


Electric Vehicles

Working toward a clean energy future



Ground transportation uses about one-third of every barrel of oil imported to Hawaii, and contributes nearly 20% of the state's greenhouse gas emissions.

Source: Hawaii Greenhouse Gas Inventory: 1990-2007

The Hawaiian Electric companies are working to reduce Hawaii's dependence on imported oil and reduce our carbon footprint by promoting the use of renewable sources for electric generation and cleaner fuels for transportation. In 2009, Hawaiian Electric joined with leading utilities nationwide in a campaign to get electric vehicles (EV) in showrooms, on the roads, and in our garages as soon as possible.

Hawaiian Electric has a strong history of support for EVs, with over a dozen experimental vehicles in our fleets in the 1990s. We continue to support research and development on how to add more plug-in EVs and power them through the existing electrical grid.

Electricity offers a lower-cost alternative to gasoline and can help cut greenhouse gas emissions from vehicles while only slightly increasing emissions from power plants. Using renewable energy to generate electricity to charge EVs will reduce oil use and emissions even further.

Hawaiian Electric's Commitment:

- Partnering with Better Place Hawaii to install a system of EV charging stations and battery swap stations
- Working with leading utilities nationwide to support EV research and development, and to promote incentives that make it easier to put EVs on the road
- Promising to purchase only hybrid sedans now and eventually plug-in EVs for our fleets
- Testing EVs in our fleets including converted Toyota Prius plug-ins on Oahu and Maui; Phoenix Motorcars EVs on Maui; hybrid bucket trucks on Hawaii Island and Oahu
- Working with a Maui architectural firm to install a wind turbine to charge EVs at Maui Electric
- Supporting laws and social changes to encourage people to buy EVs as they become available
- Working with the transportation task forces of the Hawaii Clean Energy Initiative and the Hawaii Energy Policy Forum

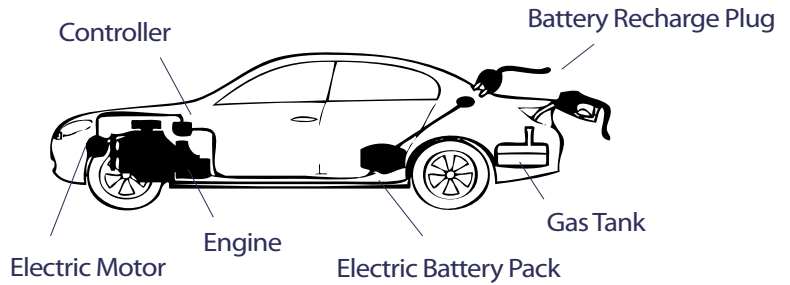


Hawaiian Electric Company

Vehicle Technologies

A hybrid, like the Toyota Prius, has an electric motor and a small battery that gets power as the car moves, stops, and starts. A smaller internal combustion engine operates in tandem or in sequence with the electric motor, depending on the model. A plug-in hybrid vehicle (PHEV) has an electric motor and larger battery that can be plugged in for recharging. The combustion engine kicks in when the battery runs down. With two drive systems and a larger battery, PHEVs have a longer range but may cost more. A pure electric vehicle relies on an electric motor and battery that are recharged by plugging into an electrical outlet. It may have a permanent battery or one that can be quickly swapped out. With today's batteries offering up to 100 miles on a charge, the majority of trips to work, school, and stores could be made without recharging or swapping the battery.

Inside a PHEV



| | Gas Vehicle | Gas/Electric Hybrid Vehicle | Plug-in Hybrid Electric Vehicle | Electric Vehicle |
|---------------------|---|--|--|---------------------------------------|
| How it works | Gasoline powered internal combustion engine | Gasoline powered internal combustion engine assisted by a battery-powered electric motor | Battery-powered electric motor assisted by a gasoline-powered engine when the battery is low | Battery powered electric motor |
| Refueling | Requires routine refueling of gas | Requires less gas | Requires minimal gas | No gas required |
| Efficiency | 8-41 miles per gallon | 50 miles per gallon for a 2010 Prius with a nickel-metal hydride battery | 60-100 miles per gallon on each charge for the first 30-40 miles | 100-300 miles per charge |
| Emissions | Produces a third of Hawaii's CO ₂ tailpipe emissions | 30-40% reduction in CO ₂ tailpipe emissions | 40-70% reduction in CO ₂ tailpipe emissions | No CO ₂ tailpipe emissions |

Benefits of all kinds of electric vehicles:

- Reduce GHG emissions and improve air quality
- Recharging during off-peak hours can increase use of idle generation capacity, especially electricity generated from renewable sources such as wind
- EVs and their batteries could return power to the grid during emergencies or periods of high demand
- Plug-in EVs today may qualify for up to \$7,500 in federal tax credits

Challenges to consider:

- Driving a hybrid, plug-in hybrid, or pure EV takes some getting use to in order to maximize efficiency
- Choices and availability of EVs, particularly plug-ins, may be limited at first, and the cost for some models may be high
- Drivers may be concerned about range — how far a pure EV can go before recharging or swapping batteries
- Developing charge stations and battery swap stations will be costly and take time

