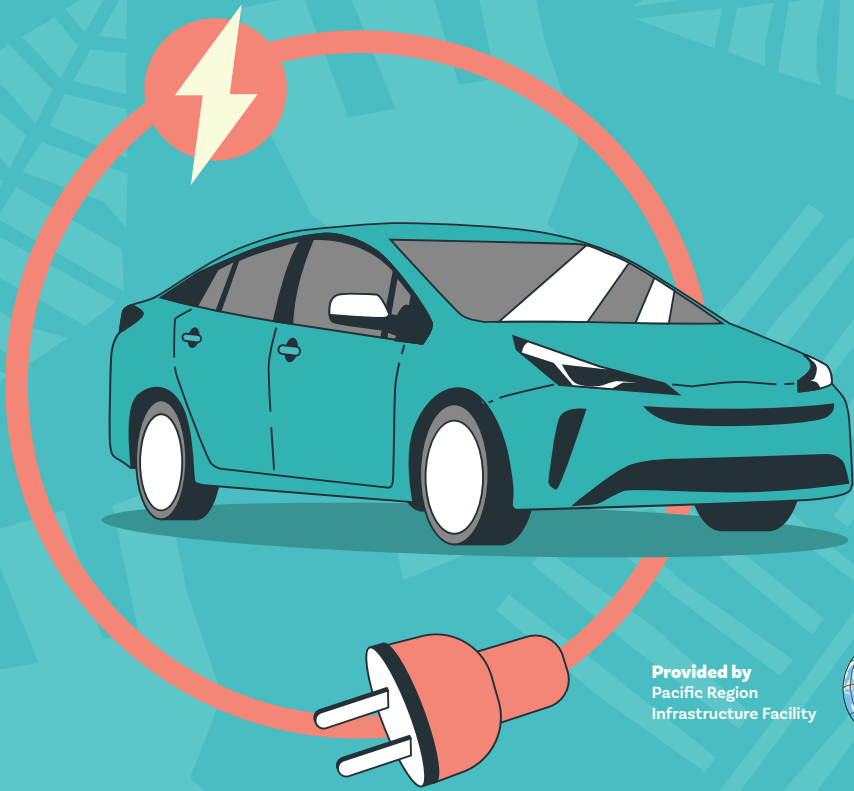


POWERING UP

Charging your Electric Vehicle



Provided by
Pacific Region
Infrastructure Facility



UNDERSTANDING EV CHARGING



Charging Basics

Just Plug & Relax.

Charging an EV is easy—just plug in and let your EV and charger look after the detail. You might also have a smart charger that allows you to program when the charge happens, and at what rate, to best match with the supply of electricity.



Know Your EV's Needs

The EV and charging point must match – know your EV's requirements and where compatible charging point are, if needing to charge out and about.

SAFETY AND EFFICIENCY



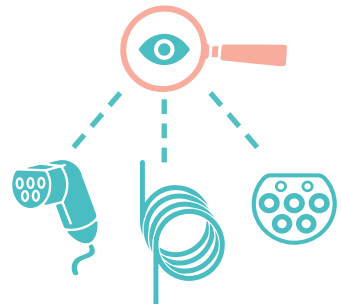
Safety First

Use equipment that's specified for the job. Portable charging cables must be rated for use with the local power supply. They should be used with outdoor sockets and protected electricity supply circuits installed in accordance with accepted requirements. A **licensed electrician must install permanently-wired charging cables** and is responsible for meeting these regulations. Do not use extension cords.



Check Before You Charge

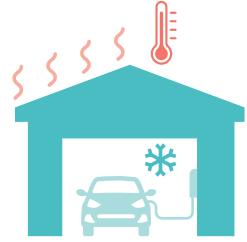
Inspect Cables & Connectors. Look over your cables and plugs before each use. If anything appears damaged, don't risk it—get it fixed.





Charge Cool, Charge Smart

It's best to charge in the shade and in the cool breeze if charging during the day. If not charging from solar, charging during the cool of the night might be better, especially if your electricity comes from hydro power or when daytime electricity supply is often strained.



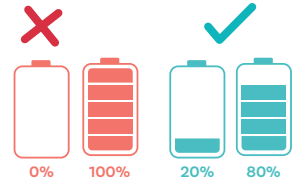
It's Safe to Charge in the Rain

Charging in the rain is okay, but don't leave your cables or chargers unnecessarily exposed to the weather ... lift them up for the ground and keep them dry where possible.



Follow the 20/80 Rule

For everyday driving, keep your battery between 20% and 80% charged. This reduces stress on the battery and extends its life.



CHARGING ROUTINE



Get into a Charging Routine

Like charging your phone, routines can make life easier. An advantage of an EV is not needing that trip to a fuel station. Make the rest of the ownership experience convenient, while considering the best time and place to charge your EV.



More Information:
Check out



ORIGINAL / BACKGROUND

Safe, good practice EV charging

Simple

Charging is safe and normally quite simple – **just plug and leave**... the EV and charger will sort it out. Smart charging or use of EV controls might provide additional advantages such as moderating the charge rate to fit with electricity supply.



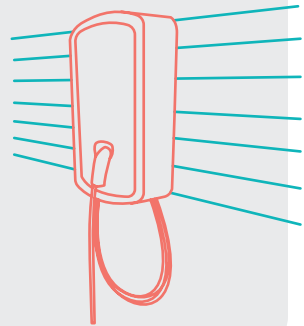
Know your charging requirements

The supply and vehicle charging connectors must match. Know what your vehicle's requirements are.



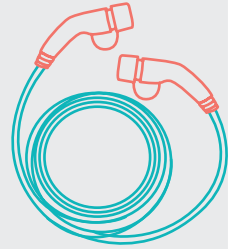
Suitable equipment

Portable charging cords may be convenient to some extent but tend to only provide slow charge rates. If you need to consistently charge for more than 4 hours a day, consider an alternative option. Permanently wired charging points can be installed at home, at work and in public spaces and generally provide higher charging rates, added safety features and various smart features such as timed and remote operation. Fast charging might be available in some cases, but unlikely necessary for most island use of EVs.



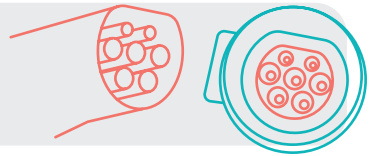
Specified for the job

The charging point must be specified for the job. When using a portable charging cord, the electricity supply socket outlet and supply to this must also be suitably specified, which includes the use of an outdoor socket and use of protection devices that isolate the electric supply should a fault be detected. An electrician must install permanently wired charging equipment and it is their responsibility to make sure the necessary safety requirements have been met. It is not advisable to use extension cords.



Safe condition

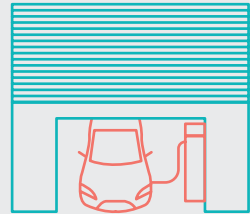
Before use, check the connector and cable. Don't use if any look in poor condition.



Location

Island time works ... slow sips in the shade ... charging in cooler areas generally best for charging, or at night if electricity mainly from hydro or when daytime supply is constrained.

You can charge in the rain ... it is safe, but be sensible ... avoid unnecessary exposure of charging cables and equipment to the elements.



20/80 Rule for Charging and Operating

Unless otherwise directed by manufacturer's instructions, keep the battery above 20% state of charge (SOC) but below 80% SOC ... it is less stressful on the battery and longer battery life is expected.





20/80 Rule for Charging and Operating EVs – unless otherwise directed by manufacturer’s instructions

When charging and operating an EV, it is recommended to keep the State of Charge (SOC) between 20% and 80% for everyday use. This range helps to optimize the lifespan and performance of most lithium-ion batteries by reducing stress on the cells. Charging or discharging outside this range regularly can accelerate the degradation of the battery. This guideline can vary based on battery chemistry, charging rates, and how long the battery remains at high or low SOC. The key to extending battery life is to minimize stress, which forms the basis of several best practices:

- Avoid frequent fast charging, especially above 80% SOC. Fast charging generates heat, which puts stress on the battery, and increases the risk of undesirable degradation reactions taking place. A Battery’s Battery Management Systems (BMS) control the maximum charging rate, for this reason, and the rate permitted normally decreases significantly as SOC increases above 80-90%. Additionally, most fast chargers require the operator to select to continue to charge above 80% SOC as an extra safety measure.
- If charging to 100% SOC is necessary, such as for maximizing range, it is better to use a slow charger above 80% and plan so that the vehicle doesn’t sit at full charge for more than a day.
- Charge in shaded areas and, if practical, during cooler times of day. Modern EVs typically have active thermal management to regulate battery temperature, but slow charging in cooler environments reduces stress and energy loss from the system. This is especially important for simpler battery systems, like those in early-generation EVs or e-bikes, which lack active cooling.
- Avoid high-powered driving when the SOC is below 30%. Drawing large amounts of current from a near-depleted battery can strain the cells, leading to damage over time.

At a more detailed level, the primary battery chemistries currently used in electric vehicles (EVs) are Nickel-Manganese-Cobalt (NMC) and Lithium Iron Phosphate (LFP). NMC batteries are the most prevalent in European EVs due to their higher energy density, making them suitable for longer-range vehicles. On the other hand, LFP batteries dominate the Chinese EV market and are common in most EVs produced by Chinese manufacturers because of their lower cost and better thermal stability. Nickel-Cobalt-Aluminium (NCA) batteries, while less common today, can be found in older EV models and some performance-focused vehicles due to their high energy density.

When it comes to charging habits, avoiding frequent charging above 80% SOC is particularly important for NMC and NCA chemistries. These battery types are more sensitive to high voltage stress, as the internal voltage of the cells increases with higher SOC. Charging to 100% regularly puts additional strain on the cells, leading to

degradation caused by side reactions like electrolyte decomposition and electrode wear. Although LFP batteries are more resilient to higher SOCs, consistently charging them to 100% can still cause capacity fade over time. For daily driving, limiting charging to around 80-90% can help reduce stress and prolong battery life.

However, for vehicles like the Tesla Model Y, which use LFP batteries, Tesla recommends charging to 100% at least once a week. This helps the Battery Management System (BMS) recalibrate, ensuring accurate range estimation and optimal battery performance. You could imagine that this variation from classic guidelines could give rise to confusion. New technology solid state lithium-ion batteries are also beginning to enter the market and these too may have different charging characteristics. Hence, while maintaining SOC to between 20% and 80% is good practice for most applications, it is also advisable to check and follow the manufacturer's recommendations as this might extend the everyday operation of the battery and vehicle.

On the lower end of the charge range, it's equally important to avoid discharging below 20% SOC, especially for NCA batteries, which are more susceptible to voltage drops and electrode wear at very low charge levels. Deep discharges also increase the risk of lithium plating, a process that permanently reduces battery capacity. Even though LFP batteries are more resistant to deep discharge, they can still be damaged if the SOC drops too low, leading to potential permanent degradation. Keeping the SOC above 20% helps protect the battery from these risks.

Low SOC operation can also affect the accuracy of the vehicle's BMS, leading to inaccurate range predictions. Both NCA and LFP batteries perform better when maintained within a healthy charge range. Operating at very low SOC can create inaccuracies in the range estimation, potentially resulting in unexpected shutdowns or increased range anxiety due to unreliable capacity readings. Maintaining SOC above 20% not only preserves battery health but also ensures better BMS performance, reducing the likelihood of these issues.

Smaller batteries used for motorcycles, e-bikes and other micromobility tend to be simple and relatively low cost, made possible through More to follow two-wheeler micromobility e-bike is simple

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