Technologies required to fully integrate electric vehicles and the smart grid

Presented at Plug-In 2011
June 19, 2011
EV SMART GRID INTEGRATION

- Off peak energy sales
  - AMR smart meter
  - TOU EV rate
- Grid support services
- Local grid reliability
- Demand response
- Energy storage
- Vehicle to grid
- Vehicle roaming
**EV PROJECT DATA**

**Charging Availability:** Range of Percent of Charging Units with a Vehicle Connected versus Time of Day

Max percentage of charging units connected across all days
Min percentage of charging units connected across all days
Percentage of charging units connected on single calendar day with peak electricity demand

**Charging Demand:** Range of Aggregate Electricity Demand versus Time of Day

Max electricity demand across all days
Min electricity demand across all days
Electricity demand on single calendar day with highest peak

**Individual Charging Event Statistics**

<table>
<thead>
<tr>
<th></th>
<th>Weekday (WD)</th>
<th>Weekend (WE)</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average length of time with vehicle connected per charging event (hr)</td>
<td>9.8</td>
<td>11.1</td>
<td>10.2</td>
</tr>
<tr>
<td>Average length of time with vehicle drawing power per charging event (hr)</td>
<td>1.9</td>
<td>1.8</td>
<td>1.9</td>
</tr>
<tr>
<td>Average electricity consumed per charging event (AC kWh)</td>
<td>6.8</td>
<td>6.0</td>
<td>6.6</td>
</tr>
</tbody>
</table>
JUMP STARTING SMART GRID

- Enabling Tasks
  - Smart Metering
  - Networks
  - Control

- Solutions
METERING

- EV Rates
  - Mandatory or voluntary
  - Savings realized
- Separate vs Sub Meter
  - Installation cost
  - Meter data management
- Integral EVSE Meter
  - Certification
  - Energy diversion
  - Verification
NETWORKS

- AMI
  - Availability
  - Bandwidth/latency

- WiFi
  - Availability
  - Reliability
  - Security

- Cellular
  - Availability
  - Cost
CONTROL – DEMAND RESPONSE

- **Hardware Cost**
  - Utility cost
  - Consumer cost

- **Implementation**
  - Utility
  - EVSP

- **Operation**
  - Notifications
  - Transparency
SOLUTIONS

- The Devil Is In The Details
- Utility Coordination
  - Metering
  - Tariffs
  - Communications
- Smart Grid As A Service
  - Customer value
  - Utility flexibility