



Bi-Directional EV Charging

Technology Overview

The U.S. has 23 gigawatt-hours of electric vehicle (EV) battery capacity, but only a fraction is being used¹, leaving a significant amount of spare, stored energy that could be directed and used elsewhere. Bi-directional EV charging can leverage this unused asset. This vehicle-to-everything (V2X) technology turns EVs into energy storage assets and provides the opportunity to increase grid resilience, reduce emissions, and lower EV fleet costs. Bi-directional EV charging reduces the grid's carbon intensity by discharging zero-carbon power stored in the battery to the grid or a building during system peaks. Using energy utilization data from a building, car, and charger to evaluate and predict when a building experiences peak power usage, bi-directional EV charging can stabilize the grid by optimizing the dispatch of a vehicle's stored energy either to the grid or to the building. V2X controls can be installed behind the interconnection point (e.g., building meter) with one or more bi-directional chargers. Its user interface is an energy management tool that provides real-time visibility into energy consumption and system operation.

Why is GSA Interested?

The U.S. Department of Energy (DOE) and the GSA are helping to lead the way toward stabilizing the grid, optimizing energy loads, and saving money for commercial buildings by focusing on building and grid integration.² With the federal fleet acting as a built-in power supply, this V2X technology promises to save money on fleet operating costs, manage climate-related risks, and improve facility energy resilience and efficiency.

The EV charge management technology will be piloted at GSA's newly established Applied Innovation Learning Laboratories. At these sites, GSA will work with federal partners, industry, and local utilities to test new technologies. Evaluation results will help refine GSA's understanding of the requirements needed to support an all-electric fleet.

How Will Success Be Measured?

The testbed will assess three manufacturer claims: reduced electricity costs with demand change management, reduced CO₂/GHG emissions, and lower overall fleet EV costs.

Deployment Potential

This technology is best suited to facilities with the following two characteristics in their electricity usage profile: a demand that varies and peaks throughout the day and an average 15-minute load that exceeds the installed bi-directional charger capacity. The charger is currently compatible with the Nissan LEAF (with quick-charge capabilities), the only EV in the U.S. using the CHAdeMO bi-directional charging standard.

¹Esource, <https://www.esource.com/136201eli/commercialized-vehicle-grid-has-arrived>, accessed 06-2022.

²SFtool.gov, <https://sftool.gov/learn/about/638/grid-interactive-efficient-buildings>, accessed 06-2022.

Green Proving Ground (GPG), in collaboration with the U.S. Department of Energy, is evaluating the real-world performance of bi-directional EV charging in federally owned buildings within GSA's inventory. The technology will be provided by Fermata Energy and coordinated with other ongoing evaluations of this technology.