DoD Plug-In Electric Vehicle Program

The DOD V2G Pilot Project
SGIP DEWG V2G Briefing

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V2G Project Scope

- Initiate large-scale testing and evaluation program for PEVs on 6 installations (DOD-wide) in four regions, with the following features:
  - 100-500 PEVs with V2G capability
    - LD pick-up trucks
    - LD cargo/passenger vans
    - MD/HD trucks and vans
    - Buses
  - One V2G-capable charging station per PEV
  - Specialized software to manage PEV fleet with V2G capability
  - Training for multiple DOD constituencies
  - Sustainment for PEVs, infrastructure, and software
  - Program management and systems integration
- Demonstrate financial and operational benefits of a V2G fleet
- Option to expand up to 1,500 PEVs on up to 30 installations
What is V2G?

- **Spinning Reserves**: Extra generation available to serve load in case of unplanned event. Good match for V2G.
- **Aggregate Daily Load Curve**:
  - **Peak Power Shaving**: Generation at times of high power demand. May be used for V2G.
  - **Frequency Regulation**: Used to regulate frequency and voltage of the grid by matching instantaneous generation supply to load demand. Best match for V2G.
CY 2011 Monthly Frequency Regulation Revenues

Monthly Revenues

Bi-Directional Power Capacity (kw)

$- 

$200.00

$400.00

$600.00

$800.00

$1,000.00

CAISO (Southern)

ERCOT

PJM
Project Management

DOD V2G Project

Site Infrastructure
- Select sites
- ECIP funded
- Infrastructure Design and Installation

AFRL RDT&E PEV–V2G Program
- Infrastructure
- V2G Vehicles
- V2G Utilities/Regulatory/Software
- V2G Technology Test/Demo
- Cost-Benefit Analysis

Los Angeles AFB
AFRL – CTC
- Infrastructure Development and Installation
- Charging Station Procurement and Installation

New Locations
- NAWS China Lake, CA
- Fort Hood, TX
- MCB Kaneohe Bay, HI
- Joint Base Andrews, MD
- Joint Base McGuire-Dix-Lakehurst (MDL)

Lawrence Berkley National Laboratory (LBNL)
- ECIP & CA Energy Commission
- Regulatory & Tariff Compliance and Qualification
- Software Development and Implementation

OSD = Lead
SAF/IE = Executing Agent

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Los Angeles AFB Project

- Los Angeles AFB is the first pilot installation for the DOD V2G Project
  - Launched in 2011 to develop institutional understanding of requisite processes and challenges to a broader deployment effort

- First federal installation to replace all general purpose fleet vehicles with plug-in electric counterparts
  - 41 plug in electric vehicles w/ charging stations
  - Sedans, trucks, vans, and a bus
  - Vehicles to be V2G-capable to the greatest extent possible

- Demonstrate the ability to manage a 100% PEV fleet
  - Provide tools for the scheduling and dispatching of PEVs to meet installation’s mission
V2G Project Status

Stage 1: Planning & Solicitation

- Obtain all requisite DOD approvals to proceed
- Establish Interagency Agreements, as necessary
- Begin design/installation of charging infrastructure for Stage 2 installations
- Establish Contract Management Team
- Finalize & release RFP:
  - Round 1 – Pre-Solicitation
  - Round 2 – Initial Applications
  - Round 3 – Final Evaluation & Selection

Stage 2: Preparation & Testing

- Complete installation of charging stations at Stage 2 installations
- Complete software design, validation, and implementation
- Complete training curriculum design & implementation
- Field test up to 500 PEVs & charging stations
- Evaluate and modify program, as necessary
- Decide whether or not to proceed to Stage 3
- Secure funding for Stage 3

Stage 3: Integration & Monitoring

- Complete installation of charging infrastructure at Stage 3 installations
- Complete implementation of software
- Replace up to 1,500 conventional vehicles with PEV’s
- Manage contract and sustainment requirements for PEV’s & charging stations
- Evaluate and modify program, as necessary
- Decide whether or not to proceed to Stage 3
- Secure funding for Stage 3
- Complete installation of charging infrastructure at Stage 3 installations
- Complete implementation of software
- Replace up to 1,500 conventional vehicles with PEV’s
- Manage contract and sustainment requirements for PEV’s & charging stations
- Evaluate and modify program, as necessary
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Change Management

- Identify change agents / champions
- Develop key communications materials
- Distribute communications to DOD community
- Establish methods to gauge stakeholder participation
- Develop additional strategies to increase adoption of policy and strategy
- Assess future opportunities for fleet electrification
Systems Integration Requirements

Communications Protocol Compatibility

Power Conversion Electronics Compatibility

Cost
Identify pathways for a portion of a retail service to participate in a wholesale market activity (e.g. frequency regulation).

Minimally requires coordination of local utilities and regional independent service operators.

Likely requires coordination of state public utility/public service commissions.

May also require coordination with FERC.

Solutions may differ by region.
System Overview

- Independent System Operator
- Scheduling Coordinator
- System Manager
- Infrastructure
- PEV–V2G Vehicles

[Images of high voltage lines, computer, infrastructure, and electric vehicles]
System Architecture

Electrical Service Tap (208V or 480V AC)

Electrical Service (120V AC)

System contained within installation master meter, but sub-metered separate from any other base load or source.

Aggregator

External communications occur via cellular modem. Charging stations communicate to aggregator via redundant Ethernet cables. All communications are separate from base LAN.
Mission requirements are always top priority
- V2G activities may be superseded at any time, regardless of financial loss
- DOD may restrict market participation to mitigate risk of non-compliance

Human factors will likely pose greatest challenge
- Car not “returned” until it’s parked in a designated location and plugged in
- Requires a much greater level of planning than conventional fleet management

V2G may create opportunities to enhance mission capabilities that would otherwise be unattainable
V2G Mission Benefits

- Exportable power from V2G PEVs can be used to enhance mission capabilities:
  - Optimization of back-up power systems
  - Integration with micro-grids
  - Integration with renewable energy infrastructure
  - Flight line operations
  - Remote operations (e.g. air range)
  - Communications vehicles
Future DOD V2G Efforts

- DOD will continue working to launch V2G systems at LA AFB and 5 other pilot locations
  - Objective is to expand rapidly if financial and operational models are validated

- Efforts underway to identify alternate V2G activities that may provide significant financial value
  - Link to renewable energy resources
  - Other demand response services

- Exploration of military mission benefits of exportable power

- Identifying transition strategies from fleet to personal vehicles

- Exploring uses of 2nd Life Batteries from V2G Pilot Project