California Electric Vehicle Infrastructure Policies and Status

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Outline

1. Overview of California Infrastructure Status and Policies

2. California EV Readiness Building Codes

3. Additional State and Local Efforts
## California Policy Background

<table>
<thead>
<tr>
<th>Policy</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global Warming Solutions Act (AB32)</td>
<td>Outlines CA’s major initiatives for climate change, 2020 GHG emission reduction goals.</td>
</tr>
<tr>
<td>Assembly Bill 118 and pending Senate Bill 1532</td>
<td>Incentive funding for alternative fuels and advanced vehicle technologies including EV infrastructure</td>
</tr>
<tr>
<td>Zero Emission Vehicle Regulation</td>
<td>10% electric drive vehicle market share by 2025</td>
</tr>
<tr>
<td>Governor’s Executive Order</td>
<td>Infrastructure and other policies to support 1.5 million electric drive vehicles by 2025 and 80% transportation GHG reduction by 2050</td>
</tr>
</tbody>
</table>
## California Public EV Charging Infrastructure Status

<table>
<thead>
<tr>
<th></th>
<th>Level 1</th>
<th>Level 2</th>
<th>DC Fast charging</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>US</strong></td>
<td>2253</td>
<td>7605</td>
<td>63</td>
<td>9921</td>
</tr>
<tr>
<td><strong>California</strong></td>
<td>494</td>
<td>1664</td>
<td>4</td>
<td>2162</td>
</tr>
</tbody>
</table>

- **Level 1** = 120 V
- **Level 2** = 240 V

Source: US National Renewable Energy Lab
Status of California Residential Charging Infrastructure

- EV Project Level 2 installations, mainly residential Nissan Leaf chargers
  - San Francisco - 1260
  - San Diego – 927
  - Los Angeles - 538
- Over 436,000 charging events at these stations

Source: Q2 2012 Status Report The EV Project
California EV Infrastructure Efforts

- California Public Utilities Commission settlement with NRG
  - 200 DC fast-charger
  - “make-readies” for 10,000 charging points at multi-dwelling units, offices, public buildings
  - Legal challenges pending

- California Plug-in Electric Vehicle Collaborative focus on workplace and multi-unit dwelling charging
Rationale

- Retrofitting a residence with a charging circuit can cost over $2,000 (actual price varies).
- On the other hand, ‘pre-wiring’ new homes for EV charging during construction only ~ $250.
- Similar benefits in other buildings.
CA EV Readiness Building Codes

- PG&E and other California Investor-Owned Utilities (IOU) began to explore building codes options in 2009.

- California Green Building Standards Code (CALGreen, Part 11 of Title 24) contains mandatory standards and voluntary “Tier 1” and “Tier 2” standards
CA EV Readiness Building Codes

- Goals of IOU Proposed CalGreen 2011 revision
  - Minimize construction requirements and cost but maximize EV “readiness” with basic charging circuit infrastructure
  - Prioritize readiness for residential charging, which accounts for bulk of charging and encourages overnight, off-peak charging.
  - “Voluntary” section of standard allows local jurisdictions to choose whether to impose these standards for new construction
CA EV Readiness Building Codes: IOU CalGreen 2011 Proposal

- Install conduit and conductor for a dedicated 240 volt, 40 amp AC circuit from the electric service panel to parking space.
- Reserve panel capacity, install circuit breaker for the charging circuit.
CA EV Readiness Building Codes: Technical Issues

- Circuit termination method
  - Does National Electrical Code call for hardwiring circuit to electric vehicle service equipment (EVSE), or allow for a rated National Electrical Manufacturers Association “plug and play” outlet?

- Potential effect of sub-metering for EV electricity usage

- Grid impacts
  - Consider off-peak benefits, concerns for potential distribution infrastructure overloading, and future “smart charging” technology.
CA EV Readiness Building Codes: Technical Issues Considered

- Circuit sizing
  - Is 40 amp, Level 2 AC circuit appropriate for the EVs of today and tomorrow?

- Service panel capacity and upsizing
  - Will compliance require upgrading panel size, increasing cost?

- Multi-family, multi-unit dwellings
  - Emphasized by urban stakeholders; we advocated provisioning 10% of parking spaces.

<table>
<thead>
<tr>
<th>Circuit Level</th>
<th>Current (amp)</th>
<th>Power (kW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC Level 1</td>
<td>12</td>
<td>1.44</td>
</tr>
<tr>
<td>AC Level 2</td>
<td>16</td>
<td>1.92</td>
</tr>
<tr>
<td>240V AC single phase</td>
<td>≤ 80 amp</td>
<td>≤ 19.2 kW</td>
</tr>
<tr>
<td>120V AC single phase</td>
<td>(12 amp)</td>
<td>(1.44 kW)</td>
</tr>
</tbody>
</table>

120V AC single phase current (12 amp); power 1.44kW
120V AC single phase current (16 amp); power 1.92kW
240V AC single phase rated current ≤ 80 amp rated power ≤ 19.2 kW
CA EV Readiness Building Codes: Current Standard

- CalGreen EV readiness revision (adopted 2011 with effective date June 2012) is a major first step
- Requires empty raceway (ie space for adding conductor later) for single family homes, and for 3% of spaces at multifamily homes, but not conductor, circuit breakers, and panel capacity
- Rationale for adopted standard: Empty raceway approach provides more flexibility on circuit sizing and avoids upfront expenses, service panel upgrade.
CA EV Readiness Building Codes: Future Revisions

- Next step: Strengthening the voluntary EV readiness requirements for CalGreen revisions later in 2012 to take effect in 2014
  - Provision fully equipped charging circuits and increase % of EV ready parking spaces in multi-family construction.
- Final goal: Transition to mandatory state-wide requirements for residential EV charging circuits.
Additional State and Local Efforts

- City of Los Angeles’ new Green Building article; Municipal Code, Chapter IX
  - 208/240 volt, 40 amp grounded AC outlet for EV charging, or panel capacity and conduit
  - Similar provisions for 5% of spaces in townhouses, apartments, and non-residential parking facilities.

- City of San Francisco’s Cleaner Fuels and Vehicles Program
  - Possible EV charging provisions in single- and multi-family residential, hotels, commercial and municipal.
### Additional State and Local Efforts

- **California Public Utilities Commission Rulemaking**
  - Goal of consistent statewide policies for EV metering, home, commercial and public EV charging infrastructure, tariff schedules, and potentially incentive programs.
  - Phase 1: EV charging providers will not be regulated as public utilities
  - Phase 2: Rules against IOUs owning EVSE at customers’ facilities
    - Initiates EV metering protocol development as potential alternative to separate meter (for lower-cost EV-specific electricity rates)
    - Until June 2013, costs of distribution upgrades are a shared cost
    - Requires utilities to perform load research
For More Information

- epike@energy-solution.com
  (510) 482-4421 ex 239

- Reducing Barriers to Electric Vehicle Adoption through Building Codes; Jordan Shackelford, Alex Chase, and Michael McGaraghan, Energy Solutions; Stuart Tartaglia, Pacific Gas and Electric Company
Thanks!

Questions and Discussion