PJM Interconnection has helped demonstrate and evaluate how plug-in electric vehicles can benefit and be integrated into the electric grid.

What Are Plug-In Electric Vehicles?

Battery-powered electric vehicles and plug-in hybrid electric vehicles are two types of plug-in electric vehicles (PEVs). A battery-powered electric vehicle has a large, rechargeable battery pack. A plug-in hybrid electric vehicle has both a gasoline engine and a smaller battery pack.

Ideally, PEVs would draw electricity from the grid during off-peak or low-price periods – currently, nights and weekends. This timing would enhance the efficiency of the grid by reducing the difference between off-peak and peak demand levels, which would enable traditional power plants to operate more steadily and efficiently.

PJM has been factoring the impacts of plug-in electric vehicles into its annual Load Forecast Report since 2020.

At a Glance

- PEVs ideally draw power from the grid during off-peak periods. Currently, that's on nights and weekends.
- PEVs are capable of providing services to the grid similar to traditional power plants. One such service is frequency regulation.
- PJM is partnering with Delmarva Power to demonstrate V2G technology.

Returning Energy to the Grid

Some PEVs are capable of providing electric services to the grid. This concept is called vehicle-to-grid (V2G) technology or demand response. Large numbers of electric vehicles plugged in and virtually aggregated as a single resource, such as a fleet of school buses, can serve as a large "battery on the grid" or "virtual power plant." In this way, they can provide some electricity services similar to what more traditional power plants supply.

One such service is frequency regulation, used to balance short-term variations between load and generation that can affect the stability of the power system. Frequency regulation, a service procured through PJM's Regulation Market, adjusts generation output or load consumption to maintain the desired frequency and power flow on the system.

Learning From Partnerships

PJM was an integral partner in one of the first successful demonstrations of V2G technology at the University of Delaware. The initiative showed that PEVs can both charge and discharge, and earn revenue, similar to a generation asset.

Today, this V2G concept is being more widely deployed and commercialized using production EVs, such as the Ford F-150 Lightning. PJM and Delmarva Power are actively demonstrating V2G using the Ford Mach-e Mustang and newly developed industry standards that allow for V2G using alternating current (AC) power. These new standards are important for reducing the cost and complexity of V2G systems.

PJM looks forward to playing a role in powering the future fleet of PEVs and enabling their ability to interact with the grid in innovative ways to maintain reliable and cost-efficient electricity.

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