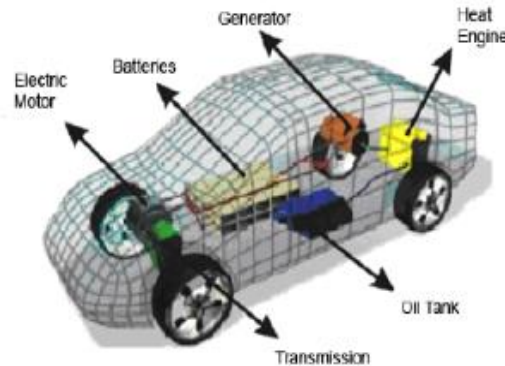


Electric Propulsion unit in Electric vehicles

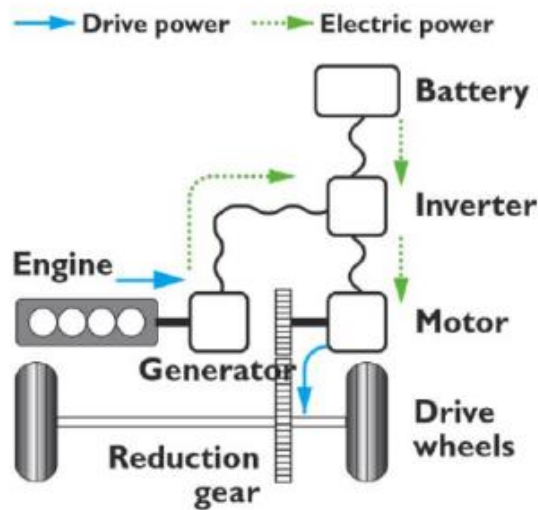
1.1. Series hybrid

In a series hybrid system, the combustion engine drives an electric generator (usually a three-phase alternator plus rectifier) instead of directly driving the wheels. The electric motor is the only means of providing power to the wheels. The generator both charges a battery and powers an electric motor that

moves the vehicle. When large amounts of power are required, the motor draws electricity from both the batteries and the generator.

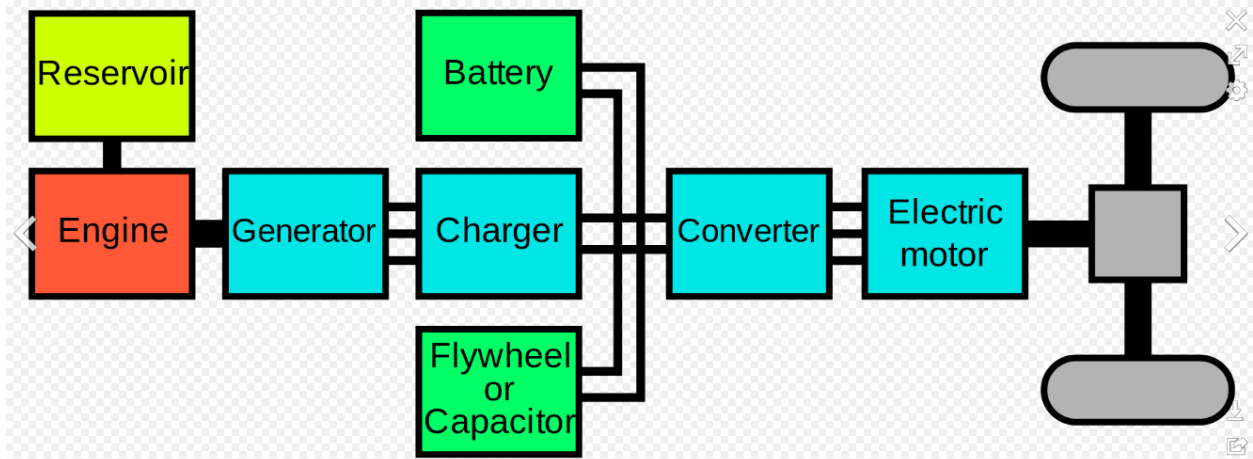


Series hybrid configurations already exist a long time: diesel-electric locomotives, hydraulic earth moving machines, diesel-electric power groups, loaders.



*Structure of a series hybrid vehicle
(below with flywheel or ultracaps as peak power unit)*

Electric Propulsion unit in Electric vehicles

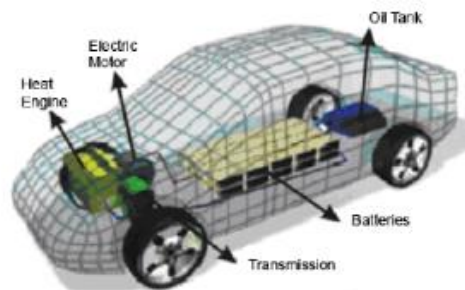


Advantages of series hybrid vehicles:

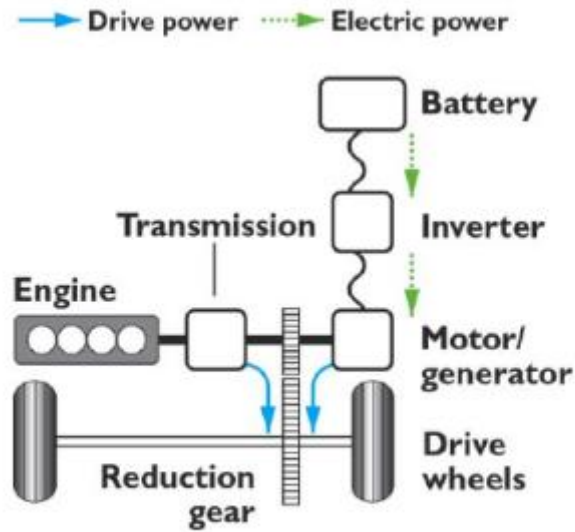
- There is no mechanical link between the combustion engine and the wheels. The engine-generator group can be located everywhere.
- There are no conventional mechanical transmission elements (gearbox, transmission shafts). Separate electric wheel motors can be implemented easily.
- The combustion engine can operate in a narrow rpm range (its most efficient range), even as the car changes speed.
- Series hybrids are relatively the most efficient during stop-and-go city driving.

1.2. Parallel hybrid

Parallel hybrid systems have both an internal combustion engine (ICE) and an electric motor in parallel connected to a mechanical transmission.



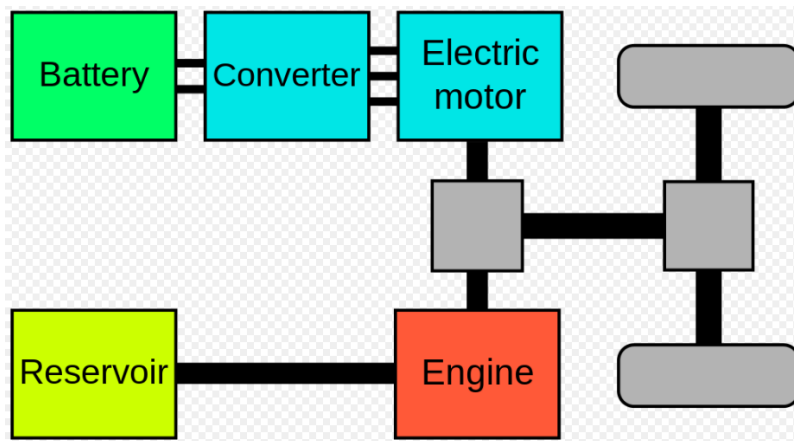
Electric Propulsion unit in Electric vehicles



Structure of a parallel hybrid electric vehicle

Most designs combine a large electrical generator and a motor into one unit, often located between the combustion engine and the transmission, replacing both the conventional starter motor and the alternator (see figures above). The battery can be recharged during regenerative braking, and during cruising (when the ICE power is higher than the required power for propulsion). As there is a fixed mechanical link between the wheels and the motor (no clutch), the battery cannot be charged when the car isn't moving.

When the vehicle is using electrical traction power only, or during brake while regenerating energy,



the ICE is not running (it is disconnected by a clutch) or is not powered (it rotates in an idling manner).

Electric Propulsion unit in Electric vehicles

