



PJM Interconnection is engaged in the growth of plug-in electric vehicles in the region it serves. PJM is helping to demonstrate and evaluate how these vehicles can be integrated into and benefit the electric grid.

Battery electric vehicles and plug-in hybrid electric vehicles make up two types of plug-in electric vehicles, or PEVs. A battery electric vehicle plugs into the grid to charge a large battery pack, which is the sole energy source for powering the motor. A plug-in hybrid electric vehicle has a gasoline engine and a smaller battery pack that can be recharged by plugging it in, which are both used to power the vehicle.

Ideally, PEVs would use electricity from the grid during off-peak or low-price periods, which are typically on nights and weekends. This timing would enhance the efficiency of the grid by shifting electricity use to the off-peak, nighttime hours, reducing the difference between off-peak and peak demand levels and allowing traditional power plants to operate more steadily and efficiently. However, over the long term and as the growth of renewable energy continues, it could become better to charge PEVs whenever there is an abundance of renewable energy available on the grid.

PEVs also are capable of providing electric services to the grid. This concept is called either vehicle-to-grid (V2G) or demand response. With large numbers of such vehicles plugged in and aggregated as a single resource through software solutions, they could serve as a large “battery on the grid” or “virtual power plant” that provide some electricity services similar to what more traditional power plants provide today.

One such service that these vehicles can provide is frequency regulation, which is used to balance short-term variations between load and generation that might affect the stability of the power system. Frequency regulation helps match generation and load and adjusts generation output or load consumption to maintain the desired frequency and power flow interchange between PJM and neighboring grids.

In an initiative with the University of Delaware, a group of electric vehicles is providing this service through the PJM market. The project aggregates power from multiple electric vehicles to create one larger power resource to demonstrate that electric vehicle-to-grid technology can sell electricity from the vehicles to the power grid.

PJM also recently partnered with BMW North America to test demand response capabilities of electric vehicles. In this demonstration, the BMW vehicles were given a price signal from PJM and were able to decide whether to continue charging the battery due to customer needs, or stop charging based on high electricity pricing.

These and many other demonstrations show that electric vehicles can benefit the electric power system by becoming connected and controllable resources with additional hardware and software solutions. When aggregated, PEVs can help RTOs and utilities efficiently and reliably operate the grid.

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