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Oxygen Initiative Comments on AB 2127

Additional submitted attachment is included below.



February 26, 2021

Oxygen Initiative EV Charging Infrastructure Assessment Comments

Background

Oxygen Initiative is committed to the accelerated adoption of zero-carbon technologies such as plug-in electric vehicles and has worked with the State of California to demonstrate technologies. As such, we express our appreciation for the staff and leadership of the California Energy Commission (CEC) and their work assembling a first-of-its-kind Assembly Bill (AB) 2127 Electric Vehicle Charging Infrastructure Assessment¹ and associated workshops held on February 4 and 5, 2021.

Our comments here pertain to Chapters 4, 5, 6, and 7 of the Assessment, and the materials presented on February 5 about the EVSE Deployment and Grid Evaluation Tool, Vehicle-Grid Integration, and Connector and Communications Standardization. Specifically, they build upon our comments² to the August 2020 Integrated Energy Policy Report workshop on AB 2127, which voiced concern that the Assessment might languish without the moral and technical clarity of what is needed for a revolution-scale adoption of electric vehicles. To reiterate our verbal comments from the workshop, February 5 was a red-letter day for the State of California. The Energy Commission's Assessment is demonstrating clear commitments to infrastructure at the required scale and with the essential capabilities to reduce transportation emissions and avert runaway climate change. The Assessment describes the indispensable components required to establish a homogenous 'plug-and-play' ecosystem of electric vehicles and charging equipment. The ISO/IEC 15118 standard will help California:

- Minimize the cost of transitioning to a 100% clean energy system that powers 100% electric car and truck sales by 2035, 100% electric drayage truck and off-road vehicle operations by 2035, and 100% electric medium and heavy-duty vehicle operations by 2045 – by maximizing grid-integrated charging, and simultaneously,

¹ <https://efiling.energy.ca.gov/getdocument.aspx?tn=236237> Referenced as “Assessment”

² <https://efiling.energy.ca.gov/GetDocument.aspx?tn=234517&DocumentContentId=67343>



- Mitigate impacts today from California's changed climate³ – including:
 - o power shutoffs resulting from aging transmission and distribution grids ill-prepared for wildfire,
 - o smoke-obscured sunlight unable to reach photovoltaic generators when California needs them most, and
 - o surges in local air pollutants from increased demand for gasoline and diesel back-up generators –with the aid of bi-directional vehicle chargers operable independently of the grid.

The recommendation to standardize EV infrastructure on the Combined Charging System (CCS) with the ISO 15118 communications standard for both DC Level 3 and AC Level 2 charging should unequivocally form the cornerstone of Commissioner Monahan's call for action on her "Three C's:"

- 1) To reduce the Cost of using electric vehicles,
- 2) To make charging broadly available and Convenient for everyone, and
- 3) To improve the Consumer awareness of the superiority of EVs over combustion vehicles.

Requiring the ISO 15118 standard for all of California's investments in charging infrastructure for **all vehicle modes and at all locations** (light duty vehicles at residences, workplaces, public stations, on road trips, in ride-hailing service, and for medium and heavy-duty vehicles) will:

- 1) Reduce the cost of electric vehicle and infrastructure roll-outs with smart charging, and eventually bidirectional vehicle-to-load (V2L), -home (V2H), -building (V2B), and -grid (V2G) applications,
- 2) Enable seamless "Plug & Charge" roaming simplicity for all drivers: from commuters to truck drivers and to autonomous fleet managers, and
- 3) Foster innovation and level the playing field across a growing ecosystem of new players of all sizes. These new players can compete on implementations that delight consumers with new applications that drive down costs and accelerate market uptake of EVs.

This requirement by the Energy Commission represents a strong signal to industry leaders globally. Along with the new Administration in Washington's push for trans-

³ <https://www.kqed.org/science/1972725/wildfire-smoke-could-be-the-main-way-californians-experience-climate-change>



portation electrification⁴ investments, California has positioned itself as a global hot-spot for innovation around this exciting space. As the world attempts to re-engineer two key pillars of the industrial economy, mobility and the power grid, this decision by the CEC reflects determination to ‘get it right the first time’ and enable fast adoption of EVs without reduced grid reliability. In fact, pairing a rising tide of variable sources of renewable energy (VRE) with a commensurate tide of flexible loads and storage in the form of electric vehicles has long been seen as the holy grail of the smart grid. That was always the ‘What.’ This CEC policy states emphatically ‘How.’

California’s commitment to a simple ‘plug and play’ world of smart vehicles connecting to a smart grid based on a common and unique standard says that California sees and acknowledges the global efforts and investments already made. It provides comfort to automakers of all brands investing in the technology that they can plan for the growth of this simple experience. Eventually, consumers will insist that it become ubiquitous.

The Assessment highlights several automaker and charging equipment efforts to implement ISO 15118 already. However, additional manufacturer commitments to the standard across a variety of charging applications should be noted.

- BMW Group: home, fleet, public, fast, and inductive⁵
- Ford Motor Company: V2L, V2H, V2B, V2G⁶
- Genesis and WiTricity: wireless⁷
- Hyundai Motor Company and Kia Motors Corporation: V2L⁸ and wireless⁹
- Nuvve with Bluebird¹⁰ and with Lion Electric¹¹: DC V2G for various MHDVs
- Proterra: DC V2G¹²

⁴ <https://www.kqed.org/science/1972525/california-environmental-officials-switch-to-offense-as-biden-takes-charge>

⁵ <https://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=6442454207>

⁶ Comments and presentation of Jacob Mathews at CEC Staff Workshop - Vehicle-to-Building (V2B) for Resilient Backup Power, January 25, 2021, <https://www.thedrive.com/news/39319/ford-f-150-hybrid-owners-in-texas-are-using-trucks-to-power-their-homes>

⁷ <https://carbuzz.com/news/new-electric-genesis-models-will-offer-wireless-charging>

⁸ <https://www.hyundai.com/worldwide/en/ioniq/ioniq5>

⁹ <https://uspto.report/patent/app/20190039465>

¹⁰ <https://nuvve.com/nuvve-and-blue-bird-announce-v2g-school-bus-offer/>

¹¹ <https://nuvve.com/nuvve-and-lion-electric-announce-v2g-collaboration/>

¹² <https://www.proterra.com/energy-services/charging-infrastructure/>



- Rhombus and IoTecha: AC and DC, Plug & Charge and V2G¹³
- Volkswagen Automotive Group: V2H and V2G¹⁴

Individually, these products represent years of focused investment to engineer, test, validate the function of ISO 15118 – and imminently – to commercialize. Collectively and cumulatively to 2030, deployments of ISO 15118 smart charging could be depicted as the “Alternative Future” in which residential nighttime charging finishes by the time drivers depart.¹⁵ As the Assessment accurately described, ISO 15118’s high-level communications permit charging to be more precisely tailored to individual drivers.¹⁶ This smarter charging can not only avoid peak demand stressing generators, but also leap-frog the risk of distribution voltage and power quality issues that will arise once electricity demands exceed the capabilities of manually-set solutions that cause “timer spikes” or, as will be detailed in the next section, inconvenience the driver.

Oxygen Initiative commends the Commission’s in-depth collaborations with researchers at the Department of Energy’s national labs and California’s universities, and California Public Utilities Commission and Air Resources Board staff to profile the load that utilities, installers, and aggregators must integrate with the grid to achieve California’s environmental goals. We look forward to the results of efforts to examine how the widespread use of bidirectional charging and “best fit” solutions like vehicle-to-vehicle, bidirectional, and automated charging may increase the flexibility of EV loads such that the state can maximize its VRE portfolio leading to 2045.

The CEC’s EDGE Model presentation, however, revealed a *blinking red light*: a large share of the IOUs’ circuits are currently, or will soon be, at risk of violating operational or safety limits.¹⁷ Although the data should be verified in coordination with CPUC, the widespread potential of overloading poses a clear challenge to achieving the state’s transportation and building electrification targets. In response, the Energy Commission must deploy smart charging systems to efficiently and flexibly accommodate EV loads **as soon as possible** to avoid possible delays in the installation of chargers, while the utilities workforce conducts necessary upgrades to the distribution grid and invests in

¹³ https://www.prweb.com/releases/iotecha_and_rhombus_energy_solutions_announce_partnership_to_enable_plug_and_charge_capable_end_to_end_vehicle_electrification_solutions/prweb17730301.htm

¹⁴ <https://www.volkswagen-newsroom.com/en/quick-easy-and-convenient-charging-solutions-at-volkswagen-6599/f-outlook-the-future-of-charging-6605>

¹⁵ <https://efiling.energy.ca.gov/getdocument.aspx?tn=236574> at page 25

¹⁶ Assessment at page 57

¹⁷ Assessment at page 48



transportation electrification programs. Utilities will serve as an important partner to enable widespread transportation electrification.

The Commission's Needs Assessment Confirms PIER and EPIC Research Findings: EV Charging Communications Must Be Standardized

The immediacy and variety of challenges described above impose compounding controls challenges throughout the grid: peak demand avoidance, renewables integration, local distribution capacity management or upgrade deferral. The need for VGI standards were illustrated in recent Commission research, *Residential Intelligent Energy Management Solution: Advanced Intelligence to Enable Integration of Distributed Energy Resources*.¹⁸ Oxygen Initiative provided the project support as an expert in EV charging “demand clearing house” technology, which offered a text message-based prompt that the driver was asked to input an estimate of their energy needs, or to override the management request to begin charging immediately. While with these user inputs it is possible to take advantage of lower-cost charging during the lowest-price hours ***through multiple trips and charge sessions*** (see Figure 43 below), expanding the control system to derive additional benefits for specific sites given their charge durations and departure times was not possible due to communication and signaling issues. Our Smart Home Study (SHS) concluded that this lack of communication is one of the major challenges to widespread vehicle-grid integration¹⁹:

Vehicle-Grid Integration Communications Should be Standardized

The SHS demonstrated a smart control system that could intelligently manage, and time electric vehicle loads in concert with:

1. Other home loads and on-site solar output
2. Location marginal pricing (LMP) signals from the day-ahead hourly CAISO

market

Our efforts could have been substantially improved with a common interoperability standard for vehicle-grid integration (VGI). As an example, when an EV owner connects to a charging station, two critical pieces of information are required to set up a grid-friendly charging plan:

1. Needed kWh for the vehicle
2. Planned departure time

¹⁸ Clint, John, Stephan Barsun, Kristin Larson et. al. 2020. Residential Intelligent Energy Management Solution: Advanced Intelligence to Enable Integration of Distributed Energy Resources. California Energy Commission. Publication Number: CEC-500-2020-057.

¹⁹ CEC-500-2020-057 at 85



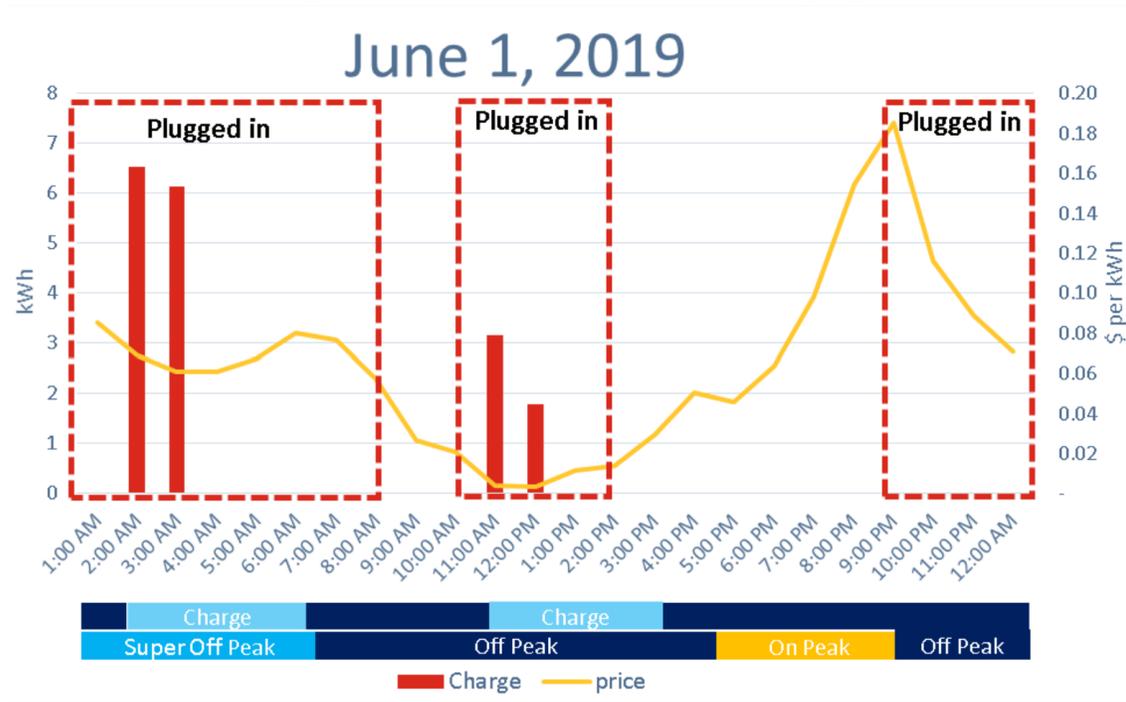
In CEC Docket 17-EVI-01, Energy Commission staff underscored this need in a presentation submitted on November 19, 2019, titled “CALeVIP Future Equipment Technology Workshop”²⁰

It follows, therefore, that distributed intelligence will be needed to automate grid-friendly charging. Consumers will benefit from a plug-and-play experience that ensures that their vehicle’s primary purpose, transportation, isn’t negatively impacted.

Communications standards are currently being considered by the Energy Commission that will:

1. Leverage EV loads and, eventually, EV batteries as a large virtual power plant capable of multiple grid support applications such as peak shifting and absorption of solar oversupply during midday.
2. Enable these aggregated DERs to be certified and dispatched by either the local utility or balancing authority.
3. Ensure reliability as the state moves to higher and higher RPS levels without excessive costs by leveraging the time flexibility of EV charging.

Figure 43: Example Phase 2 EV Charging



Source: Itron

²⁰ <https://www.energy.ca.gov/event/workshop/2019-11/staff-workshop-future-equipment-requirements-callevip>



This project's findings again bolster conclusions from PIER²¹ (summarized in our 2020 IEPR comments) and EPIC research²² upon ISO 15118 and punctuate the criticality of Staff's Assessment:

“Given that many global automakers and charging networks have already announced their intention to adopt ISO 15118 for vehicle-to-charger communications, CEC should prioritize deploying ISO 15118-ready charging hardware to ensure maximum preparedness for future vehicles and vehicle-grid integration features.”

While we agree, the Energy Commission must commit to building an ecosystem based on ISO 15118 in conjunction with back-office networking protocols like OCPP. The Grid-Integrated Charging Equipment Design Archetype²³ strikes the right balance that enables consumer confidence and simplicity along with virtually any grid support application that electric system operators may wish to dispatch now or in the future. Those applications include reverse power transfer from the vehicle battery to the home or grid.

Importantly, having ISO 15118 networked charging stations does not preclude the use of telematics. Instead, vehicles on the road today can use these stations to charge as normal.

To achieve California's goals, additional steps must be developed now:

- **Timeline for rolling out of new ISO 15118-based stations**
- **Incentives to replace existing legacy stations without ISO 15118. (Particularly in long-layover locations for AC Level 2 charging. IE, residential and workplace.)**

The Assessment correctly acknowledges the practical hurdles in designing, testing, and realizing leading-edge, open, and interoperable charging that is standardized cross

²¹ William V. Torre and Ryan Hanna, 2015. Cumulative Impacts of High Penetration of Electric Vehicle Charging and Photovoltaic Generation on Distribution Circuits. California Energy Commission. Public Interest Energy Research (PIER) Program Final Project Report, Contract 500-10-043. <http://solar.ucsd.edu/c/wp-content/uploads/2016/04/Report-on-High-Pen-of-EVs-and-PVs-Task-52-final.pdf>

²² Patadia, Shana.; Rodine, Craig (ChargePoint). 2019. Next-Generation Grid Communications for Residential PEV. California Energy Commission. Publication Number: CEC-500-2019-009
Giubolini, Luigi. 2020. Grid Communication Interface for Smart Electric Vehicle Services. California Energy Commission. Publication Number: CEC-500-2020-028.

²³ Assessment Figure 21 at 60



many automakers and electrical original equipment manufacturers (OEMs). Unlike proprietary standards, CCS requires many OEMs to collaborate upon standardization and compete in implementation for the benefit of the whole ecosystem. The Assessment describes the tension inherent with this dynamic and reasonably describes actions that government could take to promote private investment²⁴:

“The public may need to invest to solve industrywide constraints, particularly in areas such as interoperability and functional testing capacity so that first-mover companies do not have to bear disproportionate startup costs. Investments that enable growth among multiple equipment manufacturers or EVSPs in the state and beyond can confirm to investors that the opportunity extends to a broader achievement of nationwide and global ZEV targets beyond a niche in the California market.”

The CEC can facilitate a massive deployment of future-proof stations capable of supporting California’s needs now and down the road. Oxygen Initiative applauds the CEC’s recent collaboration with CharIN on the Megawatt Charging System²⁵ and the forthcoming efforts in charging interoperability testing²⁶ and subsequent equipment certification.²⁷ These investments will provide essential help to small companies, and can help develop the new skilled workers that they will need to build their businesses in California. Time is of the essence and the CEC should continue its close coordination with the automakers to support the evolution of CCS, including the forthcoming ISO 15118-20 standard, design implementations, and CCS Testing Specification.²⁸

Without declaring when new stations will be required to have ISO 15118 hardware built-in, the CEC risks:

- Wasted investments in stranded, non-upgradeable, less functional equipment

²⁴ Assessment at 81

²⁵ <https://www.charinev.org/news/news-detail-2018/news/the-charin-path-to-megawatt-charging-mcs-successful-connector-test-event-at-nrel/>

²⁶ <https://www.energy.ca.gov/event/workshop/2021-01/staff-solicitation-scoping-workshop-draft-concept-interoperability-testing>

²⁷ <https://www.energy.ca.gov/event/workshop/2020-05/staff-solicitation-scoping-workshop-pre-solicitation-concept-vehicle-grid>

²⁸ https://www.iec.ch/dyn/www/f?p=103:52:0:::FSP_ORG_ID,FSP_DOC_ID,FSP_DOC_PIECE_ID:1255,1013875,322555
<https://www.charinev.org/li-notes/>
<https://efiling.energy.ca.gov/GetDocument.aspx?tn=231196&DocumentContentId=62842>



- Adverse impacts on electric system reliability
- Delaying automaker investments in new pricing innovations for e-fuel
- Slower market uptake of EVs

Beyond this, CEC should establish a statewide plan, in coordination with CPUC and its utility investments in transportation electrification, to manage the replacement of existing stations without ISO 15118 to maximize the potential for VRE integration and consumer simplicity. Future Assessments should examine how the state might invest in replacing stations to accelerate the achievement of State goals.

Conclusion

Oxygen Initiative appreciates and compliments the CEC staff's groundbreaking efforts: from funding detailed technical analyses to world-leading demonstration programs to create a simple charging ecosystem for our zero-carbon future. Additionally, we applaud Commissioner Monahan's vision and desire for decisive action to break the dysfunctional decade-long stalemate on the standards discussion. Oxygen Initiative is eager to assist with the Energy Commission's efforts to establish California as a global leader in using customer simplicity to accelerate EV adoption and support more VRE.

In our comments above, we've laid out the '**What?**' (using the smart grid to combine renewables and vehicles), the '**How?**' (leveraging global communications standards). To conclude, we offer the most important '**Why?**':

For years now, as warnings from our natural world grew more ominous, scientists and global tech leaders have told us that the fight against climate change will require energy miracles. Creating vast amounts of energy storage is at the top of the list of miracles needed. Integrating electric vehicles with the smart grid using enabling communications represents the extraordinary opportunity to make one of these miracles a reality. We have no time to waste.



Signed,

A handwritten signature in black ink, appearing to read "Stephen G. Davis". The signature is fluid and cursive, with a long horizontal stroke at the end.

Stephen G. Davis
Founder, Oxygen Initiative