

Integration of Plug-in Hybrid Vehicles with Renewable Sources of Energy

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Compared to conventional vehicles, plug-in hybrid electric vehicles (PHEVs) incorporate an onboard energy storage unit (ESU), most commonly batteries, in their powertrain architecture. The ESU can be charged from the electric power grid at night. Parts of this stored energy obtained from the electrical outlet will be consumed to drive the vehicle in the daytime. The rest of the stored energy in batteries can be sold back to the power grid to provide a range of services including backup power for homes and business, peak shaving, regulation, reactive power, and transmission stabilization. Buying energy at night, when electricity is cheap, and selling it back during the peak load demand has the potential to be financially lucrative. In addition, drivers will be relying on the electric energy purchased off the grid as the major source of traction in their vehicles. Hence, the equivalent gas mileage of the vehicles will drastically increase. The application of an ESU benefits the performance, efficiency, cost, and reliability of both vehicles and renewable sources. Integration of both systems so that vehicles and renewable sources share the onboard ESU of PHEVs would be a very interesting and challenging idea to pursue. The PHEV and renewable distributed generation concepts have been independently introduced; however, minimal effort has been directed at trying to systematically combine these two concepts and identify the required infrastructure for the future vehicle to grid concept.