

DOCKETED

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Fermata Energy comments on 19-AB-2127 V2G Inverter List

Additional submitted attachment is included below.

May 31, 2022

Fermata Energy Comments on the 19-AB-2127 Vehicle-to-Grid Inverter List

Fermata Energy appreciates the opportunity to provide comments on the California Energy Commission (CEC) 19-AB-2127 Vehicle-to-Grid (V2G) Inverter list discussion.

Fermata Energy is a leading provider of vehicle-to-everything (V2X) technology that enables V2G and vehicle-to-building (V2B) services. Our V2X technology benefits our users, transforming EV charging from a cost center to a revenue-generating, grid-supporting asset. Fermata Energy is the only company today providing commercial V2X services at multiple sites across the US using light duty vehicles. On average, the monthly electricity bill savings from these deployments are equivalent to the monthly EV lease payment. We have active V2X systems with the City of Boulder (Colorado), Green Mountain Power (Vermont), Roanoke Electric Cooperative (North Carolina), Verizon Newlab 5G Studio (New York), Burrillville Wastewater Treatment Facility (Rhode Island), and the Alliance Center (Colorado). Other customers include unannounced utility customers in Texas, Florida, and California, and several commercial V2B demand charge management, utility demand response, and V2B car share pilots with private partners. Fermata Energy has the first commercially available, UL-certified offboard V2G direct current (DC) electric vehicle (EV) charger for light-duty EVs. Based on our experience as a hardware and software provider that has deployed multiple V2X projects across the country with utility and commercial partners, we are pleased to provide our comments on the V2G inverter list technical requirements on.

Our comments focus on the questions posed by CEC Staff during the V2G Inverter List Workshop on May 17, 2022. We draw upon our experience working with customers throughout the U.S. to interconnect and operate our V2X systems. Alongside stationary storage, V2G will enable California to consistently run on 100% renewable electricity. The California Independent System Operator (CAISO) reported that the state ran on 100% renewable generation at 2:45 PM on April 30, 2022. Batteries, including those on-board EVs, will contribute to California regularly operating on 100% renewable generation. Standardizing and defining technical interconnection requirements, as the CEC is doing in seeking feedback on a V2G inverter list, is the starting point to ensuring the development of a safe interoperable electricity infrastructure. Our comments below build upon our comments provided during the May 17, 2022 workshop, with additional detail and context.

Question 1. Which certifications should the V2G Inverter List track at launch? Underwriters Laboratories (UL) standards UL 1741, UL 1741-SA, UL1741-SB, or a combination thereof?

We recommend the CEC clarify the purpose(s) of the V2G Inverter List, which will clarify the required certifications. Our comments regarding which certifications should be required focus on the interconnection requirements under CA Rule 21. The CEC listings for solar and energy storage inverters appear to go beyond strictly the CA Rule 21 requirements to include

certifications that establish eligibility criteria, conditions for incentives, and rating standards for ratepayer-funded incentive programs such as those administered by the CEC, the California Public Utilities Commission, and local publicly owned electric utilities. In regard to required certifications for interconnection. We recommend the V2G Inverter List track UL9741¹ for bidirectional EV charging system equipment and the complete UL1741 standard family that addresses grid interconnection compliance (UL1741, UL1741-SA, UL1741-SB). Tracking the complete UL1741 standard family will enable more V2G options for California drivers. UL1741 and UL1741-SA V2G inverters are commercially available today. The Interstate Renewable Energy Council (IREC) survey of inverter manufacturers and Nationally Recognized Testing Laboratories (NRTL) certification capabilities show that a majority of inverter models will not be certified to UL1741-SB until 2023. While the industry develops UL1741-SB compliant V2G inverters, California drivers will benefit from having continued access to UL1741 and UL1741-SA V2G inverters. Moreover, enabling continued access to UL1741 and UL1741-SA V2G inverters is consistent with the Emergency Load Reduction Program (ELRP), which allows V2G devices with inverters certified to UL1741 to participate in the program.

Question 2. To what extent should the V2G Inverter List attempt to accommodate onboard inverters (AC V2G) at launch, versus focusing on offboard inverters (DC V2G)?

Fermata Energy recommends that the CEC take a technology agnostic approach that considers future technological developments, to maximize V2G technology options for California drivers. A technology agnostic approach includes the CEC supporting all connector standards: Combined Charging System (CCS) per SAE J1772, CHArge de MOve (CHAdeMO), and others as they emerge.

We recommend that the CEC maintain the V2G Inverter List in a consistent fashion to the solar and energy storage inverter lists and the requirements on DC V2G EVSEs by clearly identifying the certifying agency and certification date of any claimed safety certifications. Existing inverters on the CEC inverter list are required to list this information to ensure grid safety and performance.

For AC V2G systems that are built to SAE J3072 for integration to UL 1741-SC certified bidirectional EVSEs, the certification pathway is proposed, per J3072, to be via vehicle manufacturer self certification. We believe that the CEC should clearly identify where self certification is used for compliance to IEEE 1547 interconnection requirements. The need for identifying the certification entity and certification date is not limited to onboard inverters that utilize SAE J3072. For AC V2G systems that do not utilize the SAE J3072 + UL 1741-SC EVSE path, then the onboard inverter listing will need to call out the power export device that is paired with the onboard inverter and should list the UL 9741 certification entity and date for the EVPE device.

¹ UL 9741, Outline of Investigation for Electric Vehicle Power Export Equipment (EVPE), Issue Number: 2, May 21, 2021

Question 3. Should the V2G Inverter List track the model numbers of chargers that contain inverters, or the model numbers of the inverters themselves? If the former, how would the list accommodate onboard inverters? If the latter, how would a charger manufacturer prove that a listed inverter is indeed used in a particular charger model?

Fermata Energy advises that for offboard bidirectional EVSEs the CEC should track the model number of the EVSE that contains the bidirectional power conversion equipment (i.e. “inverter”). For AC V2G applications where the inverter is onboard the vehicle, we recommend tracking the inverter system model number. SAE J3072 specifies the inverter system model (ISM) as a unique 32-character string assigned by the vehicle manufacturer to each non-interchangeable configuration of the core inverter system, which is approved by the vehicle manufacturer for use within one of their vehicle models. Vehicles with onboard inverters that are not SAE J3072 certified will need to be certified for power export to a UL 9741 power export unit. In that case Fermata recommends the CEC list both the onboard inverter system model and the associated UL 9741 certified power export device.

Question 4. Should any parameters besides UL certification be tracked as part of the V2G Inverter List? For example, connector type, communication standards, and so on?

Fermata Energy advises the CEC to be consistent with Senate Bill 1 (Murray, Chapter 132, Statutes of 2006) that directed the CEC to create the solar inverter list to ensure solar equipment meets minimum safety and performance standards. In this spirit, the CEC should track parameters that are relevant to ensuring V2G inverters meet minimum safety and performance standards. In addition to the parameters the CEC has identified (connector type and communication protocol) we advise the CEC to engage with the Smart Inverter Working Group (SIWG) to develop cybersecurity parameters to track. V2G systems need to be compliant with emerging standards for cyber security performance, including immunity from “man in the middle” attacks and other demonstrated vulnerabilities². In April 2022, European researchers uncovered the “Brokenwire” hack that interferes with CCS communications, disrupting control communications between the vehicle and EVSE from as far away as 50 yards.³ The SIWG is currently leading its Phase 2 effort to develop communications and cybersecurity recommendations for smart inverters. SIWG will begin its Phase 3 effort shortly, which may be an opportunity to define cybersecurity parameters for bidirectional charging undertaken with CCS connectors and communications.

Next Steps

Fermata Energy appreciates the opportunity to provide input on the CEC’s questions as posed in the Workshop on May 17, 2022. As discussed in our response to Question 1, should the CEC further define the purpose(s) of the V2G Inverter List we will be pleased to provide additional input on certifications that should be required beyond UL9741 and the UL1741 standard family. We welcome the opportunity to share our experience in designing, deploying, and operating

² Bao, Kaibin et al. “A threat analysis of the vehicle-to-grid charging protocol ISO 15118.” *Computer Science - Research and Development* 33 (2017): 3-12.

³ The Hacker News. “Brokenwire Hack Could Let Remote Attackers Disrupt Charging for Electric Vehicles.” April 4, 2022. Website.

<https://thehackernews.com/2022/04/brokenwire-hack-could-let-remote.html>



V2X projects for our customers across the U.S. and beyond. Fermata Energy would be pleased to provide the CEC with additional detail on technical considerations for the proposed V2G inverter list. I may be contacted to arrange a conversation.

Best,

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