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AB 2127 Charging Infrastructure: Needed Hardware & Software

Noel Crisostomo, Fuels and Transportation Division
August 4, 2020
Outline: Hardware & Software Needs

• AB 2127 Directive, Legislative Finding and Declaration

• Charging Equipment Goals and Vision for Global Interoperability

• Interoperability Permeates Charging Infrastructure Deployment Strategies
  • Sharing convenient charging (M/HDV Connector)
  • Saving costs and grid impacts with flexible EVs (Smart Charging)
  • Accessing open and reliable charging (Roaming and Management)
Consider all necessary charging infrastructure, including, but not limited to:

<table>
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<th>Existing Chargers</th>
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<td>Counting Chargers</td>
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<td>Including in Low-income Communities <em>(SB 1000)</em></td>
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<th>Future Chargers</th>
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<tr>
<td>Electric Vehicle Infrastructure Projections <em>(EVI-Pro 2)</em></td>
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<td>EVI-Pro RoadTrip</td>
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<td>Widespread Infrastructure for Ride-hailing EV Deployment <em>(WIRED)</em></td>
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<tr>
<td>Medium- &amp; Heavy-Duty EVI-Projections <em>(HEVI-Pro)</em></td>
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<td>Off-Road, Port and Airport Electrification</td>
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Charging Hardware and Software *(Interoperability and Equipment Standards)*

Make- Ready Electrical Equipment *(Building Codes & EVSE Deployment & Grid Evaluation, EDGE)*

Other Programs to Accelerate the Adoption of Electric Vehicles *(Incentives, Investment, others)*
Charging Equipment Goals

**Convenience**
Ensure that technologies employed in plug-in hybrid and electric vehicles work in a harmonious manner and across service territories.

Public Utilities Code 740.2 (e)

**Cost Control**
EVs and charging that can record consumption and remotely communicate could assist in renewables integration, and reduce fuel costs for drivers who charge in a manner consistent with grid conditions.

Public Utilities Code 740.12(g), AB 2127 (2018)

**Customer Choice**
Standardized, open charging systems that ensure easy access by all in a competitive, and highly-innovative market.

U.S. DOE EERE Public Plug-In Electric Vehicle Charging Infrastructure Guiding Principles
Charging Equipment Goals

Interoperability “will provide standardized devices that are capable of functioning as intended with each other, without special effort by the user.”

Harmonized standards and regulations [will create:]
• Interoperable PEVs, EVSE, and communication networks
• Predictable investment requirements [to achieve scale]
Hardware-Software Solutions

OpenADR 2.0b or SEP 2.0b (Demand & Price Signals)
1. Utility Direct Load Control
2. Aggregator Managed
3. Energy Management System

Aggregator (EVSP or OEM)

OCPI or OICP (Inter-network Billing)

OCPP 1.6J, 2.0 or others IEC 63110 (Equipment Management)

ENERGY STAR (Efficiency)
NIST Handbook 44 (Meter Accuracy)
Open Public Payment (Access)

ISO/IEC 15118 (Vehicle-To-Grid Communication)
Standardization drives economies of scale and innovation through “coopetition”

Harmonize to Scale
Interoperable: Convenient, Controllable, and Competitive

Portfolio of Solutions Best Fit for the Local Environment

Marginal Component Cost for High Level Communication (Level 2 EVSE)

QCA7000 Design
ST2100 Design

Energy Commission analysis, Department of Energy, Argonne National Lab, Electrify America, Freewire Tech, Envision Solar
Convenience for Customers

Standards-based connectors and communication
- Moderates network size by improving utilization among EVs
- Reduces costs to achieve EV production and use goals
- Saves equipment costs and driver search costs at stations

ISO/IEC 15118
Vehicle-To-Grid Communication

Li, Jing (2019), Comments of EVgo and Electrify America on 6/24/20 IEPR Workshop, NREL/CEC EVI-Pro RoadTrip
Controllable Costs

Standards-based chargers and communication

• Improves customers’ ability to dynamically manage rates and capacity, paving the way to V2G resiliency
• Assists the business case for EVs by creating opportunities for valuable customer- and grid services
Standards-based network communication interfaces

- Permits reliability monitoring, offers customers options among networks, and enables repair by technicians
- Facilitates cooperation among competing networks, while ensuring a seamless customer experience
### Interoperable EV Charging is Key...

**Assess Needs**
- Expand Electric Vehicle Infrastructure Projections

**Harmonize to Scale**
- Interoperable: Convenient, Controllable, and Competitive

**Grow Partnerships**
- Lever Public and Ratepayer Investment with Private Capital

**Electric For All**
- Robust Supplier Ecosystem & Installation Workforce

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**Charging Infrastructure Deployment Strategies**

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<tr>
<th>Local &amp; Project Level</th>
<th>Statewide Ecosystem</th>
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<td>Regional Readiness Plans and Community Blueprints</td>
<td>Portfolio of Solutions Best Fit for the Local Environment</td>
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<td>Project Finance and Innovative Economic Models</td>
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<tr>
<td>Construction, Energization, and Sustained Operations</td>
<td>Biennial &amp; Ongoing Updates</td>
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...as the market remains fragmented.

California and its partners should standardize for widespread transportation electrification to be powered with 100% clean energy.

• **Automakers**: Collaborate upon standards and compete on implementation
• **Labs**: Streamline and subsidize electrical manufacturer functional testing & validation
• **CEC**: Support electrical manufacturers and fund chargers reflecting automaker technology roadmaps to achieve economies of scale
• **Utilities**: Support customers and aggregators through grid and network infrastructures
Thank you! Questions & Feedback?

Contact:
Noel.Crisostomo@energy.ca.gov

Webpage:
https://www.energy.ca.gov/programs-and-topics/programs/electric-vehicle-charging-infrastructure-assessment-ab-2127