

Series and Parallel Hybrid Vehicles

A series hybrid electric vehicle has one prime mover, an electric motor, powered by a battery and/or an engine turning an electric generator. The motor converts electrical power to mechanical power for propulsion. Electric power for the motor is available from an electrical energy storage device and/or a hybrid power unit (HPU). The HPU consists of an internal combustion engine and a generator. The engine converts the heat energy potential of a hydrocarbon fuel into mechanical power. The mechanical power of the engine is converted to electrical power in the generator, and the electrical power of the generator is then used by the drive motor to move the vehicle. The electric power created by the generator can also be used to recharge the electrical energy storage device.

In a parallel hybrid electric vehicle, there are two prime movers — an internal combustion engine and an electric motor. The engine converts the heat energy potential of a hydrocarbon fuel into mechanical power. The sum of the engine power and motor power is available at the wheels. A controller determines the load share of each device depending on the total required power, the operating efficiency, and the limitations of each device. Control can be optimized for fuel economy, performance, emissions, and range.

In both series and parallel configurations, the vehicle is capable of capturing some of the energy normally lost to friction heat in the brakes during deceleration. To do this, the electric motor used for propulsion can be switched to operate as a generator. The electricity generating process provides a braking torque, and the electricity produced is stored in the batteries.