

EECS 598 Special Topic Infrastructure for Vehicle Electrification

Wednesday and Friday, 10:30am-12:00
Winter 2014



This course covers the fundamentals of the physical and cyber infrastructures that will underpin large-scale integration of plug-in electric vehicles. PEV charger technology will be examined, with a view to establishing grid-side characteristics. V2G converter requirements will be considered. The physical power system infrastructure will be presented, beginning with an overview of power system structure and operations, through distribution system design, to consumer installations. Quality-of-supply issues and protection requirements will be addressed. The information infrastructure and regulatory framework required to support various business models for flexible PEV charging and V2G applications will be presented. Control strategies that are appropriate for large-scale PEV integration will be considered. Upon completion of the course, students should have a comprehensive knowledge of the structure, capabilities and limitations of the physical and cyber infrastructures required to support PEVs.

Syllabus:

1. Power system overview: Distribution supply systems; Reliability; Protection; Impact of high PEV penetration; Vehicle-to-grid integration.
2. Vehicle-grid interface: Grid-to-vehicle and vehicle-to-grid converter technologies; Standards; Safety systems; Quality-of-supply; Information transfer.
3. Business models for ubiquitous charging facilities: Cyber-infrastructure requirements for supporting smart/dumb charging.
4. System-wide control of charging: Time-based and price-based load shifting strategies; Optimal control of PEV demand; Hierarchical control structures; PEV control for smoothing renewable generation variability.

Prerequisites: EECS 215 or 314 (or Permission of Instructor).

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