



January 16, 2024

Honorable Chairman Liane M. Randolph and
Honorable Board Members California Air Resources Board
1001 I Street
P.O. Box 2815
Sacramento, CA 95812

Submitted electronically via public Comment Log for Advanced Clean Cars II Amendments -
November Workshop:
(<https://ww2.arb.ca.gov/public-comments/comment-log-advanced-clean-cars-ii-amendments-november-workshop>)

RE: ZEV Assurance Measures for Bidirectional Charging

Dear Chair Randolph and Honorable Board Members:

Fermata Energy is pleased to provide comments in response to the November 15, 2023 Advanced Clean Cars II Amendments Kick-Off Workshop. Fermata Energy's comments focus on the initial concepts presented for Zero Emission Vehicles ("ZEV") Assurance Measures by the California Air Resources Board ("CARB") staff at the workshop.

Founded in 2010, Fermata Energy is a leading Vehicle-to-Everything ("V2X") bidirectional charging services provider. Fermata Energy designs, supplies, and operates the technologies required to integrate electric vehicles ("EVs") into homes, buildings, and the electric grid. Fermata Energy's V2X platform incorporates CHAdeMO and CCS connectors in a bidirectional charger and management software platform that connects the EV and electricity user to the grid. Fermata Energy's V2X platform extends the value of an EV and allows the vehicle to act as a dispatchable energy storage resource when the vehicle is not in use.

Fermata Energy's customers today are earning thousands of dollars per EV and EVSE pair through Vehicle-to-Grid ("V2G") and Vehicle-to-Building ("V2B") programs nationwide. The company's bidirectional EV charging system is the first to be certified By UL Solutions in North America to UL 9741, the Standard for Bidirectional EV Charging System Equipment and is the first to earn approval in the U.S. from a major OEM for battery warranty.

In addition to developing the hardware and software required to perform V2X activities, Fermata Energy has spent over 10 years studying how V2X can unlock additional value streams from EVs, including those that are commercially viable today without regulatory intervention and how to best monetize these value streams. Fermata Energy has extensive experience with

analyzing use cases, monetization mechanisms, and business models to maximize the benefits of V2X technologies. Vehicle Grid integration (“VGI”) encompasses both V1G (smart and managed charging solutions) and V2X (bidirectional power transfer to the grid, building, home, microgrid, or any other external load source). While V1G enables EVs to participate in off-peak charging programs and provide automated load management, V2X unlocks additional value streams and benefits for ratepayers and the grid by enabling the discharge of power stored onboard an EV. V2X unlocks the value of EVs to provide all of the services that that V1G does, in addition to backup power/resilience, demand charge management, demand response, system-wide peak shaving, and ancillary services, among others.

The interest in V2X commercialization is widespread and accelerating. In addition to the launch of the Ford Lightning (EV F150 pickup truck) V2H offering, 2023 saw several EV manufacturers announce plans to make their EVs bidirectional.¹ Furthermore, several electric vehicle supply equipment (“EVSE”) manufacturers announced plans to bring bidirectional chargers to market, expanding the limited number of bidirectional chargers that are available today.² The ACC II amendments are timely and offer an opportunity for CARB to ensure that manufacturers’ bidirectional EVs meet basic interoperability standards for bidirectional charging and demonstrate these capabilities through assurance testing.

Fermata Energy appreciates the opportunity to provide input to CARB based on the scope identified during CARB’s November ACC II Amendments Kick-Off Workshop.³

- **Most relevant sections of referenced standards that should be adopted or avoided**

CARB staff identified existing standards beyond SAE J1772 that are under consideration for conformance testing by CARB including: ISO 15118-20; ISO 15118-2, and DIN 70121. Fermata Energy recommends that CARB specifically includes in the interoperability testing process an evaluation of the full range of functions in the listed standards, specifically with respect to bidirectional power transfer (V2G) communications functions in each of the standards listed. In addition, the communications requirements for V2G-AC as identified in SAE J3072 should be included as an evaluated communications standard. The onboard charger (“OBC”) requirements for V2G-AC should be included in the evaluated interoperability space to the extent vehicle OEMs provide bidirectional OBC capability.

¹ See Automotive News, GM to offer bidirectional charging on all EVs by 2026 available at <https://www.autonews.com/mobility-report/gm-evs-have-bidirectional-charging-technology-2026> and CleanTechnica, Tesla Plans To Adopt Bi-Directional Charging By 2025 available at <https://cleantechnica.com/2023/08/19/tesla-plans-to-adopt-bi-directional-charging-by-2025/>.

² See electrek, Wallbox and Kia team up to try and bring bidirectional charging capabilities to EV9 owners available at <https://electrek.co/2023/08/25/wallbox-kia-bidirectional-charging-capabilities-ev9-owners-home/> and

³ See Slides #43, #45, and #47 of Advanced Clean Cars II Amendments Kick-Off Workshop November 15, 2023 presentation available at https://ww2.arb.ca.gov/sites/default/files/2023-11/2023_11_15_ACC%20II%20Amends%20Workshop%20slides_A DA.pdf.

- **Other relevant vehicle standards to add to this list**

As referenced above, given the growing importance of bidirectional charging, Fermata Energy recommends that CARB address the following additional interoperability standards for bidirectional charging that are either currently available or under development. These relevant standards differ based on V2G direct current (“V2G-DC”) where a DC bidirectional EVSE converts DC power from the EV battery to alternating current (“AC”) power versus V2G-AC whereby DC-to-AC power conversion is performed by an onboard bidirectional charger and is sent to a building or to the grid through an AC bidirectional EVSE. The relevant standards for bidirectional charging interoperability includes the following:

- V2G-DC
 - EV-EVSE Communications
 - DIN 70121 with negative current
 - ISO 15118-2 DIS
 - ISO 15118-20 BPT
 - EVSE specific standards
 - Safety and interoperability:
 - UL 1741-SB implementing IEEE 1547-2018
 - UL 9741 for EV power export
 - UL 2231 for personnel protection
 - UL 1998 for functional safety
 - UL 2202 for DC EV chargers
 - Network-side Communications:
 - Per IEEE 1547-2018 – IEEE 2030.5, IEEE 1815 (DNP3), SunSpec Modbus
 - Per Open Charge Alliance: OCPP v1.6J or v2.0.1 (v2.1 when available)
- V2G-AC
 - EV
 - Onboard converter build standard: SAE J3072
 - EV-EVSE communications:
 - IEEE 2030.5 with Sunspec V2G-AC Profile
 - Sunspec Modbus
 - SAE J3068/1 and /2
 - ISO 15118-20 addendum for AC-BPT-DER when available
 - EVSE specific standards
 - Safety and interoperability:

- UL 1741-SC when available (still in development)
- UL 9741 for EV power export
- UL 2231 for personnel protection
- UL 1998 for functional safety
- UL 2594 for AC EV chargers
- Network-side Communications:
 - Per IEEE 1547-2018 – IEEE 2030.5, IEEE 1815 (DNP3), SunSpec Modbus
 - Per Open Charge Alliance: OCPP v1.6J or v2.0.1 (v2.1 when available)

Connectors: Note that the emergence of the North American Charging Standard (“NACS”) connector (now designated as the SAE J3400 connector), while consequential in terms of the mechanical interface between EV and EVSE, does not significantly impact the landscape for communications standards between EVs and EVSEs. The SAE J3400 TIR has designated ISO 15118-2 as the primary communications schema for communications while maintaining support for other standards as well. Going forward, it is expected that the J3400 connector and vehicle inlets will be able to implement a variety of communications standards effectively. However: regardless of the communication standard used, the interoperability of EVs and EVSEs will rely on verifiable interoperability testing and compliance certification for both EV and EVSE. This applies to both standard charging, advanced “value added services” charging such as “Plug-n-Charge”, and for bidirectional (V2X) charging methods.

- **Where the most charging event failures are happening on vehicles, and**

While bidirectional charging is nascent in California today, it is widely understood that V2G can offer significant value to customers and the grid. A study by the Electric Power Research Institute (“EPRI”) found that V2G could save \$1 billion annually for California ratepayers.⁴ California is moving towards mandating OCPP and ISO 15118 for charging network operators (“CNO”)- for network-side (EVSE) and EV-side (EVSE-EV) communications.⁵ This creates a potentially complex environment with OCPP/ISO standards managing charging sessions and SAE/IEEE/UL standards managing V2G discharge sessions. CARB has an opportunity to advance bidirectional charging interoperability through the ACC II amendment process.

⁴ See EPRI Journal, Vehicle-to-Grid: \$1 Billion in Annual Grid Benefits? available at <https://eprijournal.com/vehicle-to-grid-1-billion-in-annual-grid-benefits/>.

⁵ This occurs through California Energy Commission Grant Funding Opportunities (“GFO”) that stipulate eligibility requirements including requiring OCPP and ISO 15118. See GFO-22-609 - Responsive, Easy Charging Products with Dynamic Signals (REDWDS) Section B. Project Requirements, page 12 available at https://www.energy.ca.gov/sites/default/files/2023-07/00_GFO-22-609_CTP_Application_Manual_Addendum3_a.docx.

- **Key performance indicators that could be considered on a new ZEV label**

EV manufacturers are already making claims about the bidirectional capabilities of their EVs.⁶ We encourage CARB to consider ways in which vehicle labeling can help consumers better understand the bidirectional capabilities that the OEM is claiming their EVs have and the use cases that their EVs can support. At the most basic-level, bidirectional charging could refer to vehicle-to-load (“V2L”), whereby the vehicle could power an isolated electrical appliance. Ford’s electric F-150 Lightning offers vehicle-to-home (“V2H”) capabilities, but does not have the ability to send power from the EV to the grid (V2G) and only operates when the larger grid is down.⁷ Accurate labeling that specifies the bidirectional charging capabilities of a given EV is necessary to ensure consumers have clear expectations of how they will be able to use the bidirectional functionality of their EV.

Fermata Energy recommends that CARB add a bonus credit for bidirectional vehicles that demonstrate conformance with the emerging bidirectional charging standards listed above. When parked, bidirectional vehicles offer the opportunity to create additional emissions benefits when used to store renewable energy that would otherwise be curtailed due to excess generation or grid congestion. Fermata Energy urges CARB to issue a resolution accompanying the Advanced Clean Cars II amendments that directs staff to conduct an analysis of what additional steps the Board can take by regulation or incentives to accelerate V2X adoption in both the light-duty and medium- and heavy-duty vehicle categories.

Fermata Energy appreciates the opportunity to provide these comments in response to CARB’s November 15, 2023 Advanced Clean Cars II Amendments Kick-Off Workshop. We look forward to collaborating with CARB as they finalize the proposed amendments to ACC II.

Respectfully submitted,

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⁶ For example, see dcbel, New year, new bidirectional cars: 2024 edition available at <https://www.ford.com/trucks/f150/f150-lightning/features/intelligent-backup-power/> and Hyundai Newsroom, How bidirectional charging can power your world available at <https://www.hyundai.news/eu/articles/stories/how-bidirectional-charging-can-power-your-world.html>.

⁷ See Ford Motor Company, Ford Intelligent Backup Power available at <https://www.ford.com/trucks/f150/f150-lightning/features/intelligent-backup-power/>.