

Vauxhall Ampera Power Package

The power package, dubbed the Voltec Electric Propulsion System, comprises a 16kWh lithium-ion battery pack, a traction power electronics unit, the 111kW/150PS main electric traction motor (master engine), a 54kW/72PS electric motor, which also serves as the generator in range-extender mode, and a 1.4-litre 63kW/86PS petrol engine (slave engine). While the traction motor provides 370Nm of instant torque, the primary role of the motor/generator is to supply electricity when the range-extending petrol engine is activated. The purpose of the 1.4-litre engine is solely to power the generator whenever the Ampera's battery pack approaches its minimum state of charge. ie the front wheels are always electrically driven.



The efficiency of an electric motor reduces as it approaches its maximum rotational speed so the system includes a planetary gear set to reduce the maximum rotational speed of the traction motor. This uses three clutches which are electrically activated as required. One connects the electric motor/generator to the outer ring gear of the gearbox, another connects the ring gear to the gearbox housing, and a third connects the petrol engine to the motor/generator for extended-range driving.

As a result the Ampera can operate in single-motor mode at speeds of up to 60 mph and in two-motor mode at higher

speeds when the motor/generator cuts in functioning as an auxiliary traction motor. As a result the car can travel between 25 and 50 miles in battery-only mode.

Whenever the Ampera's battery pack is depleted to its minimum state of charge, the petrol engine is activated to extend its driving range. The engine is connected to the motor/generator, which then acts as a generator in order to supply electricity for the primary traction motor, while simultaneously maintaining the battery pack's state of charge. At higher speeds, the motor/generator adopts a dual function. While working as a generator to produce electricity, it also functions as an auxiliary motor and supplies drive torque by being re-connected to the outer ring gear of the gearbox, as in single-motor battery-only mode. In two-motor extended-range mode, the Ampera achieves greater efficiency at open-road speeds than



would be possible by using the primary traction motor alone. For optimal efficiency at higher speeds, some of the mechanical power of the petrol engine is used for propulsion. But even in this mode, the Ampera is still being driven electrically.

