



Maximizing Electric Cars' Range in Extreme Temperatures

Electric Vehicles

[Office of Energy Efficiency & Renewable Energy »](#)

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The efficiency and all-electric driving range of plug-in electric vehicles (also known as electric cars or EVs) varies based on a number of factors, including driver habits, driving conditions, and temperature, such as hot or cold weather. For an all-electric vehicle, reduced range may mean the driver will need to charge more often, depending on daily miles traveled. For plug-in hybrid electric vehicles, the internal combustion engine will turn on more quickly, increasing fuel cost and emissions.

ALL-ELECTRIC RANGE AND VERY HOT OR COLD WEATHER

Extreme weather - very hot or very cold - impacts range in EVs. The additional heating or cooling needed for passenger comfort requires more energy than more moderate temperatures would. Cold batteries also have greater resistance to charging and do not hold a charge as well.

Based on nearly 10 million miles of data collected through the EV Project, [researchers at Idaho National Laboratory](#) found that variations in weather can affect the range of

plug-in electric vehicles by more than 25%. They found all-electric Nissan Leafs driven in Chicago in the winter had 26% lower ranges (60 miles compared to 81) than those driven in Seattle in the fall. Similarly, they found that plug-in hybrid electric Chevrolet Volts driven in Chicago in the winter had 29% lower ranges (30 miles compared to 42) than those driven in Chicago in the spring.

EV manufacturers and [research supported by the Department of Energy](#) are improving temperature-control technology to compensate for some of these issues. For instance, several models are now available with battery heaters or other technology to heat the battery and improve efficiency in cold climates.

MAXIMIZING ALL-ELECTRIC RANGE

There are many things drivers can do to improve the efficiency of their vehicles, as described on [FuelEconomy.gov](#). Here are some specific tips for EVs:

- Use accessories wisely: Accessories such as heating, air conditioning, and entertainment systems affect fuel economy on all vehicles, but can have a greater effect on EVs. However, using seat warmers instead of the cabin heater can save energy and extend range.
- Use the economy mode: Many EVs come with an "economy mode" or similar feature that maximizes the vehicle's fuel economy. In some vehicles, this mode can be activated by simply pressing a button. The economy mode may limit other aspects of the vehicle's performance, such as acceleration rate, to save fuel.
- Plan ahead before driving: Pre-heating or pre-cooling the cabin of an all-electric or plug-in hybrid electric vehicle while it is still plugged in can extend its electric range, especially in extreme weather.
- Avoid hard braking and anticipate braking: This allows the vehicle's regenerative braking system to recover energy from the vehicle's forward motion and store it as electricity. Hard braking causes the vehicle to use its conventional friction brakes, which do not recover energy.
- Observe the speed limit: Efficiency usually decreases rapidly at speeds above 50 mph.

Other ways to improve efficiency include avoiding hauling cargo on your roof, removing excess weight, and keeping your tires properly inflated.

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