

Plug-in Hybrid Electric Vehicles

Traditional hybrid vehicles are powered by both an internal combustion engine and a rechargeable battery, yielding fuel economy improvements up to 30-60 percent over conventional gasoline-only models. Plug-in hybrid vehicles come with the added feature of a plug that allows the vehicle to be recharged through a conventional electrical outlet.

This fact sheet describes the benefits and costs of plug-in hybrids. It also provides information about their future development as well as State and local policies to encourage their use.

Plug-in hybrids can reduce oil use and greenhouse gas emissions and promote development of advanced vehicle technologies.

By shifting the automobile's energy source from conventional fuels to electricity, plug-in hybrids offer potential for a number of environmental and energy security benefits, such as:

- Reducing U.S. consumption of petroleum;
- Reducing greenhouse gas emissions; and
- Advancing battery and other technologies that could ultimately make 100% electric vehicles commercially viable.

Much of the current interest in plug-in hybrids arises from their key role in scenarios to stabilize the accumulation of transportation-related greenhouse gasses in the atmosphere. A recent EPA analysis found that if plug-in hybrids had a 30% market share by 2025 (and maintained it until 2050) they could reduce emissions of up to 11,000 million metric tons (MMT) of CO₂ from now to 2050 (see "A Wedge Analysis of the U.S. Transportation Sector" [[insert hyperlink](#)]). This is roughly a quarter of the 45,000 MMT of CO₂ that analysts estimate would have to be reduced by 2050 to stabilize emissions from the entire transportation sector (including trucks, aviation, rail, and other sources in addition to passenger cars).

The amount of greenhouse gas emissions reduced by plug-in hybrids depends upon the source of the electricity used to charge the vehicle when it is plugged in. For example, plug-in hybrids charging with electricity generated from burning coal would be responsible for more greenhouse gas emissions than those charging with electricity

from a renewable source, such as wind. Current studies have found that even plug-in hybrids using current electricity generation sources are responsible for fewer greenhouse gas emissions than conventional gasoline vehicles.

Future developments are likely to improve the cost-effectiveness of plug-in hybrids.

Plug-in hybrids have a larger up-front cost than current hybrid vehicles because of their larger battery, motors, and power electronics. However, fuel costs are lower for plug-in hybrids because per-mile electricity costs are lower than those for gasoline. This is especially true in areas where electricity rates are lower at night when most plug-in hybrids will be recharged.

Over time, research and mass production will likely improve the cost-effectiveness of plug-in hybrids. A number of universities, federal agencies, research organizations, utility companies, battery companies, and automakers are researching advances in plug-in hybrid technology. For example, the National Renewable Energy Laboratory (NREL) and several other organizations are seeking lighter weight, less expensive energy storage technologies. While plug-in hybrids are currently produced through conversion kits for traditional hybrid vehicles, General Motors recently announced plans to go into mass production of the first commercially available plug-in hybrid--the Saturn Vue and Chevy Volt.

State and local policies are encouraging the use and development of plug-in hybrids.

State and local governments have pursued a number of initiatives to promote the use of plug-in hybrids, including:

- A state law in [Minnesota](#) that encourages the State to buy plug-in hybrids for its public fleets;
- Demonstration projects in [New York](#) and [California](#) to analyze the feasibility and environmental benefits of introducing plug-in hybrids;
- A sales tax rebate in [South Carolina](#) for the private purchase of plug-in hybrids; and
- The “[Plug-in Partners](#)” initiative by the municipal electric utility in Austin, Texas to seek commitments from U.S. cities and utilities to help create a market for plug-in hybrids.

Where can I go for additional information?

You can access additional information about the characteristics of plug-in hybrids at the following web sites:

- A New Type of HEV: The Plug-in Hybrid (Department of Energy): www.eere.energy.gov/afdc/vehicles/hybrid_electric.html
- Plug-in Hybrid Web Page (DOE National Renewable Energy Laboratory): www.nrel.gov/vehiclesandfuels/hev/plugins.html
- State Clean Energy-Environment Technical Forum on Plug-in Hybrid Vehicles (Environmental Protection Agency and Keystone Institute, see March 15, 2007 forum): www.keystone.org/html/documents.html