



BLUE PLANET FOUNDATION &
STCH PRESENT

BEST PRACTICE GUIDELINES: ELECTRIC VEHICLE CHARGER SELECTION, INSTALLATION, AND OPERATION



The following Best Practice Guideline will support you through the electric vehicle (EV) charging station selection, installation, and operation for your property whether it be private, workplace, residential, or public space.

1 PRELIMINARY RESEARCH

Once you decide to install an EV charger, you may want to contact local stakeholders such as Blue Planet Foundation or the Sustainable Transportation Coalition of Hawaii (STCH) for up-to-date information on incentives, electricity rates, hardware, and regulations. We can help you consider your options and connect you with the appropriate electrical vehicle supply equipment (EVSE) distributor, installer, or electrician for your project.

You may be able to offset installation costs at your commercial public facility or multi-unit dwelling through the Hawaii Energy EVSE rebate program. Rebates are available on a first-come first-served basis while funding lasts. Level 2 and DC fast chargers are eligible for this rebate program. Find more information on the application process and eligibility requirements at <https://hawaiienergy.com/for-businesses/incentives/electric-vehicle-charging-stations>.

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2 CHARGER SELECTION

Before selecting the best EV charger for your circumstances, consider the following options:

LEVEL 1

Level 1 charging has the lowest installation and operational costs. Due to lower power requirements, it is also the most scalable. This charging option utilizes the 120-volt alternating current (AC) outlets found in most U.S. households. Depending on a person's EV and the battery technology it uses, charging with a 120-volt outlet will add 2 to 5 miles of range per hour of charging.

Sometimes referred to as "trickle charging", an EV would need to remain plugged into a level 1 outlet for a minimum of five hours to gain a reasonable charge. Therefore, level 1 charging is best used in locations where people park for extended periods of time, including residential or workplace. During a regular business day, one parking stall with a level 1 charger would only allow service to one car. But this can streamline management, as they don't require rotation of vehicles or management of a queue.

LEVEL 2

Level 2 chargers can be installed in residential, workplace, fleet depots, or public locations—places where drivers commonly stop for 30 minutes or more—and will charge EVs more quickly than Level 1. In public locations, this charging option uses a 240-volt AC plug and requires the installation of additional charging equipment including a charging unit and, in some cases, upgrades to electrical panels and a dedicated circuit for charging. Depending on a person's EV and the battery technology it uses, charging with a 240-volt outlet will add 10 to 20 miles of range per hour of charging. Level 2 charging will require around 2-3 hours or more in order to gain a reasonable amount of charge, or 8-16 hours for a full charge from empty. Public charging station owners may want to implement queue management systems to coordinate the movement of vehicles and ensure that no one driver monopolizes the charger. Networked charging stations can act as a tool that will automatically remind EV owners to move their vehicles after a certain time has elapsed.

LEVEL 3/DC FAST CHARGER

The DC fast charger (or level 3) has the fastest charging speed but is the most costly to install and operate. This charging option uses a 480-volt direct current (DC) plug enabling rapid charging at public charging locations. A DC fast charger can add 60 to 80 miles of range and 80 percent battery charge to an electric vehicle in 20 minutes. DC fast charging is typically suitable only for public charging facilities due to its high cost of installation and is best in locations where individuals may need emergency charge or an extremely fast charge. This level of charging may be important for those that do not have access to charging at home such as residents of multi-unit dwellings, or filling gaps in charging infrastructure along highways or in rural locations. Standard level 3 chargers are rated at 50kW and ultra-fast level 3 chargers are rated up to 350kW.

Charger Type	Power Requirements	Ideal Charge Time	Pros	Cons
1	Dedicated 120V, 16 amp circuit	6+ hours	Lowest installation & operational costs. Most scalable	Slowest charging speed. Limited smart/networking options.
2	Dedicated 240V, 80 amp circuit	30+ minutes	Can fully charge most EV batteries in 8 hours. Advanced smart/networking options.	More costly than level 1. May have ongoing network and operation costs. Requires queue management, & moving vehicles.
DC Fast Charger (Level 3)	Dedicated 480+V, 3-phase, 250+ amp circuit	15-20 minutes	Fastest charging speed. Can charge vehicle from zero to 80% capacity in 20 minutes to one hour.	Most costly to install/operate.

*Based on the Charge Ahead Colorado Best Practice for EVs

Types of Charging Equipment		
Level 1 - AC	Level 2 - AC	DC Fast Charging
Slow charging rate	Medium charging rate	Rapid charging rate
120 V	208/240 V	200-600 V
1 hour charging = 4.5 miles (approx.)	1 hour charging = 12 miles (approx.)	1 hour charging = 40 miles (approx.)
SAE J1772™ Connector	SAE J1772™ Connector	CHAdEMO™, SAE Combo Connector



3 INSTALLATION CONSIDERATIONS

- Account for the cost of equipment and infrastructure needed to protect your EV charger, such as bollards which can protect your charger from other vehicles.
- Position your charger so that it is located near sufficient electrical supply and you can best utilize the space to reach two to four parking spaces.
- Ensure the available electrical supply can support the level of charging you plan to install. If it can not, you will need to research the cost to upgrade electrical capacity or identify smart charging technologies that can balance electrical load.
- Consider installing oversized electric conduits to prevent additional costs of trenching and asphalt repairs in the future when additional stations are needed.
- For new construction developments, consider pre-writing additional charging stations to alleviate costs for future retrofitting.
- In garages, it is typically cheaper to mount conduit and chargers on the wall.
- In garages, ensure access to cell service to allow for network capabilities, such as reminders for EV owners to move their vehicles.
- In most cases, each charging unit will need a dedicated circuit.
- To save money on electrical bills and project costs, consider combining energy efficiency and charging station installation upgrades at the same time. This will alleviate costs of separate electrical services.
- Charging stations are often interconnected with the electrical utility. To alleviate issues during installation and save you time and money in the future, it is best to account for this during your planning process.

4 TRENCHING & VISIBILITY

- If possible, avoid trenching and boring as these are costly and can increase overall project costs by 25 percent or more.
- Before starting your project, consider whether your charging needs may expand in the future. If so, installing to meet all of those future needs at the same time can reduce project costs in the long run. Trenching through soil during construction is far cheaper than trenching through asphalt once the project has been completed.
- Pick a location that is close to an electrical panel. While the charging station may be less visible, it will save in installation costs. It is encouraged to place your EVSE unit close to an electrical service. Signage can be used to direct EV drivers to the station if it must be in a less visible location.

5 EV CHARGER OPERATION

LEVEL 2

In order to alleviate some of the costs associated with an EV charger, and to discourage drivers from lingering after charging, you should consider charging a fee to use your level 2 charger. Consider the following before setting any fees:

- As an EV charging station owner, you can choose to charge EV drivers a flat fee per charging session, per electricity usage (kWh), per time, or use another unique rate structure.
 - A flat charging session fee is generally not the best fee structure as you are unable to account for variable rates at which various EV models consume electricity.
- Charging a fee will ensure that chargers are available for those that need the charger versus those that want to take advantage of free electricity.
- Charging a fee for electricity usage (kWh) has generally been considered the fairest fee structure.

- A driver can be charged a penalty fee in scenarios where their vehicle is left at the charger after charging is complete, or after a set amount of time, to ensure efficient turnover at the charger. This will increase the chance that more EV drivers can utilize your charging station.
 - For example, consider billing EV drivers a set fee for the first four hours and then an additional time-based fee after those four hours.
- Consider the costs of credit card transactions when developing your charging station fee structure. For example, charging EV drivers for sessions under one hour of electricity might incur high credit card transaction fees.
- As electricity fees vary throughout the day, and parking structures tend to clear towards the evening, it is less important to encourage charger turnover late at night. Therefore, it's best not to create a penalty fee for staying over that time.
- For information on time-of-use rates for public and multi-unit dwelling EV chargers, visit <https://www.hawaiianelectric.com/products-and-services/electric-vehicles/electric-vehicle-rates-and-enrollment>

DC FAST CHARGER (LEVEL 3)

For the most part, the above considerations for level 2 charging can be applied to DC fast chargers as well. The following would be best practice for charging fees for the usage of DC fast chargers:

- Before installing, consult with your local electrical utility about electricity demand charges for a level 3 charger. (standard level 3 chargers are rated at 50kW and ultrafast level 3 chargers are rated up to 350kW). These added charges should factor into your pricing.
- Consider charging a fair price based on per kWh instead of a flat fee.
- Penalty fees for staying at a charging station over a certain period of time will allow for greater charger turnover and incentivize EV drivers to not stay plugged in to the charger for too long.
- When setting your fees, take into account the speed at which various EV models can charge.

The table below indicates the pros and cons of various fee structure combinations. This information can be useful when deciding which fee structure will best support your charging station.

Energy Based Pricing	Time Based Pricing	Fixed Fee Per Session	Pros & Cons
	X		<ul style="list-style-type: none"> - No value placed on kWh consumed - EVs with slower charging rates pay more per kWh
X			<ul style="list-style-type: none"> - No value placed on time charger is occupied - No incentive to move EV when charging completes
		X	<ul style="list-style-type: none"> - No value placed on kWh consumed - No value placed on time charger is occupied - No incentive to move EV when charging completes
X	X		<ul style="list-style-type: none"> - Values both kWh used and time charger is occupied - Fees more equitable between EVs with variable charging speeds
X		X	<ul style="list-style-type: none"> - No value placed on time charger is occupied - Values kWh consumed - No incentive to move EV when charging is complete
	X	X	<ul style="list-style-type: none"> - No value placed on kWh consumed - EVs with slower charging rates pay more per kWh

6 GEOGRAPHIC LOCATIONS

Depending on your island, you will have different electricity rates and installation costs. Contact the local utility to ask specific questions about unique time-of-use rates or other programs you may be able to opt into.



7 ORGANIZATIONS

The following organizations can provide further information and support in your next steps toward installing EV charging stations.

EDUCATIONAL RESOURCES:

- Blue Planet Foundation – <https://blueplanetfoundation.org>
- Drive Electric Hawaii – <https://www.driveelectrichi.com>
- Sustainable Transportation Coalition of Hawaii – <https://www.stchawaii.org>

ELECTRICAL CONTRACTORS:

- To find an electric vehicle charging station contractor, visit <https://www.amplifyincentives.com/HawaiiCEA/Search/ElectricVehicleChargingStation>

ELECTRICAL UTILITIES:

- Kauai Island Utility Cooperative
- Hawaiian Electric Company

EVSE REBATE ADMINISTRATOR:

- Hawaii Energy – <https://hawaiienergy.com/for-businesses/incentives/electric-vehicle-charging-stations>

EVSE MANUFACTURERS:

- Blink Charging – <https://www.blinkcharging.com>
- ChargePoint – <https://www.chargepoint.com>
- EverCharge – <https://evercharge.net>
- SemaConnect – <https://semaconnect.com>
- Siemens – <http://www.siemens.com>
- Volta Charging – <https://voltacharging.com>

LOCAL EVSE DISTRIBUTORS:

- Aloha Charge – <https://www.alohacharge.com>
- EverCharge – <https://evercharge.net>
- Volta Charging – <https://voltacharging.com>

HAWAII EV CLUBS:

- Big Island EV Association – <https://www.bigislandev.org>
- Hawaii EV Association – <https://hawaiiev.org>
- KauaiEV – <http://kauaiev.org>
- Tesla Club Hawaii – <http://www.teslahawaiiclub.com>

8 WHICH CHARGER LEVEL IS RIGHT FOR YOU?

The following diagram can help you determine which charging level will best suit your needs. These are educated suggestions based on others' experiences.

