CPS: Synergy: Collaborative Research:Architectural and Algorithmic Solutions for Large Scale PEV Integration into Power Grids

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Project Details

Lead PI:	Vijay Gupta
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Performance Period:	10/01/12 - 09/30/16
Institution(s):	University of Notre Dame
Sponsor(s):	National Science Foundation
Project URL:	http://ee.nd.edu/faculty/vgupta/research/funding/cps_pev.html
Award Number:	1239224

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Abstract: This project designs algorithms for the integration of plug-in hybrid electric vehicles (PEVs) into the power grid. Specifically, the project will formulate and solve optimization problems critical to various entities in the PEV ecosystem -- PEV owners, commercial charging station owners, aggregators, and distribution companies -- at the distribution / retail level. Charging at both commercial charging stations and at residences will be considered, for both the case when PEVs only function as loads, and the case when they can also function as sources, equipped with vehicle-to-home (V2H) or vehicle-to-grid (V2G) energy reinjection capability. The focus of the project is on distributed decision making by various individual players to achieve analytical system-level performance guarantees. Electrification of the transportation market offers revenue growth for utility companies and automobile manufacturers, lower operational costs for consumers, and benefits to the environment. By addressing problems that will arise as PEVs impose extra load on the grid, and by solving challenges that currently impede the use of PEVs as distributed storage resources, this research will directly impact the society. The design principles gained will also be applicable to other cyber-physical infrastructural systems. A close collaboration with industrial partners will ground the research in real problems and ensure quick dissemination of results to the marketplace. A strong educational component will integrate the proposed research into the classroom to allow better training of both undergraduate and graduate students. The details of the project will be provided at http://ee.nd.edu/faculty/vgupta/research/funding/cps_pev.html

CPS Domains Energy Sector Transportation Systems Sector Automotive Architectures Smart Grid Energy Critical Infrastructure Transportation CPS Technologies