# Electric Vehicle Charger Selection Guide

Updated November, 2017

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Redwood Cost Energy Authority:

- Dana Boudreau
- Pierce Schwalb
- Lori Biondini
- Allison Campbell
- Lexie Fischer
- Matthew Marshall
- Ben Winker

Local Government Commission/Civic Spark

- Amanda Le

Schatz Energy Research Center

- Jerome Carman
- Andrew Harris
- Greg Chapman
- Kristen Radecsky
- Jim Zoellick

Siskiyou County Economic Development Council

- Logan Smith

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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 March, 2017) to assist them in selecting a charger for their application.

Section 2 in this guide provides an overview of Electric Vehicle Charger (EVC) equipment, how it works, and considerations when making a purchase. Section 2 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 publically available technical specifications. As funding allows, the information in this guide will be updated periodically to include new models and specifications as product offerings evolve.

# 2 Selecting an Electric Vehicle Charger: Making Choices

While there are many different EVCs to choose from, answering 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 require payment for access to an EVC? What costs of ownership are you willing to incur?

The following sections provide information to help answer these questions, as well as providing 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.

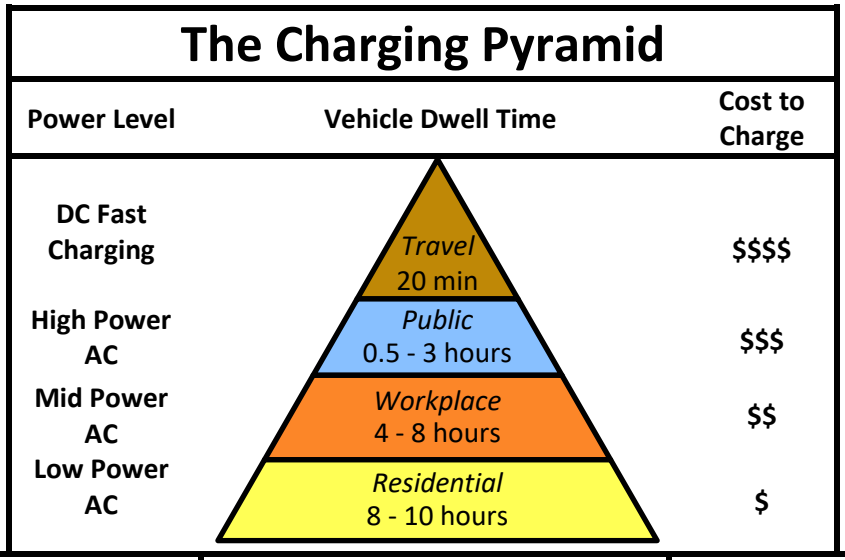
## 2.1 Types of EV Charging

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.

[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.

The charge times will vary depending on the charger, the on-board vehicle charging equipment, and the vehicle's battery capacity. The different charging levels serve different consumer needs: DCFCs best suit 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<br>• 2-5 miles of range per hour of charge<br>• Typical EVC cost: a few hundred dollars<br>• Typical installation cost: $0 | • 208/240 Volts AC, up to 80 Amps<br>• 10-20 miles of range per hour of charge<br>• Typical EVC cost: $500 - $8,000<br>• Typical installation cost: $600 - $13,000 per charger | • 200 - 500 VDC, up to 350 A<br>• 60-80 miles of range per hour of charge<br>• Typical EVC cost: $15,000 - $40,000<br>• Typical installation cost: $8,000 - $50,000 |

- 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.

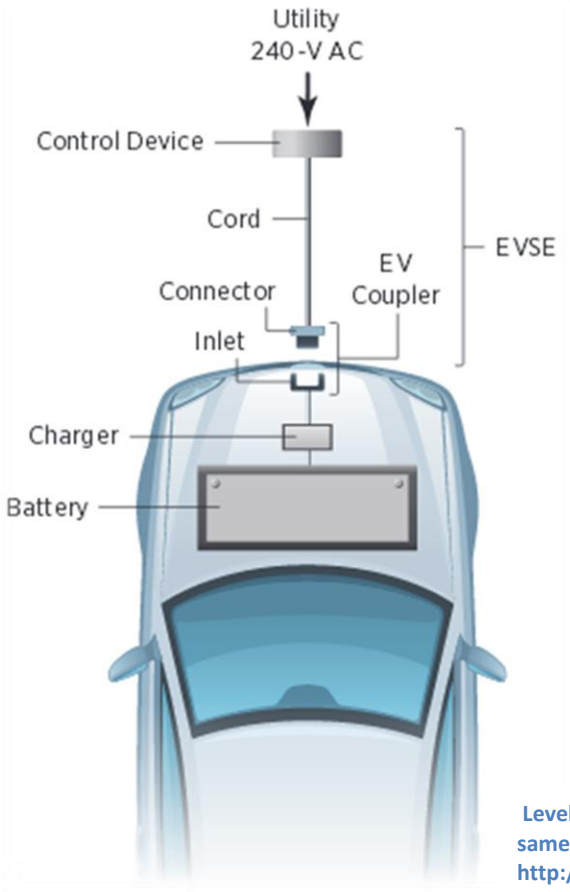
**Figure 1: Comparison of charging levels, time, and typical installation cost**

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

[2] CCS stands for Combined Charging System.

stations exclusively available to Tesla drivers, and is not covered here. In the US as of the 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.

It is important to note that not every car will be able to take advantage of an EVC's full power output. For example, many vehicles are not compatible with DC fast charging and therefore 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. Older models and PHEVs 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.




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 DCFC receptacle (left) and Level 1 and Level 2 J1772 standard receptacle (right). Source used with permission from: http://www.afdc.energy.gov/pdfs/51227.pdf

SAE J1772-CCS (left) and SAE J1772 (right). Source used with permission from wikimedia.org.

Figure 2: EVC schematic and connector inlet image

One of the largest factors in determining the type of charging to provide 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 EV infrastructure federal tax credit for an EVC in 2016 is 30% up to $1,000 for residential consumers and up to $30,000 for businesses. Some states provide EVC and battery-only electric vehicle (BEV) incentives: Oregon has an EVC tax credit for 50% of the project cost up to $750. Other options include credits or incentives for organizations, alternative energy sources, and leased facilities.

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 and wheel stops, will vary depending on local requirements. Overall, the installation costs for a Level 2 station could range from $600 - $13,000 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".

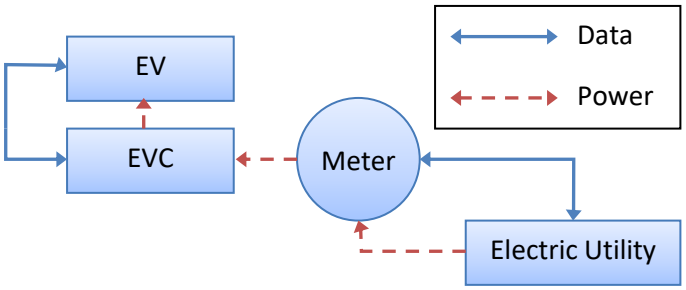



Figure 3: EVC Stand-alone ("dumb-charger") configuration

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 only viable option in locations with poor cell reception, or at low-use sites where network fees would likely exceed the cost of allowing free access.

[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.

Conversely, networked EVCs allow for payment options, notification of charging station status, and provide 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: users subscribe to the service network, which typically requires an initial deposit and periodic deposits to keep a payment account active. Users then 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 publically 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  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 to provide access to the cloud 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 re-occurring fee for the network service.

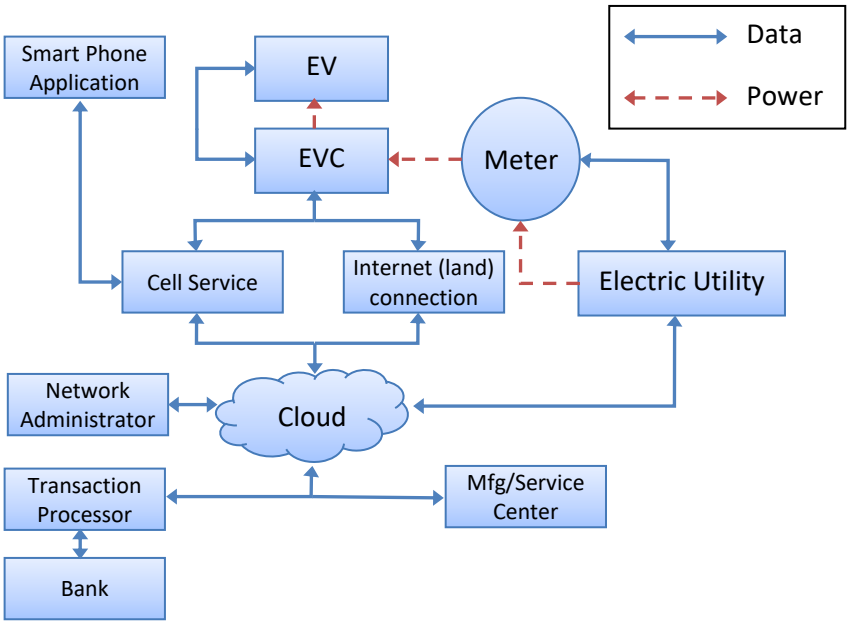



Figure 4: EVC Network with payment capability

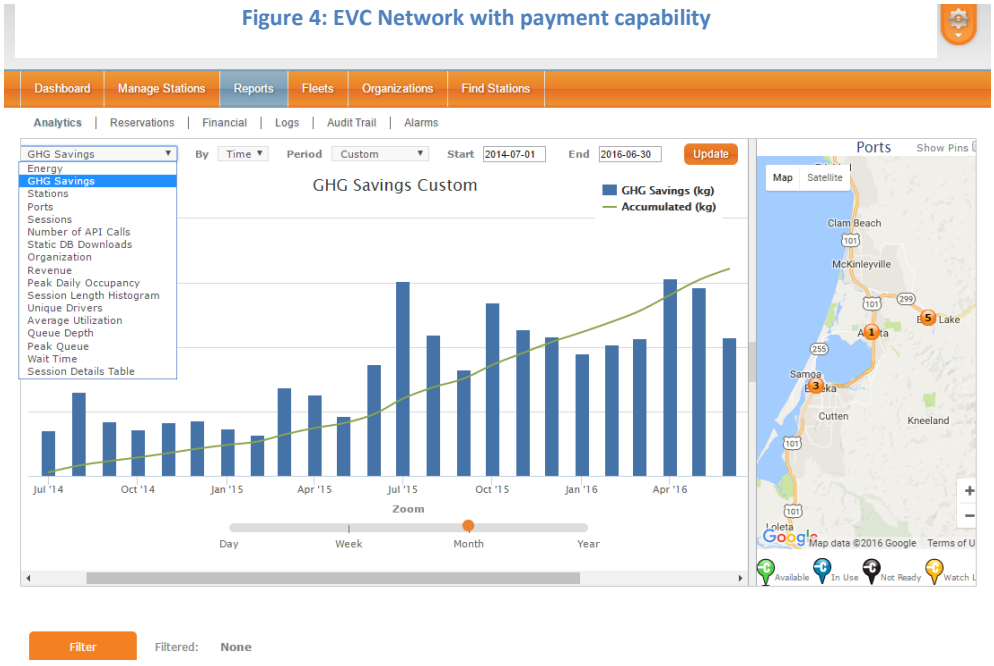



Figure 5: Example of a network dashboard

From a site 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 with regard to networked EVCs is whether or not the EVCs is compliant with Open Charge Point Protocol (OCPP). OCPP-compliant hardware and software is designed to function together regardless of manufacturer. 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.

## 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 chargers will require the station 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 draw approximately 2 kW of power – they are unlikely to increase a demand charge, but could potentially use 48 kWh (about 2 full vehicle charges) 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.*

### 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 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.[4]

*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:

1. Theft deterrence features
2. User payment options
3. Commercial maturity
4. Standard warranty length
5. Power rating (in kW) available per plug
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

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

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[5]

- 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 prevent theft or vandalism.
    - *Power Input Ratings*: Power circuit required to support charger.
    - *Operating Conditions*: Temperature and humidity operating limits.

- Management software:
    - *Network capable*: Can charger utilize network management software?
    - *Remote management*: Can charger information and settings be accessed remotely?
    - *Cross Vendor Hardware Compatibility*: Can other chargers 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.

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

- 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).

## 3.1 EVC Specification Tables

These tables give an overview of the various charging station equipment available as of November, 2016. Exact pricing and warranty will differ depending on the exact submodel 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. For pricing and other detailed information, contact a sales representative. For images of the chargers, see Section 6.

| Hardware – Electrical | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Manufacturer** | **Model** | **# Charging Ports/Type** | **Input Power** | **Output Power** | | **Cross Vendor Software Compatibility** | **Operating conditions** |
| | | | | **kW** | **miles range / hrs charging*** | | |
| ***Level 2 EVC*** | | | | | | | |
| AeroVironment | TurboDock | 1/J1772 | 208/240VAC; 16A | 3.8 kW | 13 miles range/hour | N/A | -40°F to 122°F |
| Blink | PE-30Kice | 1/J1772 | 208/240VAC; 30A | 7.2 kW | 24 miles range/hour | No | -22°F to 122°F |
| BTC Power | Chargion | 1-2/J1772 | 208/240VAC; 16A, 30A, 40A options | 3.3 – 9.6 kW | 11-32 miles range/hour | Greenlots SKY/OCPP compliant | -22°F to 122°F 90% RH non-condensing |
| ChargePoint | CT4000 | 1-2/J1772 | 208/240VAC; 40A circuit | 7.2 kW (max) | 24 miles range/hour | No | -22°F to 122°F 95% RH non-condensing |
| Clipper Creek | LCS / HCS / CS | 1/J1772 | 208/240 VAC | 2.88 – 19.2 kW | 9.6-64 miles range/hour | CS models can use Liberty Plugins control system | Unknown |
| Efacec | Public | 2/J1772 | 208/240 VAC 30 A / each output | 7.2 kW | 24 miles range/hour | Greenlots SKY OCPPv1.2, 1.5 and 1.6 compliant | -13°F to 122°F or -31°F to 122°F |
| eMotorWerks | JuiceBox | 1/J1772 | 100-250 VAC; 40A-70A max | 10 – 18 kW | 33-60 miles range/hour | No | -40°F to 149°F |
| EV Box | BusinessLine | 1-2/J1772 | 1- or 3-phase, 230V – 400V, 16A and 32A | 3.7 – 22 kW | 12-73 miles range/hour | Greenlots SKY OCPPv1.2, 1.5 and 1.6 compliant | -22°F to 122°F 95% RH non-condensing |
| EVoCharge | 30A EVoReel EVSE/iEVSE | 1-2/J1772 | 208/240VAC; 40A | 7.2 kW | 24 miles range/hour | Customer can configure with any OCPP network | -22°F to 122°F 95% RH non-condensing |
| EVSE LLC | AutoCoil | 1-2/J1772 | 208/240VAC; 30A | 7.2 kW | 24 miles range/hour | Greenlots SKY/OCPP compliant | -22°F to 122°F 95% RH non-condensing |
| Juice Bar | Mini Bar | 1-2/J1772, 1-2/120V connections | 208/240VAC; 40A | 7.2 kW | 24 miles range/hour | Greenlots SKY/OCPP compliant | -22°F to 122°F |
| Millbank | PowerGen | 1/J1772 | 208/240VAC | 7.2 kW | 24 miles range/hour | N/A | -22°F to 122°F |
| OPConnect | Mark II | 1-2/J1772 | 208/240VAC; 30A per port | 7.2 kW | 24 miles range/hour | Yes | -22°F to 140°F 95% RH non-condensing |
| | | | | | | | |

| Hardware – Electrical, continued | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Manufacturer** | **Model** | **# Charging Ports/Type** | **Input Power** | **Output Power** | | **Cross Vendor Software Compatibility** | **Operating conditions** |
| | | | | **kW** | **miles range / hrs charging*** | | |
| ***Level 2 EVC*** | | | | | | | |
| Schneider | EVlink Level 2 | 1-2/J1772 | 208/240VAC, 40A, 2 Pole Circuit Breaker | 7.2 kW | 24 miles range/hour | Chargepoint network (Level 2 only) | -22°F to 122°F 95% RH non-condensing |
| SemaConnect | ChargePro™ | 1/J1772 | 208/240VAC; 30A | 7.2 kW | 24 miles range/hour | No | -22°F to 122°F 95% RH non-condensing |
| Shorepower Technologies | ePump | 1-4/J1772 | 240VAC per connection port; up to 30A | 7.2 kW | 24 miles range/hour | Uses OPConnect software network | -4°F to 140°F |
| Siemens | VersiCharge | 1/J1772 | 208/240VAC; 40A circuit | 1.8 – 7.2 kW | 6-24 miles range/hour | Greenlots SKY OCPPv1.2, 1.5 and 1.6 compliant | -22°F to 122°F 95% RH non-condensing |
| Telefonix | PowerPost | 1/J1772 | 208/240VAC; 20A circuit | 3.4 kW | 11 miles range/hour | N/A | -22°F to 122°F |
| ***DCFC EVC*** | | | | | | | |
| ABB | Terra 53 CJ | 1/CHAdeMO + 1/SAE CCS | 480 VAC, 75A | 50 kW | 167 miles range/hour | Yes, OCPP compliant | -31°F to 122°F |
| ChargePoint | CPE200 | 1/CHAdeMO + 1/SAE CCS | 480 VAC, 63A | 50 kW | 167 miles range/hour | No | -35°F to 120°F 95% RH non-condensing |
| EV Box | BusinessLine | 1-2/J1772 | 3-phase, 400V, 32A | 3.7 – 22 kW | 12-73 miles range/hour | Greenlots SKY OCPPv1.2, 1.5 and 1.6 compliant | -22°F to 122°F 95% RH non-condensing |
| Schneider | EVlink DC Fast | 1/CHAdeMO or 1/CHAdeMO + 1/SAE CCS | 480VAC, 79A | 50 kW max | 167 miles range/hour | Greenlots (DC Fast only) | -22°F to 122°F 95% RH non-condensing |

* - 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** |
| ***Level 2 EVC*** | | | | | | | |
| AeroVironment | TuboDock | Wall or Pedestal | Coil Rack | 1/J1772 | Not specified | 208/240VAC; 16A | -40°F to 122°F |
| Blink | PE-30Kice | Wall or Pedestal | Coil Rack | 1/J1772 | Not specified | 208/240VAC; 30A | -22°F to 122°F |
| BTC Power | Chargion | Wall or Pedestal | Coil Rack or Cord Retractor | 1-2/J1772 | Not specified | 208/240VAC; 16A, 30A, 40A options | -22°F to 122°F 90% RH non-condensing |
| ChargePoint (charger by Leviton) | CT4000 | Wall or Pedestal | Cable Hanger | 1-2/J1772 | Locking charger holster | 208/240VAC; 40A circuit | -22°F to 122°F 95% RH non-condensing |
| 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 | Unknown |
| Efacec | Public | Wall or Pedestal | Coil Rack | 2/J1772 | Bolted to wall or pole mount | 208/240 VAC 30 A / each output | -13°F to 122°F or -31°F to 122°F |
| eMotorWerks | JuiceBox | Wall or Pedestal | Cable hangers, coil racks available | 1/J1772 | Optional locking bracket | 100-250 VAC; 40A-70A max | -40°F to 149°F |
| EV Box | BusinessLine | Wall or Pedestal | Cable Hanger | 1-2/J1772 | Bolted to wall or pole mount | 1-phase, 230V, 16A | -22°F to 122°F 95% RH non-condensing |
| EVoCharge | 30A EVoReel EVSE/iEVSE | Wall or Pedestal | Retractable Reel with auto-rewind & lock features. Wall or Ceiling Mounted. | 1-2/J1772 | Tamper proof mounting fasteners | 208/240VAC; 40A | -22°F to 122°F 95% RH non-condensing |
| EVSE LLC | AutoCoil | Wall or Pedestal | Retractable cable | 1-2/J1772 | Not specified | 208/240VAC; 30A | -22°F to 122°F 95% RH non-condensing |
| Juice Bar | Mini Bar | Wall or Pedestal | Coil and optional overhead cord management system | 1-2/J1772, 1-2/120 V connections | 2 key secure lock for internal components | 208/240VAC; 40A | -22°F to 122°F |
| Millbank | PowerGen | Wall or Pedestal | Cable wrap (wall) or storage (pedestal) | 1/J1772 | Pedestal has lockable component cabinet | 208/240VAC | -22°F to 122°F |

| Hardware – Mechanical, continued | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Manufacturer** | **Model** | **Mounting** | **Cable Management** | **# Charging Ports/Type** | **Theft Deterrence** | **Power Rating input(s)** | **Operating conditions** |
| ***Level 2 EVC*** | | | | | | | |
| OPConnect | Mark II | Wall or Pedestal | Coil Rack | 1-2/J1772 | Integrated surveillance camera | 208/240VAC; 30A per port | -22°F to 140°F 95% RH non-condensing |
| Schneider | EVlink Level 2 | Wall or Pedestal | Coil Rack | 1-2/J1772 | Not specified | 208/240VAC, 40A, 2 Pole Circuit Breaker | -22°F to 122°F 95% RH non-condensing |
| SemaConnect | ChargePro™ | Wall or Pedestal | Coil Rack | 1/J1772 | Not specified | 208/240VAC; 30A | -22°F to 122°F 95% RH non-condensing |
| Shorepower Technologies | ePump | Pedestal | Coil Rack | 1-4/J1772 | Overcurrent & GFCI protection; car-to-cord safety detection; locking cord and access doors (optional) | 240VAC per connection port; up to 30A | -4°F to 140°F |
| Siemens | VersiCharge | Pedestal | Cable Wrap | 1/J1772 | Charger locks to pedestal mount | 208/240VAC; 40A circuit | -22°F to 122°F 95% RH non-condensing |
| Telefonix | PowerPost | Wall or Pedestal | Retractable Cord Reel | 1/J1772 | Not specified | 208/240VAC; 20A circuit | -22°F to 122°F |
| ***DCFC EVC*** | | | | | | | |
| ABB | Terra 53 CJ | Pedestal | Cable Hanger | 1/CHAdeMO + 1/SAE CCS | Not specified | 480 VAC, 75A | -31°F to 122°F |
| ChargePoint | CPE200 | Pedestal | Cable Hanger | 1/CHAdeMO + 1/SAE CCS | Not specified | 480 VAC, 63A | -35°F to 120°F 95% RH non-condensing |
| EV Box | BusinessLine | Wall or Pedestal | Cable Hanger | 1-2/J1772 | Bolted to wall or pole mount | 3-phase, 400V, 32A | -22°F to 122°F 95% RH non-condensing |
| Schneider | EVlink DC Fast | Pedestal | Coil Rack | 1/CHAdeMO or 1/CHAdeMO + 1/SAE CCS | Not specified | 480VAC, 79A | -22°F to 122°F 95% RH non-condensing |

| Management Software | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Manufacturer** | **Model** | **Network-capable** | **Remote Management** | **Cross Vendor Hardware Compatibility** | **Network Protocol** | **Demand response capability** | **Data Reporting** |
| ***Level 2 EVC*** | | | | | | | |
| AeroVironment | TurboDock | No | Yes; Bluetooth enabled | N/A | N/A | N/A | N/A |
| Blink | PE-30Kice | Yes | Yes | No | Proprietary | Yes | Yes |
| BTC Power | Chargion | Yes | Yes | Yes | OCPP | Yes | Energy use, session duration, user cost. By transaction or monthly. |
| ChargePoint | CT4000 | Yes | Yes | Yes | OCPP | Not specified | 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 | N/A | OCPP | Yes, automated through OpenADR | Energy use, session duration, payment details, customer cost. By transaction. |
| eMotorWerks | JuiceBox | Yes | Yes | Clipper Creek & AeroVironment compatible | OpenADR compliant | Capable (Optional) | 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 | 30A EVoReel EVSE/iEVSE | Yes, not mandatory | Yes via any OCPP Network | N/A | OCPP | Capable (Optional) | Yes via any OCPP Network |
| EVSE LLC | 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 |
| Millbank | PowerGen | No | N/A | N/A | N/A | N/A | N/A |
| OPConnect | Mark II | Yes | Yes | Yes | OCPP/OpenADR | Yes | Energy use |
| Schneider | EVlink Level 2 | Yes, not mandatory | Yes | N/A | OCPP | Yes | Energy use, session duration, customer cost, gasoline and GHG savings. By transaction. |
| SemaConnect | ChargePro™ | Yes, not mandatory | Yes | Not Specified | OCPP (unconfirmed) | Yes | Yes |
| Shorepower Technologies | ePump | Yes, not mandatory | Yes | Yes | OpenADR 2.0b | Yes, OpenADR 2.0b | Energy use |

| Management Software, continued | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Manufacturer** | **Model** | **Network-capable** | **Remote Management** | **Cross Vendor Hardware Compatibility** | **Network Protocol** | **Demand response capability** | **Data Reporting** |
| ***Level 2 EVC*** | | | | | | | |
| Siemens | VersiCharge | Yes | Yes | N/A | OCPP | Yes, automated through OpenADR | Energy use, session duration, payment details, customer cost. By transaction. |
| Telefonix | PowerPost | No | N/A | N/A | N/A | N/A | N/A |
| ***DCFC EVC*** | | | | | | | |
| ABB | Terra 53 CJ | Yes | Yes | Yes | OCPP | Add-on available | Yes |
| ChargePoint | CPE200 | Yes | Yes | Yes | OCPP | Not specified | Energy use, session duration, customer cost, gasoline and GHG savings. By transaction. |
| EV Box | BusinessLine | Yes | Yes | N/A | OCPP | Yes, automated through OpenADR | Energy use, session duration, payment details, customer cost. By transaction. |
| Schneider | EVlink DC Fast | Yes, not mandatory | Yes | N/A | OCPP | Yes | Energy use, session duration, payment details, customer cost. By transaction. |

| Payment System | | | | | |
|---|---|---|---|---|---|
| **Manufacturer** | **Model** | **Open Access** | **Customer Payment** | **Price Setting Option** | **Owner Payment** |
| ***Level 2 EVC*** | | | | | |
| AeroVironment | TurboDock | Yes | N/A | N/A | N/A |
| Blink | PE-30Kice | Yes | Blink InCard, mobile app, and “800” number | Set by Blink network | Not Specified |
| BTC Power | Chargion | 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 | Can integrate into existing billing systems, iOS and Android mobile app ready | Price by duration, energy, or session. Flexible pricing available. | Choice of free network or 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 | AutoCoil | Yes | RFID and mobile app, optional magnetic stripe/chip based card | 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 |
| Millbank | PowerGen | Yes | N/A | N/A | N/A |
| OPConnect | Mark II | Yes | Major credit cards, OPConnect card, Wright Express Fleet Card®, phone number or email based PIN, mobile app | Flexible | Network fees will vary |
| Schneider | EVlink Level 2 | Yes | RFID, PayPal | Price by duration, energy, or session. Time and user-variable pricing available. | 1, 2, and 3 year subscription plans |

| Payment System, continued | | | | | |
|---|---|---|---|---|---|
| **Manufacturer** | **Model** | **Open Access** | **Customer Payment** | **Price Setting Option** | **Owner Payment** |
| ***Level 2 EVC*** | | | | | |
| SemaConnect | ChargePro™ | Yes | SemaConnect Pass, 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 |
| Telefonix | PowerPost | Yes | N/A | N/A | N/A |
| ***DCFC EVC*** | | | | | |
| ABB | Terra 53 CJ | Yes | Major credit cards, credit card smart phone apps | User-variable pricing available. | Service and maintenance packages available. |
| ChargePoint | CT4000, CPE200 | Yes | Chargepoint or RFID card, "800" number | Price by duration, energy, or session. Time and user-variable pricing available. | Chargepoint network plan; $280/port/year, various subscriptions lengths. |
| 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 |
| Schneider | EVlink DC Fast | Yes | RFID, PayPal | Price by duration, energy, or session. Time and user-variable pricing available. | 1, 2, and 3 year subscription plans |

| Manufacturer/Certification Information | | | | | |
|---|---|---|---|---|---|
| **Manufacturer** | **Model** | **Listings** | **Accessibility Features** | **First Entry to EVSE Market** | **Installation Rating** |
| ***Level 2 EVC*** | | | | | |
| AeroVironment | TurboDock | UL and cUL | Insertion force: Not listed<br>Control height: 48” | 2011 | NEMA 3R |
| Blink | PE-30Kice | NEC 625, UL and ULc to 2594 | Insertion force: 45N<F<80N<br>Control height: 48” – 60” | 2012 | Outdoor Rated, NEMA 3R |
| BTC Power | Chargion | NEC 625 UL 2231, UL2594 | Insertion force: 45N<F<80N<br>Control height: < 54” | 2013 | NEMA 3R |
| ChargePoint | CT4000 | UL, cUL, NEC Article 625 | Insertion force: Not listed<br>Control height: < 48” | 2009 | Not Specified |
| Clipper Creek | LCS / HCS / CS | UL, cUL, ETL, cETL | Insertion force: 45N<F<80N<br>Control height: Variable | 2006 | NEMA 4R |
| Efacec | Public | UL, SAE 1772 | Insertion force: 45N<F<80N<br>Control height: < 54” | 2011 | Not Specified |
| eMotorWerks | JuiceBox | CE, NEMA, SAE | Insertion force: 45N<F<80N<br>Control height: Variable | 2010 | Outdoor rated |
| EV Box | BusinessLine | SAE 1772 | Insertion force: 45N<F<80N<br>Control height: Variable | 2010 | Not Specified |
| EVoCharge | 30A EVoReel EVSE/iEVSE | UL/cUL & ETL/cETL | Insertion force: 45N<F<80N<br>Control height: > 54” | 2009 | Outdoor Rated, NEMA 3R |
| EVSE LLC | AutoCoil | NEC 625, UL 2231&2594, CAN/CSA 22.2 | Insertion force: 45N<F<80N<br>Control height: < 54” | 2009 | NEMA 3R |
| Juice Bar | Mini Bar | ETL, UL 2231, UL2594, CSA C22.2 No. 280-13 | Insertion force: 45N<F<80N<br>Control height: < 54” | 2009 | Not Specified |
| Millbank | PowerGen | Unknown | Insertion force: Unknown<br>Control height: < 48” | 2011 | NEMA 3R (pedestal) or NEMA 4R (wall mount) |
| OPConnect | Mark II | UL 2594, 2231 | Insertion force: 45N<F<80N<br>Control height: <54” | 2009 | NEMA 3S per 250-1997 |
| Schneider | EVlink | NEC 625, SAE J1772, UL, CSA 22.2 | Insertion force: 45N<F<80N<br>Control height: < 54” | 2011 | NEMA 3R |
| SemaConnect | ChargePro™ | NEC 625 UL 2231, UL2594 | Insertion force: 45N<F<80N<br>Control height: < 54” | 2008 | NEMA 3R |
| Shorepower Technologies | ePump | ETL & ETI | Insertion force: Unknown<br>Control height: < 48” | 2004 | Not Specified |

| Manufacturer/Certification Information, continued | | | | | |
|---|---|---|---|---|---|
| **Manufacturer** | **Model** | **Listings** | **Accessibility Features** | **First Entry to EVSE Market** | **Installation Rating** |
| Siemens | VersiCharge | UL, SAE J1772, NEC 625 | Insertion force: 45N<F<80N<br>Control height: Variable | 2011 | NEMA 4R |
| Telefonix | PowerPost | SAE J1772, UL, NEMA | Insertion force: 45N<F<80N<br>Control height: <54” | 2011 | UL50 and UL50E Type 3R |
| ***DCFC EVC*** | | | | | |
| ABB | Terra 53 CJ | C UL us, IEC 61000 class B | Not specified | Not specified | NEMA 3R |
| ChargePoint | CPE200 | UL, cUL, NEC Article 625 | Insertion force: 45N<F<80N<br>Control height: < 54” | 2009 | Not Specified |
| EV Box | BusinessLine | SAE 1772 | Insertion force: 45N<F<80N<br>Control height: Variable | 2010 | Not Specified |
| Schneider | EVlink | cULus, CHAdeMO,<br>SAEJ1772 (DC Fast) | Insertion force: Unknown<br>Control height: < 54” | 2011 | NEMA 3R |

## 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. The following manufacturers have not responded to our requests for information as of March 2017:

- ABB
- ShorePower
- SemaConnect

# 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.

**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.

**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.

**Theft Deterrence:** Features to prevent EVC theft and vandalism.

# 5 References


1. California Energy Commission. (2015) *Agreement ARV-14-046*. http://www.energy.ca.gov/business_meetings/2015_packets/2015-04-08/Item_09f_ARV-14-046_Redwood_Coast_Energy_Authority.pdf. Accessed October 31, 2016.
2. Corelis, Dennis J. (2016). *Access California: New Regulations for Electric Vehicle Charging Stations*. Presentation of behalf of Division of the State Architect, archived by Electric Vehicle Charging Association. www.evassociation.org/uploads/5/8/0/5/58052251/EVC_update_30_march_2016_epri_presentation.pptx. Accessed October 31, 2016.
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.
4. Roaming for EV Charging (ROEV). (2016). *How Public EV Charging Works*. http://roev.org/How-It-Works/Overview. Accessed October 31, 2016.

# 6 Product Photos

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

| | | | | |
|---|---|---|---|---|
| ABB (P1)<br> | AeroVironment TurboDock (P2)<br> | Blink, single port (P3)<br> | BTC Power Chargion EVP, single port (P4)<br> | BTC Power Chargion EVP, dual port (P5)<br> |
| ChargePoint CT 4000 (P8P6)<br> | ChargePoint CPE200 (P9P7)<br> | ClipperCreek LCS (P8)<br> | ClipperCreek HCS (P9)<br> | ClipperCreek CS (P10)<br> |
| Efacec Public Charger (P11)<br> | eMotorWerks JuiceBox (P12)<br> | EV Box Business (P13)<br> | EVSE LLC AutoCoil (P14)<br> | EvoCharge, EVoReel (P15)<br> |

| | | | | |
|---|---|---|---|---|
| EVoCharge, single port (P16)<br> | EVoCharge, dual port (P16)<br> | GE DuraStation Double Pedestal (P17)<br> | JuiceBar LLC, Minibar double port (P18)<br> | Millbank PowerGen (P19)<br> |
| OPConnect Mark II (P20)<br> | Schneider EV Link Level 2 (P21)<br> | Schneider EV Link DC Fast (P22)<br> | SemaConnect ChargePro (P23)<br> | Shorepower Technologies, ePump (P24)<br> |
| | Siemens VersiCharger (P25)<br> | Telefonix PowerPost (P26)<br> | | |

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 53 CJ multi-standard DC charger, by ABB. https://library.e.abb.com/public/671325739d8346e58c32d3893b998a7e/4EVC204301-LFUS-RevD_Terra53CJ.pdf.

P2. TuboDock, by AeroVironment. http://store.evsolutions.com/turbodock-ev-charging-stations-c42.aspx.

P3. Blink Level 2 Pedestal Charger by Blink. http://www.blinknetwork.com/file/18762/CCGI_Blink_EVSE-L2AC-G1_OwnersManual-Commercial_2.2%5B1%5D.pdf.

P4. Level 2 Commerical EV Charging Station by BTCPower. http://www.btcpower.com/products-and-applications/Level-2-Commercial-EV-Charging-Station/.

P5. BTCPower Dual Pedestal by BTCPower. http://www.thebluebook.com/iProView/813090/national-car-charging-llc/subcontractors//images/564078_-electric-vehicle-charging-stations/866745_btcpower-dual-pedestal.html.

P6. CT4000 Family by ChargePoint. https://www.chargepoint.com/products/commercial/ct4000/.

P7. ChargePoint Express 200 by ChargePoint. http://www.chargepoint.com/products/commercial/cpe200/.

P8. LCS-30 by ClipperCreek. https://store.clippercreek.com/all-products/lcs-30-24-amp-ev-charging-station.

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