 4X
BTC Power	30A/40A/70A	NEC 625, UL 2594, UL 2231, cUL, ETL	Insertion force: 45N<F<80N Control height: < 54"	2013	NEMA 3R
ChargePoint	CT4000	UL, cUL, NEC Article 625	Insertion force: Not listed Control height: < 48"	2009	NEMA 3R
Clipper Creek	LCS / HCS / CS	UL, cUL, ETL, cETL	Insertion force: 45N<F<80N Control height: Variable	2006	NEMA 4R
Efacec	Public	UL, SAE 1772	Insertion force: 45N<F<80N Control height: < 54"	2011	NEMA 3R
eMotorWerks	JuiceBox	UL, cUL	Insertion force: 45N<F<80N Control height: Variable	2010	NEMA 4X
EV Box	BusinessLine	UL, cUL, CE, Energy Star	Insertion force: 45N<F<80N Control height: Variable	2010	NEMA 3R
EVoCharge	EVSE/iEVSE/ iEVSE Plus	UL/cUL & ETL/cETL	Insertion force: 45N<F<80N Control height: > 54"	2009	NEMA 4R
EVSE LLC	3704 AutoCoil	NEC 625, UL 2231&2594, CAN/CSA 22.2	Insertion force: 45N<F<80N Control height: < 54"	2009	NEMA 3R
Juice Bar	Mini Bar	ETL	Insertion force: 45N<F<80N Control height: < 54"	2009	NEMA 3R
KEBA	KeContact P30	CE, UL	Not specified	2013	Not specified
Leviton	Evr-Green	NEC 625, UL, CSA-C22.2	Not specified	2011	NEMA 3R
MOEV	Quad 2.4	SAE J1772	Not specified	2015	NEMA 6/12
OPConnect	Level 2	UL	Not specified	2009	NEMA 4R
Plugless Power	Gen 2	Not specified	Not specified	2011	Outdoor rated, max wheel load 680 kg
PowerCharge	Pro Series	ETL, cETL, UL 2231/2594	Not specified	2017	NEMA 3R
Schneider	EVlink Parking	NEC 625, SAE J1772, UL, CSA 22.2	Insertion force: 45N<F<80N Control height: < 54"	2011	IP54
SemaConnect	Series 6	NEC 625, UL 2231, UL2594	Insertion force: 45N<F<80N Control height: < 54"	2008	NEMA 3R

Manufacturer/Certification Information					
Manufacturer	**Model**	**Listings**	**Accessibility Features**	**First Entry to EVSE Market**	**Installation Rating**
Level 2 EVC					
Shorepower Technologies	ePump	ETL & ETI, UL pending	Insertion force: Unknown Control height: < 48”	2004	NEMA outdoor rated
Siemens	VersiCharge	UL, SAE J1772, NEC 625	Insertion force: 45N<F<80N Control height: Variable	2011	NEMA 4R
Tellus Power	Level 2	ETL, UL, NEC 625	Not specified	2013	NEMA 3R
Wattzilla	QuadZilla	UL	Not specified	2015	NEMA 4X
Webasto	TurboDX	UL, cUL	Not specified	2018	Type 4 (IP66) enclosure
Wirelane	EV Charger	Not specified	Not specified	2018	IP54
DCFC EVC					
ABB	Terra 54HV	UL 2202, CSA 107.1	Not specified	Not specified	NEMA 3R
AddEnergie Technologies	SmartDC-V2	CSA Canada	Not specified	2009	NEMA 3R
Andromeda Power LLC	ORCA Air	UL	Not specified	2012	NEMA 3R
Blink	DC Fast Charger	NEC Article 625, UL2202, UL2231, UL2251, UL 50 UL	Insertion force: 45N<F<80N Control height: 24” – 48”	2012	NEMA 3R
Bosch	EV2000	UL, cUL, UL2202, UL2231	Not specified	2013	NEMA 3R, IP54
BTCPower	50kW DC Fast Charger	UL, NEC 625, ETL, cETL	Not specified	2013	NEMA 3R
ChargePoint	CPE200/250	UL, cUL, NEC Article 625	Insertion force: 45N<F<80N Control height: < 54”	2009	NEMA 3R, IP54
Efacec	QC45	UL, SAE 1772	Insertion force: 45N<F<80N Control height: 24” – 48”	2011	NEMA 3R
EV Box	Troniq 50	CE, EN/IEC 61851-1, ISO15118	Not specified	2010	IP54
Juice Bar	Energy Bar QC45	UL, SAE 1772	Insertion force: 45N<F<80N Control height: 24” – 48”	2009	NEMA 3R
OPConnect	Standard/Slim Line DC Fast Charger	UL	Not specified	2009	NEMA 4
Schneider	EVlink DC Fast	UL, cUL	Insertion force: Unknown Control height: < 54”	2011	IP54
Tellus Power	DC 150	CE	Not specified	2013	IP54
Tritium	Veefil^{RT}	CE, UL, RCM, FCC, IC	Not specified	2014	IP65

Network-only Providers						
Company	**Network**	**System Features**	**Turnkey Installation Services**	**Mobile App for Drivers**	**Real-time Support**	**OCPP Supported**
Driivz	Driivz EV Charging Management	Charger operations, billing, fleet and host management, analysis & reporting, energy management	No	Yes	Not specified	Yes
EV Connect	EV Cloud	Open network allows for hardware/software flexibility	Yes	Yes	24/7	Yes
FLO	FLO	Smart energy management to limit peak demand surcharges, configure energy management settings, track usage and electricity consumption.	Yes	Yes	During business hours	No
Go Electric Stations	NEXTCHARGE	Station maps, charge analysis, diagnostics, remote adjustments	No	Yes	Not specified	Yes
Greenlots	SKY	Flexible pricing options, asset management, predictive analytics and usage reporting, charging optimization capacity, grid balancing services, fleet solutions	Yes	Yes	24/7	Yes
Kitu Systems	Convoy	Updates on station information, connection status, charging information, and transaction receipts. Site management web portal for data collection and reporting. Access control, payment option control, and load management for sites.	Yes	Yes	24/7	Yes
Liberty Plug-Ins	HYDRA-R	Usage costs, carbon footprint monitoring, smart energy management to limit peak demand charges, restrict access to chargers, provide payment options	No	Yes	Not specified	Not specified
Shell New Energies	RechargePlus	Intelligent APP minimizes charging during peak demand periods, system dashboard for monitoring and station control	No	No	24/7	Not specified

Turnkey Providers		
Company	**Service**	**Services Offered**
ABM	Turnkey EV Charging Port Installation	Provides site planning and installation services for EV chargers, focusing on ChargePoint hardware/network systems, both Level 2 and DC Fast Chargers.
Charge Bliss	Building Energy Management w/ Integrated EV Charging	Develops energy management systems for buildings, including integrating EV chargers. Capable of setting up microgrids.
EDF Renewables	Solar-EV Charging Integration	Combines EV infrastructure with solar and storage, has the option of adding EV chargers as part of solar/storage installations.
Electrify America	Highway Corridor DC Fast Charging, Community DC Fast and Level 2 Charging	Installs Level 2 and DC Fast Chargers at key locations along highway corridors and on commercial/residential properties to increase public awareness of EVs and ease of use. Provides mobile app and membership model to get discounted rates.
EverCharge	Charging Station Installation & Management	Provides on-site evaluations, gains building & HOA approvals, installs hardware with certified electricians, monitors power usage & reimbursements, provides 24/7 support. SmartPower technology maximizes existing building infrastructure by intelligently allocating power where/when it is needed.
National Car Charging	EV Charger Consultation, Installation, and Station Management	Provides installation strategy & planning help, assist with equipment choice and equipment installation, and provides continued station management.
U-Go	Turnkey EV Charger Installation	Provides EVBox Level 2 chargers, EVpump DC Fast chargers to commercial property owners and municipalities.
Verdek	Turnkey EV Charger Installation	Provides permitting, installation, and inspection services for hardware from ChargePoint, Efacec, eMotorWerks, and EVoCharge.
Video Voice Data Communications	Turnkey Electrical Engineering & Construction	Operations and maintenance partner for ChargePoint. Site assessments for residential, commercial, and public EVSE needs. EV consulting and permitting acquisitions.
Volta	EV Charging Station Installation (powered by brands)	Installs Level 2 chargers on commercial properties, provides free charging to customers by charging companies to advertise on large LCD screens on the sides of the chargers.
Zero-Impact Solutions	Turnkey EV Charger Installation	Recommends most appropriate charging platforms for businesses, focusing on ROI. Takes care of hardware purchasing, installation, management, and ongoing monitoring.

3.2 Manufacturer Information Gaps

We have endeavored to include as many EVC manufacturers and network providers as possible in this guide. When available technical specifications were insufficient, we contacted the manufacturer to request additional information. We received varying levels of response from manufacturers.

4 Glossary

 # Charging Ports/Type: The number of cars that can charge simultaneously on a single charger and the type of connector(s) (e.g. CHAdeMO, J1772) available.

Accessibility Features: Charger features to facilitate greater access to potential users. As standards for electric vehicle chargers under the ADA do not extend beyond the height of operable parts, we focus on the operable part (control) height, and the insertion force required to insert a charger connector.

ADA title 24 2017 compliance (ADA): Americans with Disabilities Act EVC regulations. New scoping provisions in effect January 2017 ensure requirements such as van and general accessibility dimensions, parking designation, and path of travel are in accordance with the 2016 California Building Code. (2)

BEV: Battery-only electric vehicle. A vehicle whose only power source is an onboard battery.

Cable management: Method to physically store charging cable, typically a rack for cable coils or a retractable cable device.

Cable Hangar: A cable management method that anchors the cable to the charger such that the cable hangs above the ground.

Cable Wrap: A cable management method where the charging cord is intended to wrap around the physical charger.

CAT5: Common computer networking cable, typically used to connect internet-based devices.

CEC: California Energy Commission, a California State agency.

CHAdeMO: CHArge de MOve (CHAdeMO). An association as well as the eponymous DCFC EV fast charging process that requires a CHAdeMO charging socket on the EV. This is different from the Level 2 SAE J1772 charging sockets common to most public chargers in the US.

Charging ports: Number of charging plugs, or ports, per EVC. Multiple ports per station allows for more charging ability with adjacent parking spots. EVCs may be wall-mounted, pedestal, or overhead, supporting different configurations and access. “Dual head” refers to two charging ports per EVC.

Coil Rack: A cable management method where a physical rack is provided to coil the cable.

Commercial maturity: Is the hardware or software manufacturer a major market participant with an established customer base and several product releases? This is a qualitative metric for general consideration and subject to interpretation. The specification tables attempt to capture this with the date of entry into the EVSE market.

Connector: PEV input receptacle for charging. Level 1 and Level 2 charging is based on the Society of Automotive Engineers (SAE) International standard, or SAE J1772 standard. PEVs equipped with DCFC

charging may use the CHAdeMO connector, developed in coordination with Tokyo Electric Power Company, or the SAE Combo plug.

Cross vendor compatibility: The ability for EVC hardware to operate using networks from a different manufacturer (cross vendor software compatibility) or the ability for network software to operate on hardware produced by a different manufacturer (cross vendor hardware compatibility).

Customer payment methods (Customer Payment): Payment and subscription methods for customers. Magnetic strip: located on the back of a credit or debit card and can be swiped through a reader. RFID: Radio Frequency Identification device uses a copper coil antenna and a chip to store small amounts of data that can be accessed by a reader within close proximity using radio waves. Club card: existing EVC manufacturer or network RFID card. Mobile device: smartphone may contain wireless RFID chips, which allows a smartphone or plastic key ring to communicate with nearby devices without a cable.

Data reporting: Usage and service data recorded by networked EVSE and available for reporting.

Demand Charges: A charge levied by utility companies based upon the customer's maximum power draw during a given period, usually one month. Typically only applies to large electricity consumers.

Demand Response Capability: The ability of EVCs to adjust power output based on local grid demand. Exact implementation will vary, but is typically coordinated between a service network provider and electric utility.

Energy use and data reporting (Data Reporting): Method for recording EVC energy usage and data.

EVC: Electric vehicle charger. Generally referred to outside of this guide as EVSE.

EVSE: Electric vehicle supply equipment. The common literature acronym for electric vehicle chargers.

First Entry to EVSE Market: The year in which a manufacturer first released an EVSE product.

Input Power: Power input, specified based on supply voltage and amperage.

Installation Rating: Installation certifications. NEMA: National Electrical Manufacturers Association; ratings typically establish durability and weather protection for outdoor installations.

J1772: An electric vehicle charging standard established by SAE International (formerly the Society of Automotive Engineers). Establishes charger connector shape, standard for Level 2 chargers in the US.

kWh: An energy unit equivalent to drawing one kilowatt of power for one hour.

Level 1: A charging process using a cord that plugs into a standard 120 volt outlet, usually taking between 8-20 hours to fully charge a PEV with a standard battery capacity.

Level 2: A charging process using a 240 volt electric circuit, which usually takes 4-8 hours to fully charge a PEV with a standard battery capacity. Level 2 is the most common type of public charging in California.

Level 3: DC fast charging is often referred to as Level 3 because it charges at a substantially faster rate than Level 2 AC charging. Level 2 AC charging and DC fast charging are currently the common modes of commercial charging. However, according to SAE, Level 3 charging can be either AC or DC. Level 3 AC is defined as > 20kW.

Listings: Manufacturer certifications by either independent safety certification laboratories, such as UL or ETL, or national standards, such as the National Electric Code (NEC).

Manufacturer: The company responsible for manufacturing the charger or network software described in the specification tables.

Mobile app for drivers: A smart phone application created by and particular to a certain network that provides drivers extra functionality such as reserving stations, paying session fees, or monitoring charging status.

Model: The specific model of charger examined in the specification tables. For this guide, models have been selected to give a general idea of the capabilities of the chargers produced by that manufacturer.

Mounting: The physical mounting for the charger unit, i.e. wall-mounted or pedestal-mounted.

Network-capable: Capable of being a part of a network service.

Network protocol: Protocol for communication between EVC site host and an EVC network, such as the Open Charge Point Protocol (OCPP)

Network Service: An infrastructure system of public EVCs. There are a variety of providers, administrators, and manufacturers who offer services.

OCPP: Open Charge Point Protocol (OCPP), an international open communication standard. OCPP-compliant hardware and software is designed to function together regardless of manufacturer. This allows EVC site hosts to mix and match charging stations and choose the network provider of their choice without issues of interoperability and compatibility. (3)

Open Access: A charger that can be available for any customer to use, with or without a network subscription

Operating Conditions: The temperature and humidity requirements for a charger to operate normally.

Output Power: Power output provided to vehicle from the charger.

Owner Payment: Payment and subscription methods for site owners/operators.

Pedestal: Pedestal EVCs include a pole, box, or similar structure to provide free-standing installation. These typically are mounted on a sidewalk or small concrete foundation, similar to other street-based utility equipment. Pedestal EVCs are hard-wired.

PEV: Plug-in electric vehicle. A vehicle requiring battery electric power to operate that can be externally charged. Both battery-only (BEV) and plug-in hybrid (PHEV) vehicles are available.

PHEV: Plug-in hybrid electric vehicle. A plug-in electric vehicle that also carries a backup gasoline engine-generator.

Power rating input(s): Power input, specified based on supply voltage and amperage.

Pricing schedules: Pricing schedule for EVCs. Variable pricing: site host offers varying price points at different locations or points-of-sale.

Price Setting Option: The different price schemes a charger is capable of supporting, i.e. dollars/kWh, dollars/hour, etc.

Range/Hour: A measurement of charger power specifying the amount of driving range added per hour of time spent charging.

RCEA: Redwood Coast Energy Authority.

Real-time Support: Support provided by charging station networks to station owners or users in need of assistance (often done via an 800 number listed on the charging station itself).

Remote Management Capability: EVC can be controlled through a device not physically attached to the station. It is important for communication and control, and can be implemented to improve safety and productivity.

ROEV Compliant: Meets standards currently in development by Roaming for EV Charging (ROEV) association to allow drivers to access multiple network services with a single account. The association represents ChargePoint, Blink, and NRG EVgo networks and works with Nissan, BMW, Audi, and Honda[4].

SAE CCS: Society of Automotive Engineers Combined Charging System. It is a fast charging method for EVs delivering high-voltage current via a specific combination plug. The plug socket is an AC connector with a DC option.

Session fees: EVC charging fees for customer. Typically determined by site host. Important to consider surcharges and commissions.

System Features: Network features designed to provide customers with information about the network and its operation, as well as improved functionality for charging station users.

Theft Deterrence: Features to prevent EVC theft and vandalism.

Turnkey Provider: A company that will walk customers through every step of the process in buying, installing, and operating a charging station.

5 References

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3. Open Charge Alliance. (2016). *Open Charge Alliance Factsheet*. http://www.openchargealliance.org/uploads/files/Factsheet_OCPP_1.6_2016.pdf. Accessed October 31, 2016.
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6 Product Photos

This section shows the general appearance of some of the EVC models described in this guide.

ABB Terra 54HV (P1) 	AddEnergie Technologies CoRe+ (P2) 	Andromeda Power LLC Orca Air (P3) 	Blink IQ 200 (P4) 	Blink DC Fast Charger (P5) 
Bosch EV800 (P6) 	Bosch EV2000 (P7) 	BTC Power 30A (P8) 	BTC Power DC Fast Charger (P9) 	ChargePoint CT4000 (P10) 
ChargePoint CPE200 (P11) 	Clipper Creek HCS (P12) 	Efacec Public (P13) 	Efacec QC45 (P14) 	eMotorWerks JuiceBox (P15) 

EV Box BusinessLine (P16) 	EV Box Troniq 50 (P17) 	EVoCharge EVSE (P18) 	EVSE LLC 3704 AutoCoil (P19) 	Juice Bar Mini Bar (P20) 
Juice Bar Energy Bar QC45 (P21) 	KEBA KeContact P30 (P22) 	Leviton Evr-Green (P23) 	MOEV Quad 2.4 (P24) 	OPConnect Level 2 (P25) 
OPConnect DC Fast Charger (P26) 	Plugless Power Gen 2 (P27) 	PowerCharge Pro Series (P28) 	Schneider EVlink Parking (P29) 	Schneider EVlink DC Fast (P30) 
SemaConnect Series 6 (P31) 	Shorepower Technologies ePump (P32) 	Siemens VersiCharge (P33) 	Tellus Power Level 2 (P34) 	Tellus Power DC 150 (P35) 

Tritium Veefil[RT] (P36)	Wattzilla QuadZilla (P37)	Webasto TurboDX (P38)	Wirelane EV Charger (P39)	
				

Stations not to scale: please see manufacturing specifications for physical dimensions. Image credits are given in section 6.1. Current models may vary from those shown here.

6.1 Photo credits

P1. Terra 54 HV DC charger by ABB. https://library.e.abb.com/public/44674585505e40b5b5683192a8bf5ffb/4EVC800801-LFUS_Terra54UL_web.pdf
P2. CoRe+ by AddEnergie Technologies. https://addenergie.com/en/core/
P3. Orca Air by Andromeda Power LLC. http://www.andromedapower.com/products/orca-air/
P4. IQ 200 by Blink. https://www.blinknetwork.com/chargers-commercial-l2-pedestal.html
P5. DC Fast Charger by Blink. https://docs.wixstatic.com/ugd/e964f2_60b3d51ada4f417fb5a3536c09fba46b.pdf
P6. EV800 by Bosch. https://www.boschevsolutions.com/charging-stations/ev800-series-bollards?sku=EL-50650-GNT-B
P7. EV2000 Fast Charger by Bosch. https://www.boschevsolutions.com/charging-stations/ev2000-series?sku=EL-52240
P8. 30A EV Charger by BTC Power. http://www.btcpower.com/index.php?action=30-40A-Pedestal
P9. DC Fast Charger by BTC Power. http://www.btcpower.com/index.php?action=50kW-DCFC
P10. CT4000 by ChargePoint. https://www.chargepoint.com/products/commercial/ct4000/
P11. CPE200 DC Fast Charger by ChargePoint. http://www.chargepoint.com/products/commercial/cpe200/
P12. Clipper Creek HCS by Clipper Creek. https://store.clippercreek.com/all-products/hcs-40-hcs-40p-ev-charging-station
P13. Public by Efacec. http://electricmobility.efacec.com/ev-public-charger/
P14. QC45 DC Fast Charger by Efacec. https://electricmobility.efacec.com/ev-qc45-quick-charger/
P15. JuiceBox by eMotorWerks. https://evcharging.enelx.com/store/residential/juicebox-pro-40-smart-40-amp-evse-with-24-foot-cable?gclid=EAIaIQobChMIhfPMiv7p5AIVsRx9Ch36rwInEAQYASABEgLeo_D_BwE
P16. Businessline by EV Box. http://www.ev-box.com/products/businessline/
P17. Troniq 50 DC Fast Charger by EV Box. https://evbox.com/en/products/dc-charger
P18. EVSE by EVoCharge. https://www.evocharge.com/product/30a-evoreel.html
P19. 3704 AutoCoil by EVSE LLC. http://evsellc.com/products/ev-chargers-3704-autocoil/
P20. Mini Bar by Juice Bar. https://www.juicebarev.com/products/charging-stations/mini-bar-double
P21. Energy Bar QC45 DC Fast Charger by Juice Bar. https://www.juicebarev.com/products/charging-stations/energy-bar-qc45
P22. KeContact P30 by KEBA. https://www.keba.com/en/emobility/products/product-overview/product_overview
P23. Evr-Green by Leviton. https://www.leviton.com/en/products/brands/evrgreen
P24. Quad 2.4 by MOEV. https://www.moevinc.com/showcase/
P25. Level 2 by OPConnect. https://www.opconnect.com/press/hospitality/
P26. DC Fast Charger by OPConnect. https://www.opconnect.com/press/hospitality/
P27. Gen 2 by Plugless Power. https://www.pluglesspower.com/gen2-tech-specs/

P28. Pro Series by PowerCharge. https://www.powerchargeev.com/collections/networked-commercial-stations/products/powercharge-p10dpn-commercial-ev-charger
P29. EVlink Parking by Schneider. https://www.schneider-electric.com/en/product-range/60850-evlink-parking/
P30. EVlink DC Fast Charger by Schneider. https://www.schneider-electric.com/en/product-range/60852-evlink-fast-charge-solution/
P31. Series 6 by SemaConnect. https://www.semaconnect.com/charging-stations/series6/
P32. ePump by Shorepower Technologies. https://www.shorepower.com/electric-vehicle-charging-stations/
P33. VersiCharge by Siemens. https://new.siemens.com/us/en/products/energy/topics/transportation-electrification/versicharge-solutions/versicharge-commercial.html
P34. Level 2 by Tellus Power. http://telluspower.com/products/
P35. DC 150 by Tellus Power. http://telluspower.com/products/
P36. Veefil^{RT} by Tritium. https://www.tritium.com.au/product/productitem?url=veefil-rt-50kw-dc-fast-charger
P37. QuadZilla by Wattzilla. https://www.wattzilla.com/products/quadzilla.htm
P38. TurboDX by Webasto. https://webasto-charging.com/en_row/catalog/product/view/id/18/s/webasto-next/category/3/
P39. EV Charger by Wirelane. https://www.wirelane.com/#product