

FOR COMMERCIAL & PUBLIC PROPERTIES

Installing Level 2 Electric Vehicle Chargers

*Guide for Potential Hosts of Public, Workplace,
and Multi-Unit Dwelling EV Charging Sites*



This guide provides information for commercial, government, and institutional property owners who are assessing whether, where, and how to install Level 2 Electric Vehicle (EV) charging stations on their property. Within the next 10 years, one in every six cars on the road in Maine are expected to be electric.* While the majority of EV charging is done at home, charging in public places is important for travelers, those who lack access to home charging, and drivers of commercial vehicles. Public charging is increasingly an amenity that EV drivers look for at public locations, workplaces, and multi-unit dwellings. Providing charging can help attract customers, add value to rental housing, and improve employee satisfaction.

Some topics covered in this guide include:

- ⚡ **Choosing the right equipment;**
- ⚡ **Choosing a site;**
- ⚡ **Collecting payment;**
- ⚡ **Purchasing EV charging equipment; and,**
- ⚡ **Finding an installer.**



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* Maine Climate Council, Maine Won't Wait, December 2020: <http://climatecouncil.maine.gov/>.



Examples of EV Charging Locations

WORKPLACES

Workplace charging can be a convenience for visitors to a commercial building and a benefit for employees who work there, especially for those who lack access to home charging.

MULTI-UNIT DWELLINGS (MUDS)

Most EV drivers charge at home because it's less expensive and more convenient. Level 2 charging is suitable for apartments and condominiums where residents park overnight. MUD property owners can also consider installing Level 1 charging using 120 volts. While this type of charging is slower than Level 2, it's far less expensive, may not require electrical panel upgrades, and can serve the needs of most drivers who park overnight. For example, a person who drives 30 miles per day can replenish their battery using a Level 1 charger in about six hours.

PUBLIC SPACES

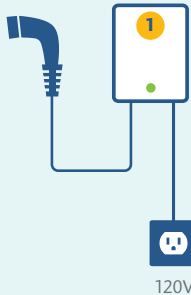
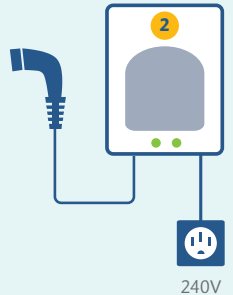
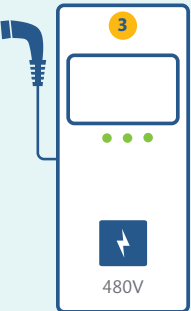



Consider Level 2 charging at locations where people spend 1.5 hours or more, such as restaurants, hotels, recreation facilities, event venues, colleges, and universities. Level 2 chargers provide about 25 miles of range per hour of charging, so drivers expect to see them at places where they will be parked for longer periods of time.

Level 2 chargers are not recommended for places where people typically spend only a short time or that have few amenities nearby.



Comparisons of Different Charging Levels

This guide focuses on Level 2 charging that uses 240 volts, which is a good fit for locations where people park for 1.5 or more hours. Level 3 (or DC fast charging) is faster than Level 2, and requires more expensive equipment and electrical upgrades. DC fast charging is typically found along major travel corridors and other high-traffic areas.

<p>LEVEL 1 120V</p>  <p>120V</p>	<p>LEVEL 2 240V</p>  <p>240V</p>	<p>LEVEL 3 480V DC Fast Charge</p>  <p>480V</p>
<p>USAGE</p>  <p>HOME</p>	<p>USAGE</p>  <p>HOME COMMERCIAL</p>	<p>USAGE</p>  <p>COMMERCIAL</p>
<p>CHARGE TIME</p> <p>Adds 5 miles per hour of charge*</p> <p>Charge from 20-80% in 20+ hours</p>	<p>CHARGE TIME</p> <p>Adds 25 miles per hour of charge*</p> <p>Charge from 20-80% in 7 hours</p>	<p>CHARGE TIME</p> <p>Adds 100-200+ miles per 30 minutes of charge*</p> <p>Charge from 20-80% in 15-30 minutes</p>
<p>TYPICAL COSTS per port**</p> <p>Equipment: \$0 to \$200</p> <p>Installation: \$0</p>	<p>TYPICAL COSTS per port**</p> <p>Equipment (networked): \$1,800 to \$7,000</p> <p>Equipment (non-networked): \$600 to \$4,500</p> <p>Installation: \$500 to \$10,000</p>	<p>TYPICAL COSTS per port**</p> <p>Varies by site and type of equipment. Can exceed \$100,000 per port.</p>

Choosing the Right Equipment

NETWORKING

Chargers can either be networked (sometimes called “smart”) or non-networked (“basic”). Networked chargers allow charging station owners to assess a fee for their use; drivers can view the status of chargers within a specific network using a website or app. Basic (non-networked) chargers are not equipped with payment systems.

Depending on the network, networked chargers will be able to accept payment via a credit card reader, an RFID (Radio-Frequency Identification) card, an app, or a QR (Quick Response) code.

Networked chargers will need a cellular, Wi-Fi, or Ethernet connection. They require ongoing subscription costs, which are typically a few hundred dollars per year per charging port. Networked chargers typically cost more to install and operate than non-networked chargers. Collecting payment for charging is usually not a significant source of revenue, but it allows site hosts to recover the costs of providing the charging service.

CONNECTOR TYPES

The universal charging connector for Level 2 charging in the U.S. is called “SAE J1772.” All EVs can charge using this connector (Tesla drivers will need an adapter). The other connector type for Level 2 charging is Tesla, which can be used only by Tesla vehicles.



SAE J1772

NUMBER OF PORTS

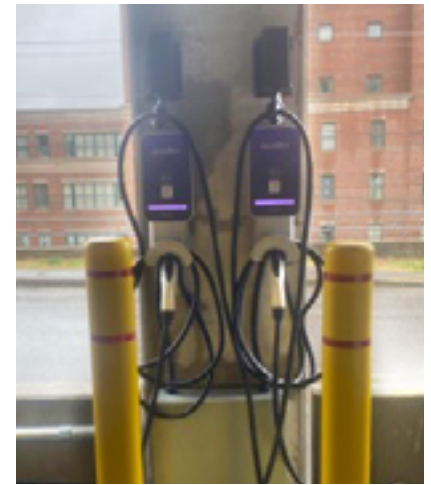
“Dual-port” chargers can serve two vehicles at once. Some dual-port chargers share electrical output between two ports, so they only require the panel capacity of one charger. If two cars are plugged in simultaneously to one of these shared chargers, charging will be slower because the output is shared.

MOUNTING

Chargers can be mounted on a pedestal, a wall, or a utility pole. See below for examples of different types of installation.



An example of a pedestal-mounted Level 2 charger.



An example of a wall-mounted Level 2 charger.

Choosing a Site

Here are some factors to consider when deciding where to locate EV chargers:

Distance from electrical supply. The distance from the electrical panel to the chargers often has a large impact on project costs, especially if underground trenching is required. Siting the chargers as close as possible to the electrical supply will help minimize costs.

Snow removal. Consider snow removal and plow patterns in the winter. Wheel stops or bollards can help prevent plows or other vehicles from hitting the chargers.

Rooflines and drip patterns. Consistent dripping water can freeze on chargers in the winter, making them difficult to use and creating a slipping hazard. To avoid this issue, locate chargers away from drip lines or construct a roof or enclosure over them.

Parking spaces. EV-charging parking spaces should be designated as "EV Charging Only." Avoid locating chargers in parking spaces that are normally used for very brief visits (e.g., outside the post office).



Collecting Payment

Collecting payment for charging allows site hosts to recover the cost of electricity and other operations and maintenance. Setting a fee also encourages users to vacate the space when they have reached their desired charge level so other people can access the station.

While only networked chargers are equipped with payment systems, it is also possible for site hosts to install basic chargers and recover electricity costs in other ways:

Session fee. A site host could request payment for each session from EV owners who use the charger either via cash or another payment type. This type of transaction could be driven by the honor system, or the charger could be secured with a lock and unlocked after the customer has paid the fee;

Monthly fee. An example of a monthly fee would be a landlord charging a fee in addition to rent for tenants to have access to EV chargers. Workplaces could also give employees the option to pay for EV charging on a monthly basis.

Tip: *Some chargers can be installed initially without networking and can later be equipped with networking if the site host wants to start charging for the service.*

Setting Prices

Most networking service providers allow the owner to set the price of a charge. The price can have one or more components:

Session fee. A session fee is a flat rate for an EV to charge at a networked station;

Energy (kWh) fee. An energy (kWh) fee depends on the amount of energy that an EV owner uses to charge their vehicle. This is the most direct way to recover the cost of the electricity used by the station;

Time fee. A time fee can be per minute, per hour, or per day and can include an “overstay” fee if the EV owner doesn’t vacate the charging station space after the vehicle has finished charging.

Site hosts should consider what their goals are when setting prices. If the goal is to recover operating costs, consider charging the cost of the electricity itself plus a small additional fee to account for ongoing costs (e.g., networking and maintenance). If the goal is to bring customers to patronize a business, charging could be offered for free or at a nominal rate.

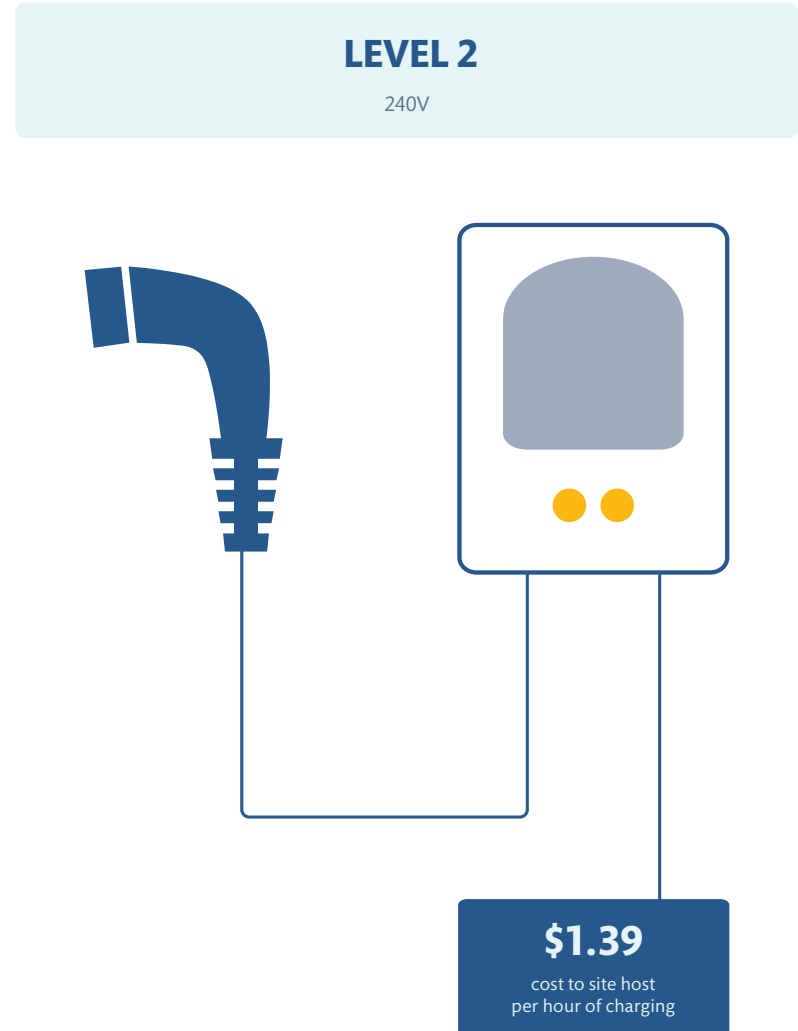
How much does it cost to charge an EV?

A typical Level 2 charger has a power output of 6.6 kilowatts (kW). At an electricity rate of 21 cents (\$0.21) per kilowatt-hour (kWh), the electricity used by the charger will cost the site host roughly \$1.39 per hour of charging.

Larger EV charger installations with multiple ports may cause a business or other electrical customer to incur “demand charges” on their electrical bill. Consult with your utility to determine whether installing EV chargers at your site may push you into a different category of electricity rates.

Load Sharing

Load sharing, or “power sharing,” is a term for equipment and software systems that keep the total power draw from a group of charging ports at or below a certain level. If you are concerned about the overall power load at your site or have limited panel capacity, ask your electrician or charging equipment vendor about load sharing technologies.



Special Considerations for Multi-Unit Dwellings (MUDs)

MUDs, such as apartment buildings and condominiums, face particular challenges when determining who pays for the electricity used by EV drivers. Traditional networked chargers can ensure that drivers pay the full cost of the electricity they use, but this equipment has higher upfront and ongoing costs than basic chargers, which may result in higher costs for drivers. MUDs may have other options to keep costs down:

- If chargers are designated for specific residents and attached to separate meters, users can be charged directly for the amount of electricity they use.
- MUDs can use basic chargers and include EV charging in the rent as an amenity or a surcharge for residents that use the chargers.

One objective of publicly funded EV programs is to facilitate EV ownership by low- and moderate-income Mainers, including those who rent apartments and do not have a practical way to charge an EV on their personal electric utility account. It would help advance this objective if property managers of MUDs that serve such tenants strive to keep the rates for EV charging affordable so that tenants can benefit from the operating cost advantage of EV ownership.





Access

While some chargers are open to the public, site hosts may restrict use of the chargers. For instance, workplace chargers could be reserved for employees, and chargers at MUDs could be restricted to residents. Here are some ways to restrict access to chargers:

- Install chargers in a gated or otherwise restricted area (e.g., parking garages).
- Use a locking mechanism that allows access by a combination lock, key, or key card.
- Ask your networking service provider if they offer a means to restrict access to certain users, or charge different prices depending on the user group. For instance, a MUD could allow access to tenants and the public, but charge a different fee for each group.
- Restrict access with map visibility. Consider having your station listed as “restricted” on public locator maps, such as Plugshare or Google Maps.



Accessibility and Americans with Disabilities Act (ADA) Compliance

The U.S. Access Board has published “Design Recommendations for Accessible Electric Vehicle Charging Stations.”* These standards cover accessibility, ease of use, and safety for disabled drivers, including those using wheelchairs or other assistive equipment. Key considerations include ensuring adequate space for exiting and entering the vehicle, unobstructed access to the chargers, free movement around the chargers and connection point on the vehicle, and clear paths and close proximity to any building entrances.

Finding an Installer



A licensed electrician can install EV chargers and may be able to procure the equipment for you. Efficiency Maine maintains a list of experienced energy professionals, called Qualified Partners, who can install energy-efficiency equipment at your business. Find a Qualified Partner on the Efficiency Maine website. (Where the form asks “What services do you need?,” select “Electric Vehicle Chargers.”)

Here are some more tips for finding an installer in Maine who can meet your needs:

- Consult with your current electrician, if you have one.
- Search for an electrician licensed in the state of Maine: <https://www.pfr.maine.gov/almsonline/almsquery/SearchIndividual.aspx?board=4220>
- Licensed electricians are required to follow the requirements of the National Electrical Code (NEC), which is the nationally recognized electrical-safety standard. You can also search the Maine Contractor Directory: <http://mainecontractordirectory.com/maine-contractors/electricians-electrical-contractors>



Purchasing EV Charging Equipment

Many companies sell charging equipment that is rated for commercial use. Efficiency Maine maintains a list of EV Charging Service Providers that can be found at the back of this guide.

Project Management Companies

Some companies will provide oversight of the entire process, including permitting, electrical upgrades, and procuring the chargers. This can be helpful for large installations with multiple chargers. Efficiency Maine maintains a list of some of these service providers that can be found at the back of this guide.

Electrical Upgrades

To determine if your site needs electrical upgrades, answer the following questions (or ask your electrician):

How many charging ports do you need?

Consider the number of visitors, employees, or residents who may want to access your station in a given day.

Does the site have the required panel capacity (240V / 40A for each Level 2 port)?

A good rule of thumb is to make sure that you have 40 amps of capacity in your electrical panel for each charging port.

If you plan to install multiple charging ports, or if you plan to add more ports in the future, you may need new service from your electric utility provider. Consult with your electrician to determine whether you will need new service and how much it will cost.

Adding extra electrical capacity during new construction or significant renovation can save money on future upgrades. Given increasing demand for EV charging, consider whether your site can benefit from “future proofing” by adding capacity now.



Typical Costs*

NETWORKED		NON-NETWORKED
\$1,800 - \$7,000	CHARGING EQUIPMENT	\$600 - \$4,500
\$500 - \$10,000	INSTALLATION	\$500 - \$10,000
\$200 - \$300	NETWORK SUBSCRIPTION <i>(per year per port)</i>	\$0

Extended Warranties/Maintenance Contracts: This is an optional service that can often be purchased from the charging equipment vendor. May cost an additional \$200-400 per year per port.

FACTORS INFLUENCING COST

Distance from the electrical panel: The farther the chargers are from the panel, the greater the cost to run conduit to the chargers. If any trenching or paving is required, this will further increase costs.

Electrical panel upgrades: Consulting a licensed electrician is the best way to know if you will need to upgrade your electrical panel.

Networked chargers: Networked charging equipment is typically more expensive than non-networked equipment, and requires ongoing networking costs.



Tips to Improve User Experience

To help drivers have a positive experience with your chargers, consider these tips:

- 1 Be clear about expectations for the use of the chargers. This may include:
 - Signage indicating that parking spaces are for EVs only. This can help minimize conflict between EV drivers and drivers of internal combustion engine (ICE) cars.
 - Providing clear information about who is permitted to use the chargers (general public, employees, or residents only).
- 2 Ensure that the chargers are listed on sites such as the Alternative Fuels Data Center (AFDC) and PlugShare, and are listed accurately as “public” or “restricted.”
- 3 Place chargers in a safe, well-lit area.
- 4 Monitor chargers for maintenance needs and complete repairs in a timely manner.



Incentives

Efficiency Maine periodically releases funding opportunities for the installation of EV charging stations. Current funding opportunities are listed at efficiencymaine.com/opportunities.

Some municipalities may provide grants to business and property owners to install EV chargers. Check with your local government to determine if any incentives are available. Private foundations and organizations may also have grants available for installing EV chargers.

Federal tax credits, administered through the IRS, may be available to offset the cost of installing EV charging equipment. More information about currently available federal tax credits can be found at efficiencymaine.com. Federal tax credits are administered through the federal government, not through Efficiency Maine.



Additional Resources

You can find additional tools and resources at efficiencymaine.com, including:



Video series on installing public chargers for property owners



List of EV charging installers, vendors, and project management companies



Links to resources from the US Department of Energy and other states on workplace charging, MUD charging, and more



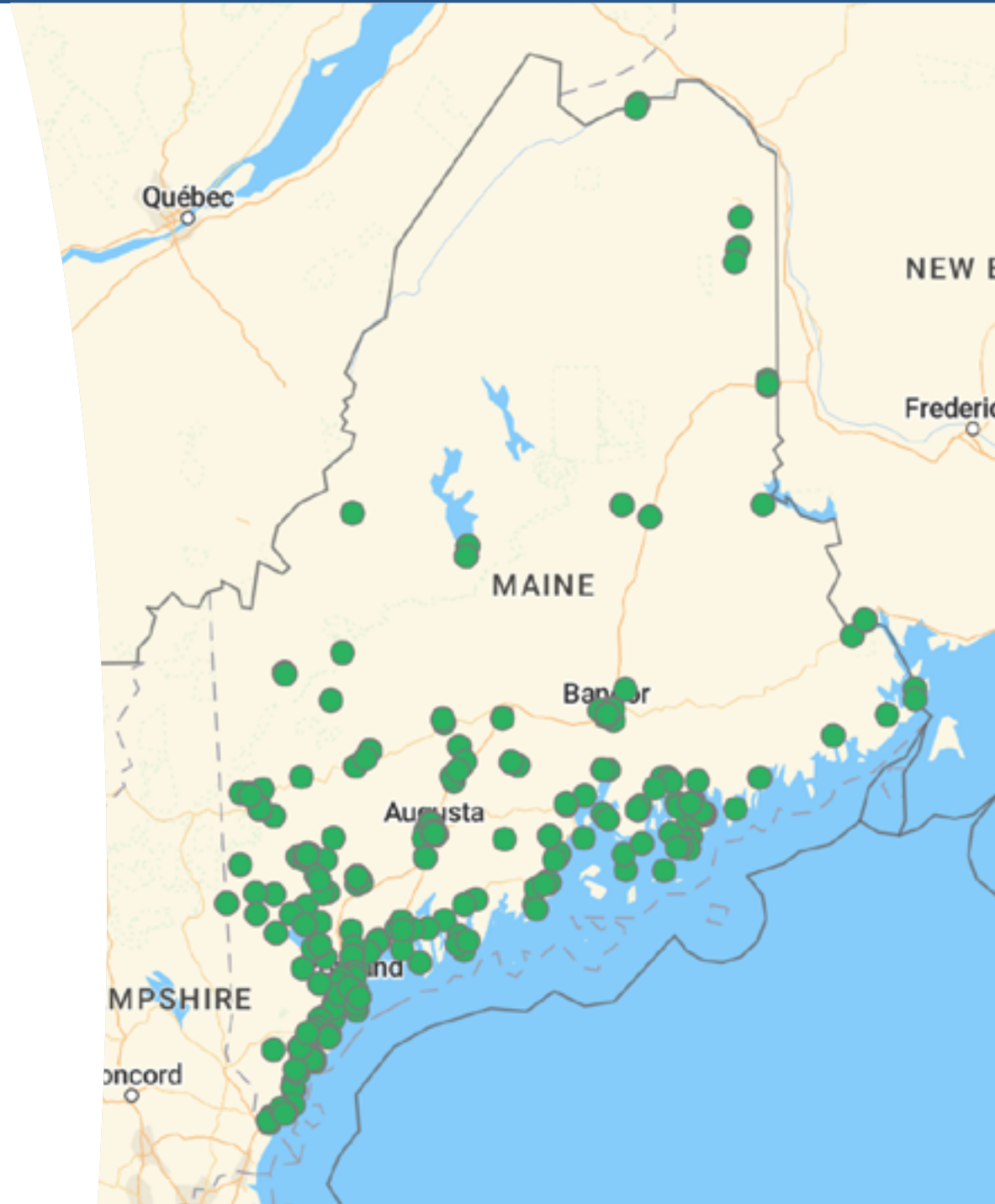
Charging Station Locator



Vehicle Cost Calculator



Background on Efficiency Maine's Electric Vehicle Initiatives



About This How-To Guide

Maine has established aggressive requirements to reduce carbon emissions. It also is a Zero Emission Vehicle (ZEV)* state, creating an expectation that in the next several years Maine consumers will be purchasing and driving tens of thousands of EVs.

At Efficiency Maine, we are committed to helping the state reach its long-range targets to reduce greenhouse gases while lowering energy costs for Maine drivers and helping transform the marketplace toward lower-cost, lower-carbon vehicles.

To that end, Efficiency Maine administers programs to expand availability of EV charging infrastructure and the adoption of electric vehicles in Maine. Its programs provide instant rebates for eligible vehicles (BEVs and PHEVs) at participating car dealers in Maine and grants to fund the installation of EV charging infrastructure in public areas, workplaces, and multi-unit dwellings in Maine.

Efficiency Maine received funding for this “how-to” manual through a grant from the Maine Public Utilities Commission pursuant to An Act to Support Electrification of Certain Technologies for the Benefit of Maine Consumers and Utility Systems and the Environment.** This manual is part of Efficiency Maine’s initiative to develop and distribute a comprehensive suite of educational materials about EVs, including “how-to” manuals and videos, as well as a list of eligible vehicles, available rebates, charging station locator, and vehicle cost calculator that can be found at efficiencymaine.com/ev.

For an online version of this “how-to” manual, visit the Efficiency Maine website at efficiencymaine.com/docs/Installing-Public-EV-Chargers-Guide.pdf or call 866-376-2463.



* The aim of the Zero Emission Vehicle (ZEV) program is to help states achieve their emissions goals by requiring that a certain percentage of vehicles use the cleanest available technologies, including battery electric and plug-in hybrid electric vehicles. ZEV has been a major contributor to the successful commercialization of hybrid-electric vehicles and ultra-low-emission technologies. To date, 13 states have adopted the ZEV Program (California, Colorado, Connecticut, Maine, Maryland, Massachusetts, New Jersey, New York, Oregon, Rhode Island, Vermont, Virginia, and Washington).

** Public Law, Chapter 365, LD 1464, 129th Maine State Legislature.

Glossary of Terms

AC (alternating current): A form of electricity that regularly changes direction, which is the kind of power that comes from a power plant to homes and businesses.

BEV (battery electric vehicle): Also known as “all-electric” vehicles, BEVs use energy that is stored in rechargeable battery packs. BEVs must be plugged into an external electricity source in order to recharge.

CCS connector: One of two common Level 3 charging connectors. Used with many North American-made vehicles.

CHAdeMO connector: One of two common Level 3 charging connectors. CHAdeMO is used on a small number of EV models in North America, most notably the Nissan LEAF.

Charging plug: The specific piece of equipment on a charging station that connects the charger to the vehicle. Also called a “connector.”

Charging port: The system within a charger that charges one EV. A charging port may have multiple connectors, but it can only provide power to charge one EV through one connector at a time.

Charging station/EV charger: A piece of equipment that supplies power for electric vehicles in the form of electricity that charges the vehicle’s battery.

DC (direct current): A form of electricity that flows in one direction and is the type of power that comes from a battery.

EV (electric vehicle): A broad category that includes all vehicles that can be fully powered by an electric motor.

ICE (internal combustion engine): An ICE is powered by combustible fuels, such as gasoline or diesel fuel, which are liquids derived from fossil fuels.

Kilowatt-hour (kWh): Unit used to measure electrical energy usage.

Level 1 charger: Charges your EV using a common household outlet up to 120V. Level 1 is the slowest method of charging and can take up to 24 hours or more to fully charge your EV. A Level 1 charging cord typically comes with the purchase of a new EV.

Level 2 charger: Charges your EV at 240V using an installed outlet or hardwired to a 240V power supply. Depending on your EV model and charger, a Level 2 plug can charge a vehicle five times faster than a Level 1 plug.

Level 3 charger: Also known as a DC fast charger, a Level 3 charger is the fastest method of charging compatible EVs. It can charge a BEV battery to 80% in about a half hour. Most plug-in hybrid electric vehicles (PHEVs) are not equipped for DC fast charging.

PHEV (plug-in hybrid electric vehicle): PHEVs contain a battery that can be charged with an external electric power source as well as an engine powered by gasoline or diesel.



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