<table>
<thead>
<tr>
<th><strong>DOCKETED</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Docket Number:</strong></td>
<td>17-EVI-01</td>
</tr>
<tr>
<td><strong>Project Title:</strong></td>
<td>Block Grant for Electric Vehicle Charger Incentive Projects</td>
</tr>
<tr>
<td><strong>TN #:</strong></td>
<td>230794</td>
</tr>
<tr>
<td><strong>Document Title:</strong></td>
<td>Presentation - CALeVIP Future Equipment Technology Workshop</td>
</tr>
<tr>
<td><strong>Description:</strong></td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Filer:</strong></td>
<td>Christina Cordero</td>
</tr>
<tr>
<td><strong>Organization:</strong></td>
<td>California Energy Commission</td>
</tr>
<tr>
<td><strong>Submitter Role:</strong></td>
<td>Commission Staff</td>
</tr>
<tr>
<td><strong>Submission Date:</strong></td>
<td>11/19/2019 3:44:55 PM</td>
</tr>
<tr>
<td><strong>Docketed Date:</strong></td>
<td>11/19/2019</td>
</tr>
</tbody>
</table>
In Case of Emergency
Agenda

- CALeVIP Background and Current Equipment Requirements
- Updated Proposal for Future Equipment Requirements
- Analysis of Equipment Hardware and Software Technology
- Public Roundtable Discussion
  - Features Demanded and Product Supply Chain
- Proposed Timelines for Implementation
- Questions & Wrap Up
CALeVIP Background and Current Equipment Requirements

Updated Proposal for Future Equipment Requirements

Analysis of Equipment Hardware and Software Technology

Public Roundtable Discussion
  Features Demanded and Product Supply Chain

Proposed Timelines for Implementation

Questions & Wrap Up
Block Grant ARV-16-017

Goal: Rapid deployment of public L2 and DCFC stations across California
Clean Transportation Program

Fund[s] programs and projects that **accelerate the commercialization of vehicles and alternative and renewable fuels including buy-down programs through near-market and market-path deployments**, advanced technology warranty or replacement insurance, **development of market niches, supply-chain development**, and research related to the pedestrian safety impacts of vehicle technologies and alternative and renewable fuels.

– Assembly Bill 118 (2007) and AB 8 (2013), CA Health and Safety Code §44272(e)(7)
Charging Infrastructure Assessment

The [Energy] Commission...shall prepare a statewide assessment of electric vehicle charging infrastructure needed to support the levels of electric vehicle adoption required for the state to meet its goals of putting at least five million zero-emission vehicles on California roads by 2030...

The assessment shall...consider all necessary charging infrastructure, including, but not limited to, the chargers, make-ready electrical equipment, and **supporting hardware and software**, all vehicle categories, road, highway, and offroad electrification, port and airport electrification, and other programs to accelerate the adoption of electric vehicles...

– Assembly Bill 2127 (2018), CA Public Resources Code §25229
Innovations in Charging Technology

Electric vehicle charging with demand-side management can reduce electricity use during peak times and shift use to periods of excess electricity supply...The Energy Commission is seeking ways to **advance innovative and transformative technologies and transportation trends that increase the efficiency and effectiveness of zero-emission charging infrastructure**. Newer recharging technologies such as robotic charging, pantograph charging, and wireless charging have shown great potential to improve upon the speed and cost-effectiveness of charging infrastructure. Such **advancements could greatly increase use of existing equipment and enable new private investments**.

– Clean Transportation Program Investment Plan Update (2019)
CALeVIP Pillar Requirements

Technology: Level 2 Chargers
  o J-1772 connector
  o 6.2kW+ power rating
  o Networked
  o Minimum 2-year networking agreement
  o New (not refurbished, not previously installed and removed)
  o Open standard protocol
  o Energy Star Certified
  o Approved by a Nationally Recognized Testing Laboratory
  o Accept at least two payment methods (if payment is required)
    o Acceptable payment methods may include (but are not limited to) mobile app-based payment, a toll-free phone number, near-field communications (NFC) or onsite card reader
CALeVIP Pillar Requirements

Technology: Direct-Current Fast Charger (DCFC)
- Both CHAdeMO and Combined Charging System (CCS) connector
- 50kW+ power rating
- Networked
- Minimum 5-year networking agreement
- New (not refurbished, not previously installed and removed)
- Open standard protocol
- Approved by a Nationally Recognized Testing Laboratory
- Accept at least two payment methods (if payment is required)
  - Acceptable payment methods may include (but are not limited to) mobile app-based payment, a toll-free phone number, near-field communications (NFC) or onsite card reader
Needs for Refinement

“Networked” not sufficiently-defined
Inconsistent application and customer confusion

“Open standard protocol” not sufficiently defined
Not implementable and unable to achieve specific functions

Nationally Recognized Testing Laboratory Certification
Processes are costly and untimely for EVSE manufacturers

Need to harmonize with impending or new EVSE regulations
Division of Measurement Standards adopting sections of the National Institute of Standards and Technology (NIST) Handbook 44, §3.40.

Air Resources Board specifying payment methods and other requirements for publicly accessible EVSE per SB 454.

New ENERGY STAR proposed specifications for DC Fast Charging.
CALeVIP Background and Current Equipment Requirements

Updated Proposal for Future Equipment Requirements

Analysis of Equipment Hardware and Software Technology

Public Roundtable Discussion
Features Demanded and Product Supply Chain

Proposed Timelines for Implementation

Questions & Wrap Up
• Level 2 conductive or inductive, AC and DC chargers shall have the capability of communication with the PEV, based on ISO/IEC 15118 communication
• Require for equipment installed after January 1, 2020*, implementation of:
  • ISO/IEC 15118
  • Open Charge Point Interface (OCPI)
    *Consistent with proposed SB 454 compliance timeframe for OCPI
• Validate proof of implementation
Increasing urgency for grid reliability (integration) and resiliency (independence)

LA's Heat Wave Left More Than 75,000 Without Power — And Broke An Electricity Use Record

BY RYAN FONSECA IN NEWS ON JULY 9, 2018 1:45 AM

Line crews with the Los Angeles Department of Water and Power, seen here atop a pole replacing a transformer on Sunday, July 8, 2018, work to restore power to thousands during the weekend's heat wave in the region. (Photo courtesy LADWP via Twitter)

https://laist.com/2018/07/09/las_heat_wave_left_more_than_50000_without_power_and_broke_an_electricity_use_record.php
Increasing urgency for grid reliability (integration) and resiliency (independence)

https://laist.com/2018/07/25/living_at_the_beach_no_longer_means_no_ac_needed.php
Increasing urgency for grid reliability (integration) and resiliency (independence)

Los Angeles County Cooling Degree Days in a Year

CalAdapt, https://cal-adapt.org/tools/degree-days
Increasing urgency for grid reliability (integration) and resiliency (independence)

Figure 1.7 Hourly load-weighted average marginal energy prices

Increasing urgency for grid reliability (integration) and resiliency (independence)
Increasing urgency for grid reliability (integration) and resiliency (independence)
Refined Goals

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

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

- **Cost Control.** EVs should assist in grid and renewables management, and reduce fuel costs for drivers who charge in a manner consistent with grid conditions.

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

1. US DOE/EU JRC EV-Smart Grid Interoperability Center
2. U.S. DOE EERE Public Plug-In Electric Vehicle Charging Infrastructure Guiding Principles
3. Public Utilities Code 740.12(g)
4. Public Utilities Code 740.2(e)
New Proposal for 2021+ Projects

Open, Standards-Based Network Communication

Aggregator (EVSP or OEM)

OCPI or OICP (Inter-network Billing)

OCPP 1.6, 2.0 & others (Equipment Management)

OpenADR 2.0b & SEP 2.0b (Demand & Price Signals)

 ISO/IEC 15118 (Vehicle-to-Grid Communication)

ENERGY STAR Certification
NRTL Safety Certification
DMS EVSE Regulations
SB 454 compliance, if applicable

SAE J1772 Conductive
AC Level 2, 6.2 kW+
DC Level 1 & 2, 6.2 kW+

DMS EVSE Regulations
SB 454 compliance, if applicable
New Proposal for 2021+ Projects

Open, Standards-Based Network Communication

Aggregator (EVSP or OEM)

OCPI or OICP (Inter-network Billing)

OCPP 1.6, 2.0 & others (Equipment Management)

OpenADR 2.0b & SEP 2.0b (Demand & Price Signals)

ENERGY STAR (Potential Add'l)
NRTL Safety Certification
DMS EVSE Regulations

ISO/IEC 15118 (Vehicle-to-Grid Communication)

SAE J2954 Wireless
AC up to 11 kW
New Proposal for 2021+ Projects

Direct Current Fast Charging

- OpenADR 2.0b & SEP 2.0b (Demand & Price Signals)
- OCPP 1.6, 2.0 & others (Equipment Management)
- ISO/IEC 15118 (Vehicle-to-Grid Communication)
- IEEE 2030.1.1 (CHAdeMO)
- ENERGY STAR (Final Pending)
- NRTL Safety Certification
- DMS EVSE Regulations
- SB 454 compliance
- SAE J1772 CCS, 50 kW+
- CHAdeMO, 50 kW+

Open, Standards-Based Network Communication

Aggregator (EVSP or OEM)

OCPI or OICP (Inter-network Billing)
CALeVIP Background and Current Equipment Requirements

Updated Proposal for Future Equipment Requirements

**Analysis of Equipment Hardware and Software Technology**

- Public Roundtable Discussion
  - Features Demanded and Product Supply Chain

- Proposed Timelines for Implementation

- Questions & Wrap Up
Nationally-Recognized Testing Laboratory Approval

**Competition and Customer Choice.** Equipment must meet applicable product safety standards, and be tested by an accredited Nationally-Recognized Testing Laboratory and certified to meet such standards.

<table>
<thead>
<tr>
<th>SAE J1772 Conductive</th>
<th>SAE J2954 Wireless</th>
<th>CCS &amp; CHAdeMO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Currently Required for Equipment Eligibility in CALeVIP</td>
<td>CEC will require NRTL approval for wireless EVSE.</td>
<td>Currently Required for Equipment Eligibility in CALeVIP</td>
</tr>
</tbody>
</table>
ENERGY STAR Certification

Cost Control. ENERGY STAR certified EV chargers on average use 40% less energy than a standard EV charger when the charger is in standby mode.

Competition and Customer Choice. ENERGY STAR chargers provide a well-recognized label to encourage customers to maximize their energy savings.

<table>
<thead>
<tr>
<th>SAE J1772 Conductive</th>
<th>SAE J2954 Wireless</th>
<th>CCS &amp; CHAdeMO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final Version 1.0</td>
<td>Test Method not yet developed.</td>
<td>Version 1.1 DC EVSE Final Draft Test Method</td>
</tr>
<tr>
<td>Currently Required for Equipment Eligibility in CALeVIP</td>
<td>CEC will consider a Requirement in CALeVIP if or when a Specification is developed.</td>
<td>CEC will require DCFC certification in CALeVIP pending EPA’s specified effective date of the specification in 2020.</td>
</tr>
</tbody>
</table>
ENERGY STAR®
Electric Vehicle Supply Equipment

November 18, 2019
ENERGY STAR Version 1.0 Specification Today

Scope:
✓ AC Level 1
✓ AC Level 2
✓ AC Dual Input L1/L2

Key Features:
1. Energy Savings, 40% in Standby Modes
2. Safety
3. Open Communications

Communications Details:
• Grid Communications
• Open Access
• Consumer Override

Photo by Dennis Schroeder, NREL 39251
ENERGY STAR Version 1.0 Charging Partners

solaredge
chargepoint
EVBox
ClipperCreek, Inc.
SemaConnect
BLINK
eMotorWerks
LiquidSky
Webasto
LITEON
ENERGY STAR Certification

Join ENERGY STAR

• Confirm you are eligible by reviewing the ‘ENERGY STAR Partner commitments and product specifications’
• Complete a Partnership Application and Participation Form and send the forms to join@energystar.gov
• Partners will be notified when the application is processed and receive information on next steps

Certify Products

• Products must be tested by an EPA-recognized Laboratory and then certified by an EPA-recognized Certification Body (CB). A list of currently recognized Labs and CBs, and their contact information, can be found:
  o On the EPA Recognized Bodies webpage. For Product Type, select “Other” and for Program, select “Electric Vehicle Supply Equipment.”

Become an ENERGY STAR Partner

• Once the CB certifies a product, it will automatically be uploaded to the ENERGY STAR Qualified Product List
  o Please allow 24 hours from time of certification for your products to appear on the Qualified Product List.
<table>
<thead>
<tr>
<th>Organization Name</th>
<th>Type of Recognized Body</th>
<th>Direct Contact Information</th>
<th>City</th>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bay Area Compliance Laboratories Corp. (BACL) Website</td>
<td>Certification Body</td>
<td>Wayne Chu, <a href="mailto:Wayne.Chu@baclcorp.com">Wayne.Chu@baclcorp.com</a></td>
<td>Sunnyvale</td>
<td>CA</td>
</tr>
<tr>
<td>Bay Area Compliance Laboratories Corp. (BACL) Website</td>
<td>Accredited Laboratory</td>
<td>Wayne Chu, <a href="mailto:Wayne.Chu@baclcorp.com">Wayne.Chu@baclcorp.com</a></td>
<td>Sunnyvale</td>
<td>CA</td>
</tr>
<tr>
<td>Curtis-Straus LLC, a Bureau Veritas Company Website</td>
<td>Certification Body</td>
<td>Scott Lambert, <a href="mailto:scott.lambert@us.bureauveritas.com">scott.lambert@us.bureauveritas.com</a>, 978-486-8880</td>
<td>Littleton</td>
<td>MA</td>
</tr>
<tr>
<td>Intertek Testing Services NA, Inc. Plymouth Township Website</td>
<td>Accredited Laboratory</td>
<td>Craig Davenport, <a href="mailto:craig.davenport@intertek.com">craig.davenport@intertek.com</a>, 607-758-6296</td>
<td>Plymouth Township</td>
<td>MI</td>
</tr>
<tr>
<td>Intertek Testing Services NA Website</td>
<td>Certification Body</td>
<td>Craig Davenport, <a href="mailto:craig.davenport@intertek.com">craig.davenport@intertek.com</a>, 607-758-6296</td>
<td>Arlington Heights</td>
<td>IL</td>
</tr>
<tr>
<td>MET Laboratories, Inc. Website</td>
<td>Certification Body</td>
<td>Jim Reed, <a href="mailto:Jim.Reed@metlabs.com">Jim.Reed@metlabs.com</a></td>
<td>Baltimore</td>
<td>MD</td>
</tr>
<tr>
<td>TUV SUD America, Inc. Website</td>
<td>Certification Body</td>
<td>Bryan Cubitt, <a href="mailto:bcubitt@tuvam.com">bcubitt@tuvam.com</a>, 678-341-5902</td>
<td>Peabody</td>
<td>MA</td>
</tr>
<tr>
<td>UL LLC. Website</td>
<td>Accredited Laboratory</td>
<td>David Piecuch, <a href="mailto:david.piecuch@ul.com">david.piecuch@ul.com</a>, 847-664-3760</td>
<td>Fremont</td>
<td>CA</td>
</tr>
<tr>
<td>UL Verification Services Inc. Website</td>
<td>Certification Body</td>
<td>David Piecuch, <a href="mailto:david.piecuch@ul.com">david.piecuch@ul.com</a>, 847-664-3760</td>
<td>Northbrook</td>
<td>IL</td>
</tr>
</tbody>
</table>
Rebranding

• If the partner can document a product is a privately labeled version of another model that is certified as ENERGY STAR, only one test report is required.
• Rebranded products may make use of laboratory reports that do not include the rebranded model information for purposes of certification, so long as the partner can demonstrate to the certification body through separate documentation that the products are identical other than model number.
Version 1.1 DC EVSE Test Method Activities

- **Goal of Version 1.1 is to include DC EVSE in scope**
  - Develop test method to measure energy efficiency
  - Collect data based on test method
  - Draft specification criteria to recognize most efficient products

- **Activities from launch until today:**
  - Released a Discussion Guide in May 2018, a Draft 1 Test Method in November 2018, a Draft 2 Test Method in June 2019, and a Final Draft in September 2019
    - Held 5 stakeholder webinars and numerous stakeholder discussions regarding proposals between May 2018 and now
    - EPA is now assembling data based on this Final Draft Test Method to inform a forthcoming specification
ENERGY STAR Version 1.1 Specification

• Key topics that will be addressed in the specification:
  • **Criteria to recognize energy efficiency in DC chargers:**
    ✓ Active charging % efficiency
    ✓ Minimizing heating and cooling
    ✓ Standby losses – display, lighting, network
  • **Allowances for features:** Will develop appropriate allowances for features based on data produced from the ENERGY STAR Test Method
Key Aspects of Final Draft Test Method - Scope

- EPA is proposing the following scope of what DC EVSE would be included in the Version 1.1:

<table>
<thead>
<tr>
<th>DC EVSE Output Power</th>
<th>≤ 65 kW</th>
<th>65 kW &lt; Output Power ≤ 350 kW</th>
<th>&gt; 350 kW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standby Mode Criteria</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>Operation Mode Criteria</td>
<td>✔️</td>
<td>Report efficiency, but no criteria</td>
<td></td>
</tr>
<tr>
<td>Network Connection Required</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
</tr>
</tbody>
</table>

- The relevant criteria will be determined in the specification development process based on data available and data produced.
Key Aspects of Final Draft Test Method – Temperature Conditions

- EPA is proposing to require testing in the following temperature climate conditions:
  - Cold, temperate, and hot conditions for Operation Mode
  - Temperate condition only for Standby Modes

<table>
<thead>
<tr>
<th>Type of Climate</th>
<th>Representative Temperature</th>
<th>Applicable Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cold</td>
<td>20°F or −7°C (± 5°F, ± 2.5°C)</td>
<td>Operation Mode</td>
</tr>
<tr>
<td>Temperate</td>
<td>68°F or 20°C (± 5°F, ± 2.5°C)</td>
<td>No Vehicle Mode, Partial On Mode, Idle Mode, and Operation Mode</td>
</tr>
<tr>
<td>Hot</td>
<td>104°F or 40°C (± 5°F, ± 2.5°C)</td>
<td>Operation Mode</td>
</tr>
</tbody>
</table>
Key Aspects of Final Draft Test Method – Test Procedures

Test in the following modes:

- Standby Modes (No Vehicle Mode, Partial On Mode, and Idle Mode)
- Operation Mode at the following loading conditions:

<table>
<thead>
<tr>
<th>Loading Condition</th>
<th>Test Condition</th>
<th>Example for 150 kW capable UUT</th>
<th>Example for 50 kW capable UUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loading Condition 1</td>
<td>25% of Maximum Available Output Power ± 2% and 350 V ± 7 V</td>
<td>37.5 kW</td>
<td>12.5 kW</td>
</tr>
<tr>
<td>Loading Condition 2</td>
<td>50% of Maximum Available Output Power ± 2% and 350 V ± 7 V</td>
<td>75 kW</td>
<td>25 kW</td>
</tr>
<tr>
<td>Loading Condition 3</td>
<td>75% of Maximum Available Output Power ± 2% and 350 V ± 7 V</td>
<td>112.5 kW</td>
<td>37.5 kW</td>
</tr>
<tr>
<td>Loading Condition 4</td>
<td>50 kW ± 1 kW and 350 V ± 7 V</td>
<td>50 kW</td>
<td>50 kW</td>
</tr>
<tr>
<td>Loading Condition 5</td>
<td>150 kW ± 3 kW and 350 V ± 7 V</td>
<td>150 kW</td>
<td>N/A</td>
</tr>
<tr>
<td>Loading Condition 6</td>
<td>100% Maximum Available Output Power (determined in Section 7.4.B), above) ± 2% and Voltage= mid-point of available output voltage range</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>
Updated Connected Functionality Criteria in V1.1

- Goal: more useful to utilities and grid operators
- Connected criteria will continue to be optional
- Aiming for more specific in order to be more useful
- Useful for long dwell time applications, (AC only? Small DC as well? Or only under a given kW limit? Or just advise on application?)
- Primary use case: schedule charging (through vehicle, charger, or cloud control of charger)
- Protocols: OCPP, SEP 2.0, OpenADR and CTA-2045 all relevant for DR messaging and requests

- Reporting for ISO 15118 capability, vehicle-to-grid capability, other capabilities?
- EPA will continue to require provision for consumer override of a DR event
Version 1.1 Next Steps

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discussion Guide Published and Webinar</td>
<td>May/June 2018</td>
</tr>
<tr>
<td>Test Method Working Session #1 and #2</td>
<td>August and September 2018</td>
</tr>
<tr>
<td>Draft 1 Test Method Published and Webinar</td>
<td>November 2018</td>
</tr>
<tr>
<td>Draft 2 Test Method Published</td>
<td>June 6, 2019</td>
</tr>
<tr>
<td>Draft 2 Test Method Webinar</td>
<td>June 25, 2019</td>
</tr>
<tr>
<td>Draft 2 Test Method Written Comments Due</td>
<td>July 8, 2019</td>
</tr>
<tr>
<td>Final Draft Test Method and Call for Data</td>
<td>September 12, 2019</td>
</tr>
<tr>
<td><strong>Data Assembly</strong></td>
<td><strong>September 2019 - Present</strong></td>
</tr>
<tr>
<td>Release Version 1.1 Draft 1 Specification and Final Test Method</td>
<td>Early 2020</td>
</tr>
<tr>
<td>Version 1.1 Effective Date</td>
<td>Summer 2020</td>
</tr>
</tbody>
</table>
How to Participate

• If you wish to be added to EPA’s stakeholder distribution list to receive test method/specification development updates, please email us at:
  • Emmy.Feldman@icf.com, or
  • EVSE@energystar.gov
• All information related to the Version 1.1 DC EVSE Test Method and Specification development process can be found at:
  https://www.energystar.gov/products/spec/electric_vehicle_supply_equipment_version_1_1_pd
SB 454 Open Access Act Compliance

**Convenience.** Choice of payment with credit card or mobile payment or both; Station location reported to Alternative Fuels Data Center; Enable Roaming.

**Cost Control.** Disclose fees associated with charging session and display cost of electricity (i.e. $/kWh or $/MJ) at the point of sale.

<table>
<thead>
<tr>
<th>SAE J1772 Conductive</th>
<th>SAE J2954 Wireless</th>
<th>CCS &amp; CHAdeMO</th>
</tr>
</thead>
<tbody>
<tr>
<td>EVSE Standards (Sept 4, 2019)</td>
<td>Regulation designed for connector-based EVSEs</td>
<td>EVSE Standards (Sept 4, 2019)</td>
</tr>
<tr>
<td>Payment Method requirements for Publicly Accessible EVSE* For new: July 1, 2023.</td>
<td></td>
<td>Payment Method requirements for Publicly Accessible EVSE* For new: January 1, 2022.</td>
</tr>
</tbody>
</table>

CDFA Division of Measurement Standards EVSE Regulations

**Competition and Customer Choice.** Accurate, EVSE-based measurement of electricity maintains integrity in the sale of *commercial* services for charging.

**Cost Control.** EVSEs with the ability to indicate energy and unit price of electricity delivered (or recorded) enables transparent site management.

<table>
<thead>
<tr>
<th>SAE J1772 Conductive</th>
<th>SAE J2954 Wireless</th>
<th>CCS &amp; CHAdeMO</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Proposed EV Fueling Systems Regulations (October 9, 2019)</strong></td>
<td>NIST HB 44 §3.40 defines EVSE to include wireless charge transfer Is this appropriate?</td>
<td>Proposed EV Fueling Systems Regulations (October 9, 2019)</td>
</tr>
<tr>
<td>CALeVIP requires access to 2 years of utilization data.</td>
<td>CEC will consider requiring access to 2 years of utilization data.</td>
<td>CALeVIP requires access to 5 years of utilization data.</td>
</tr>
<tr>
<td>Requirements for new AC EVSE: January 1, 2021 DC EVSE: January 1, 2023</td>
<td></td>
<td>Requirements for new DC EVSE: January 1, 2023</td>
</tr>
</tbody>
</table>

*For full requirements see CDFA/DMS EV Fueling Systems Regulation, https://www.cdfa.ca.gov/dms/regulations.html.*
DMS Load Test Tolerances and NIST “Trial” Terms to advance VGI

Load Test Tolerances

<table>
<thead>
<tr>
<th>Accuracy Class</th>
<th>Application or Commodity Being Measured</th>
<th>Acceptance Tolerance</th>
<th>Maintenance Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.0</td>
<td>AC electricity as a vehicle fuel</td>
<td>1.0 %</td>
<td>2.0 %</td>
</tr>
<tr>
<td>5.0</td>
<td>DC electricity as a vehicle fuel</td>
<td>2.5 %</td>
<td>5.0 %</td>
</tr>
<tr>
<td>2.0</td>
<td>DC electricity as a vehicle fuel</td>
<td>1.0 %</td>
<td>2.0 %</td>
</tr>
</tbody>
</table>

For installs prior to 1/1/33

For installs on/after 1/1/33

Which “experimental” or “trial” terms in §3.40 should be considered or adopted?

**Exceptions** A.2.(a) Utility AHJ-jurisdictional, A.2.(b) Wholesale electricity

- **S.2.4.3. Selection of Unit Price** for variable unit prices prior to delivery via a purchaser’s deliberate action (Note: 3 options) and approval prior to sale

- **S.3.1. Metrological Components** adequately protected from conditions detrimental to accuracy, by providing for a physical seal or audit trail
Open, Standards-Based Network Communication

> **Convenience.** Network communications allow service providers and site hosts to monitor the status of and upgrade the EVSEs, authenticate users, reserve charging sessions, dispatch energy delivery, and transfer payments in real time.

> **Competition and Customer Choice.** Open, non-proprietary communication protocols, which are often formally created by industry via standards-development organizations, allow for site host customers to minimize the risk of stranding assets or remaining “locked-in” with an individual EV service provider.

> **Cost Control.** EVSEs with network communications enable price-based usage control, site or utility tariff load management, and recovery of installation costs.

<table>
<thead>
<tr>
<th>(Independent of Charging Interface)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Currently equipment requirements for network interoperability are based on the ability to revert to an “open standard protocol”</td>
</tr>
<tr>
<td>Network protocols and architectures are designed fit for specific purposes.</td>
</tr>
</tbody>
</table>
Open, Standards-Based Network Communication

Open Standards, defined per EPA ENERGY STAR, include those

- within the Smart Grid Interoperability Panel (SGIP) Catalog of Standards
- within the NIST Smart Grid Framework
- adopted within American National Standards Institute (ANSI) or other well-established international standards organizations such as the International Organization for Standardization (ISO), International Electrotechnical Commission (IEC), International Telecommunication Union (ITU), Institute for Electrical and Electronics Engineers (IEEE), or Internet Engineering Task Force (IETF).

Consideration of de facto or formal standards development organizations (SDO)

<table>
<thead>
<tr>
<th>Example</th>
<th>Industry Specification</th>
<th>Formal SDO</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZigBee Alliance</td>
<td>Smart Energy Profile</td>
<td>IEEE 2030.5 (2013)</td>
</tr>
<tr>
<td>Open Charge Alliance</td>
<td>Open Charge Point Protocol</td>
<td>?</td>
</tr>
</tbody>
</table>

Adapted from VGI Communication Protocol Working Group Energy Division Staff Report, Table 4.
A modernized grid would likely have to accommodate new types of communications interfaces including new interfaces...

- For new entities
- Between subsystems
- For Legacy Systems

NIST New Smart Grid Interfaces Categories Assessment, Discussion Draft (2018)
Multiple viable uses of protocols, dependent on purpose and situation

- Utility Direct or Aggregator–managed load controls
- Presence of other EVSEs, non-EV loads, and/or an Energy Management System
- Transfer information across networks (direct btw. EVSPs or via clearing houses)
Open, Standards-Based Network Communication

Communication Functionality and Physical Layer

• Network Connectivity (one of the following)
  • IEEE 802.11n for high-bandwidth wireless networking
  • IEEE 802.3 for Ethernet for Local- or Wide- Area Network Applications
• Capable of remote software updates
• Real-time protocol translation, encryption, and decryption
  • Internet Protocol (IP)-based processor must support multiple protocols
  • Compliant with Transmission Control Protocol (TCP)/IP and IPv6

Each individual EVSE is required to be capable of open, standards-based network communication.

Should a specific protocol be required for purposes of minimizing the risk of stranding EVSE hardware?

Adapted from VGI Communication Protocol Working Group Energy Division Staff Report, Table 4.
ISO/IEC 15118 High-Level Communications

**Convenience.** ISO 15118 enables a PEV controller to “associate” with the EVSE controller. This allows for Signal-Level Attenuation Characterization, to avoid signal noise possible in arrays where multiple EVs and EVSEs can charge. The EV and EVSE pairing assists with automating transactions.

**Competition and Customer Choice.** Many automakers and EVSE manufacturers are currently deploying, or planning to deploy EV and EVSEs with these features, providing drivers additional options and services.

**Cost Control.** Automating the exchange of smart charging control data maximizes site demand reduction potential, while respecting driver needs.

<table>
<thead>
<tr>
<th>Requirement</th>
<th>SAE J1772 Conductive</th>
<th>SAE J2954 Wireless</th>
<th>Combined Charging Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>VGIWG Recommendation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Requirements for AC EVSE: TBD 2021.</td>
<td></td>
<td>CEC will consider</td>
<td>Requirements for CCS DCFC:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>requiring</td>
<td>TBD 2021.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>implementation</td>
<td></td>
</tr>
</tbody>
</table>
High-Level Communications (HLC) allow for driver authentication, automated transfer and renegotiation of transaction details, and information to coordinate smart charging between site hosts, EVSE networks, and drivers. Actuating the two-way controls requires a networked EVSE with an added HomePlug Green PHY transceiver chip. Most OEMs plan to use ISO 15118 or a variant for their upcoming products within the next 10 years.

Implementing a common, unique EV/EVSE communications protocol based on ISO 15118 for SAE J1772 is crucial for seamless charging interoperability to reduce EVSP network software costs and site hosts’ utility operational costs.

Innovative use cases will build upon improvements to ISO 15118 as it is planned to enable wireless charging (J2954) and EVs to be used DER (J3072).
Interoperability, equipment, network, and operational implications from permutations of EVs, designed with High-Level Communications (HLC) or Pulse Width Modulation (PWM) controls, using Electric Vehicle Supply Equipment (EVSE) that communicate either ISO/IEC 15118, SEP 2.0b, or both, for charging.

Select EV OEMs (potential penetration per % of total CA sales as of Q2 2019)

Potential penetration includes new car and light truck registrations per the California New Car Dealers Association California Auto Outlook.

Varied EV/EVSE HLC Protocols stifle the vision for interoperability and increase manufacturer and user costs.

(1) EVSE costs are approximations submitted by IoTecha to the 2017 VGI Working Group and are corroborated by CEC’s transceiver marginal cost analysis.

(2) 37% of automakers not pictured have either made confidential statements about or have not discussed their HLC communications protocol designs.
Conservatively, ISO 15118 enabling circuits cost <$10/unit at scale. Assuming that the Level 2 EVSE is networked, the transceiver marginal cost is about $1.5/unit.

Source: Energy Commission March 2019 analysis of supply equipment charge controllers and wholesale electronics suppliers.
With economies of scale production, including a transceiver adds de minimis upfront costs to a L2 EVSE (albeit excluding design, engineering, and software integration).

Using conservative assumptions for driver willingness to pay and higher-end component costs demonstrates net value for OEMs at volumes <1k units.

With any networked technology, cybersecurity should be ensured upon installation and addressed continuously to establish trusted charging systems. NIST states that most communications between EVSEs and EVs use the ISO/IEC 15118 standard, noting that cybersecurity for the standard is ongoing in development. NIST describes that:

- The use of Intrusion Detection Systems and Simple Network Management Protocol Management Information Base (IEC 62351-7) would be used to notify of possible attacks.
- Responses to attacks would likely require aborting communications. The EVSE may not continue to charge EVs, using local default charging conditions.
- EVSE and communication modules would be tested for malware and additional measures for preventing attacks would be added during recovery.


ISO/IEC 15118-20 defines 2nd generation network & application protocols.
Lunch Break
Begin at 1 PM
CALeVIP Background and Current Equipment Requirements

Updated Proposal for Future Equipment Requirements

Analysis of Equipment Hardware and Software Technology

Public Roundtable Discussion
  Features Demanded and Product Supply Chain

Proposed Timelines for Implementation

Questions & Wrap Up
Customer Charging Needs

- What are customers’ needs in the EV charging experience? What do customers like or want more of?

- What are drivers’ and site hosts’ biggest challenges or frustrations in charging?

- How are the issues common or different across locations (residential, workplace, public, and other charging)?

- How are drivers and site hosts managing the gaps between needs and frustrations? What solutions do they currently use to address their concerns?
What are the solutions for customers’ needs? What features are manufacturers planning for in their product roadmaps (detail: what, where, when)?

What are manufacturers doing to build chargers that accommodate future needs? What strategic investments are being made to lay the foundation necessary for long term value?

Do standards assist in manufacturers’ development and production of interoperable charging solutions? What solutions are being used for the following use cases: Level 2, conductive or wireless charging, AC or DC, fast charging (or others)?

How are vehicle manufacturers’ product commitments for California considered as part of broader marketing efforts, including on the scale of the international automotive market?
1. Ready / Compliant. EVSE engineered to a standard specification

2. Certification Test Specification established to verify specific performance

2. Certification Test Harness automates conformance tests, executes cases, and reporting

3. Certified. Determination that EVSE meets requirements, is labeled for public marketing

2. Interoperability Tests. Vendors convene to determine if systems interface as intended

Certification Regimes

1st Party: Manufacturer attests the EVSE meets the std. (Self-Certification)

2nd Party: User tests the EVSE to verify the EVSE meets the std.

3rd Party: Independent authority, test laboratory, and certification body

Increased Transparency

Increased Speed

Adapted from NIST
To what level of requirements should the Energy Commission hold EVSE manufacturers applying to qualify their equipment as eligible for CALeVIP?

What are EVSE manufacturers’ responses to the open items (?) posed?

What supply chain constraints should the CEC help manufacturers alleviate and how? (Amended terms, funds for R&D, testing, or manufacturing)?

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. “Ready” or “Compliant”</td>
<td></td>
<td>Compliance, as applicable</td>
<td>Compliance, as applicable</td>
<td>Individual Specification(s) Needed?</td>
<td>Term Needed? Version # Needed?</td>
<td></td>
</tr>
<tr>
<td>2. “Conformed” or “Interoperable”</td>
<td>Testing Laboratory Facilities?</td>
<td>As reported to ARB</td>
<td>Per the DMS Type Testing Procedures</td>
<td>Certification Procedures? Facilities?</td>
<td>Certification Procedures? Facilities?</td>
<td></td>
</tr>
<tr>
<td>3. “Certified”</td>
<td>Approval by NRTL Certification Body</td>
<td>As reported to ARB</td>
<td>Per Local AHJ Sealing Procedures</td>
<td>Labeling Procedure(s) ?</td>
<td>Labeling Procedure?</td>
<td></td>
</tr>
<tr>
<td>EVSE and EVSP Critical Path Items</td>
<td>Updated Testing Procedures for DCFCs?</td>
<td>Potential updates per ARB regulation</td>
<td>Alignment with CEC’s proposed “Trial” terms for submetering?</td>
<td>OpenADR 2.0b SEP 2.0b OCPP 1.6, 2.0 Others?</td>
<td>AC DC Wireless? ...V2V/V2H/V2G?</td>
<td></td>
</tr>
</tbody>
</table>
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Questions & Wrap Up
### Proposed Timelines for Implementation

Does your product roadmap currently have or plan to have the following features?

<table>
<thead>
<tr>
<th>Level 2 Manufacturers</th>
<th>ENERGY STAR</th>
<th>ISO 15118</th>
<th>OCPP 1.6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes or In Progress</td>
<td>14/14 (100%)</td>
<td>8/14 (57%)</td>
<td>14/14 (100%)</td>
</tr>
<tr>
<td>No</td>
<td>0/14 (0%)</td>
<td>6/14 (43%)</td>
<td>0/14 (100%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DCFC Manufacturers</th>
<th>ENERGY STAR</th>
<th>ISO 15118</th>
<th>OCPP 1.6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes or In Progress</td>
<td>7/8 (%)</td>
<td>5/8 (63%)</td>
<td>8/8 (100%)</td>
</tr>
<tr>
<td>No</td>
<td>1/8 (%)</td>
<td>3/8 (37%)</td>
<td>0/8 (0%)</td>
</tr>
</tbody>
</table>
### Proposed Timelines for Implementation

<table>
<thead>
<tr>
<th>2020 Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
<th>2021 Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
<th>2022 Q1</th>
<th>Q2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ENERGY STAR for DCFC</strong></td>
<td>Draft 1 Specification &amp; Final Test Method</td>
<td>V1.1 Effective</td>
<td></td>
<td>3rd PC Certification</td>
<td></td>
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<td></td>
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<tr>
<td><strong>OCPP 1.6</strong></td>
<td>Certification by OCA avail. Fall 2019</td>
<td>1st PC</td>
<td></td>
<td>3rd PC Certification</td>
<td></td>
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<tr>
<td><strong>CDFA DMS EVSE Regulations</strong></td>
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<td>AC EVSE 1/1/21</td>
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<tr>
<td><strong>CARB SB 454 Compliance</strong></td>
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<td></td>
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<td></td>
<td>DCFC 1/1/22</td>
<td></td>
</tr>
</tbody>
</table>

PC = Party Certification (see page 59)

Only EVSEs that meet the minimum requirements of CALeVIP will be eligible for funding.

EVSEs that are currently listed within the CALeVIP Eligible Equipment List will be removed if they do not meet the requirements by the proposed effective dates.
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Questions & Wrap Up
Please state your name and affiliation.
Written comments must be submitted to the Docket Unit by **5:00 p.m. on December 13, 2019**

The CEC encourages use of its electronic commenting system. Visit [https://efiling.energy.ca.gov/Ecomment/Ecomment.aspx?docketnumber=17-EVI-01](https://efiling.energy.ca.gov/Ecomment/Ecomment.aspx?docketnumber=17-EVI-01), which links to the comment page for this docket. Select or enter a proceeding to be taken to the “Add Comment” page. Comments may be included in the “Comment Text” box or attached in a downloadable, searchable Microsoft® Word (.doc, .docx) or Adobe® Acrobat® (.pdf) file. Maximum file size is 10 MB.

Written comments may also be submitted by email. Include the docket number 17-EVI-01 and Future Equipment Requirements for CALeVIP in the subject line and send to docket@energy.ca.gov.

If preferred, a paper copy may be submitted to:
California Energy Commission
Docket Unit, MS-4
Re: Docket No. 17-EVI-01
1516 Ninth Street
Sacramento, CA 95814-5512
Thank you

Brian Fauble

Brian.fauble@energy.ca.gov

Noel Crisostomo

Noel.crisostomo@energy.ca.gov