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**Comments of Nuvve Corporation on the Inaugural Assembly Bill  
(AB) 2127 Electric Vehicle Charging Infrastructure Assessment**

*Additional submitted attachment is included below.*

**Comments of Nuvve Corporation on the Inaugural Assembly Bill  
(AB) 2127 Electric Vehicle Charging Infrastructure Assessment –  
Staff Report (Docket Number 19-AB-2127)**

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Nuvve is a San Diego-based technology and services company operating in the U.S. and internationally whose bi-directional vehicle-to-grid (V2G) technology transforms electric vehicles (EVs) into grid resources when those vehicles are plugged in, while guaranteeing the expected level of charge at the time the driver needs it for transportation. These benefits can be realized across all types of EVs including light-duty vehicles (both battery-only and plug-in hybrids) and medium to heavy duty vehicles, such as school buses and other short haul fleets while integrating stationary batteries and demand response resources. While Nuvve is an industry leader in bi-directional technologies, we work in a variety of areas relevant to the broader Vehicle-Grid Integration (VGI) effort in California and around the world.

We appreciate the opportunity to comment.

### **Contextualizing the Draft AB 2127 Assessment**

The size of the transportation electrification task before the state of California, known as one of the world's largest economies and as a bellwether for automotive and energy technology trends, is even more daunting when one stops to consider that transportation electrification is not, in itself, the end goal. Rather, we are seeking to lead the global effort to address climate change, and transportation electrification is merely one element of the much larger task of decarbonization. Reframing the task in this way should highlight the urgency of it.

The AB 2127 Assessment is one tool to point the direction we need to go and to measure our progress toward transportation electrification and climate-related goals. This draft assessment confirms what other agencies have indicated: We are behind. California cannot indulge in another ten or twenty years of considering principles and piloting to determine the one correct path to a decarbonized future. The AB 2127 Assessment, the IEPR, the VGI Working Group, all tell us the direction we need to go. We need to move as quickly as possible.

## **New Technology and Pilots<sup>1</sup> and Aligning Charging with Renewable Generation<sup>2</sup>**

Nuvve agrees with the CEC's position that pilots must lead to commercial outcomes. As Nuvve previously noted in comments on the CEC's draft concept document BESTFIT program<sup>3</sup>, many of the technologies that come together to constitute "Vehicle-Grid Integration" have been piloted elsewhere before, or in fact have already been rolled out commercially in other jurisdictions. Pilots that require time and resources of both the state and private stakeholders for implementations that are merely novel to California must be devoted to building on existing progress rather than reinventing the wheel. In 2021, new TE and VGI pilots cannot result in unread reports, but rather must serve as springboards to commercial roll out in timeframes that contribute to California's fast-approaching climate and EV penetration milestones. Pilots should generate outputs that indicate how markets and system planning practices need to flex and adjust to allow industry to move ahead in the absence of consistent technical standards to show the way for more permanent changes. CPUC and CEC pilots should be driven by and contribute to outcomes the agencies as regulators want to see, not stove piped proofs of concept that can potentially stagnate progress of emerging technologies rather than pushing them forward.

An Example: California has mandates related to both solar and EVs that, as we understand it, are in no way connected or even coordinated with one another.<sup>4</sup> The Draft AB 2127 Assessment notes that multiple EV segments can charge when solar resources are generating. The INVENT project has already demonstrated that both uni-directional and bi-directional EVs can dynamically coordinate with co-sited solar output as irradiance grows and then wanes over the course of the day, but found lack of intent in rate design to encourage this service. *We do not need another study on the basic relationship between solar pv and EVs.* Any pilot that explores "EV Plus Solar VGI" should build on these results, exploring how best to structure utility rates to incentivize customers, how EV rates and Net Energy Metering (NEM) rates can be combined or harmonized, and how co-sited EV- Plus Solar combinations compare to system-level

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<sup>1</sup> Draft AB 2127 Assessment, p 86

<sup>2</sup> Draft AB 2127 Assessment, p 92

<sup>3</sup> Nuvve comments on BESTFIT Innovative Charging Solutions Docket Number 19-TRAN-02

<sup>4</sup> Draft AB 2127 Assessment, p.92

coordination of EVs and solar resources in terms of benefits to customers and society. EV Plus Solar pilots should be happening as soon as possible to better coordinate implementation of solar rooftop mandates with transportation electrification programs.

Determination of value should not be the sole or possibly even the primary focus of a pilot or working group deciding if policy support for a particular implementation is warranted. Regulatory agencies must acknowledge that climate goals and rollout mandates (not to mention the actual threat of climate change) are changing the calculus. If extreme heat events become as common as and part of fire season, pilots should focus on potential to address that problem rather than market value of kWh of solar shifted on a daily basis when designing pilots. V2G resources in an EV Plus Solar a configuration could, in addition to the optimization above, conceivably constitute the much-discussed V2G Resilience use case. A pilot could explore the synergies between V2G and solar as a solar output optimization primary case and what changes in interconnection rules are necessary to enable a V2G Plus Solar backup contingency. EV Plus Solar is one example of a VGI configuration that could be at every new house, yet the separate EV and solar mandates proceed. Pilots have an essential place in progress and innovation, and Nuvve is grateful to have benefited from pilot programs in California and elsewhere. But pilots must be properly contextualized as tools to accelerate our progress toward decarbonization, and designed with that urgency in mind.

*Note: The following section was co-drafted with Rhombus and thus contains the same or similar language as the Rhombus comment, but separate documents were filed to enable further content in this comment. The two companies collaborate and agree on the issues that follow.*

### **CEC grid supportive listing for DC V2G inverters**

COMMENT: Nuvve and Rhombus together are industry leaders in development of hardware and software necessary to support V2G functionalities, and therefore are among the first to attempt to list a V2G inverter on the CEC's Grid Support Inverter List. Utilities in California and across the country use this list as a streamlining mechanism to

qualify inverters for interconnection in their territories. Listing with the CEC has become a de facto requirement, effectively setting it up as a gating item for new resources. The perceived authority of the CEC's list is such that while IOUs can interconnect V2G DC systems without CEC listing, lack of listing severely hampers the credibility of new devices when approaching customers. Simply put, the CEC list has become an essential component for commercialization of new grid supportive inverter-based devices.

Rhombus has received all relevant certifications and submitted all necessary documentation to CEC's Renewable Energy Division. While REDS acknowledge that everything is in order, they have informed us they cannot list the inverter, as they are legislatively limited from doing so by SB1. The Grid Support Inverter List was established specifically for solar inverters, and was later adjusted to include battery inverters via Title 24 of the Building Code. REDS has been as helpful as possible, but have informed us that they cannot take this decision on their own to include V2G inverters, which, while technically battery inverters, are inside EVSEs.

The CPUC has cleared the way for interconnection of V2G systems, confirming in Decision 20-49-035 that DC V2G systems are a form of storage and sufficiently addressed by Rule 21 as currently written. The IEPR, the VGI Roadmap, and the VGI Working Group have together laid the groundwork for a V2G industry. These inverters comply with all interconnection requirements for stationary storage inverters. The CPUC Decision confirms that for interconnection purposes there is no difference between a DC V2G inverter and a stationary battery inverter, and we therefore contend it is appropriate that these inverters be housed on this list. Barring inclusion on the existing list, we request that the CEC develop a new V2G-specific list to house currently compliant and commercially available DC V2G inverters, and to include in the future V2G AC inverters when standards are available to determine listing requirements.<sup>5</sup>

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<sup>5</sup> Draft AB 2127 Assessment, p. 52

## **CEC inclusion of March 2019 UL Power Control System Certificate Requiring Decision (PCS CRD)**

In addition to inclusion of V2G inverters, we believe now is the time for the CEC to consider inclusion of the March 2019 PCS CRD as an optional component of a listed inverter system. The CPUC's Decision 20-49-035 refers to this CRD as an enabling mechanism to install V2G stations in uni-directional mode. The CRD can further obviate the need for a potentially cost-prohibitive relay in cases of Rule 21 non-export interconnections. These two applications will make the CRD a common if not essential element for V2G interconnection, and a logical inclusion to the CEC's grid support inverter list. We do not know if the CEC is currently able to include software solutions such as the CRD, which would be developed and certified separately from the hardware components of the inverters with which the software solution will be integrated, and for whose legal, technical, and operational viability the CRD solution will be crucial. The CEC's list, as we understand it, includes and can only currently accept standalone devices. We encourage the CEC Renewable Energy Division staff to consider how they will accept essential software-based solutions from companies who have not manufactured the hardware component. If the CEC's list is to remain a useful streamlining mechanism, it must evolve to include the non-hardware elements that will be key to the interconnection and integration of distributed resources. This CRD will likely only become more significant as new and aggregated distributed resources are connected to the grid over the next decade, and the time is now to initiate a process to recognize it administratively.

We acknowledge and agree with the CEC's assessment<sup>6</sup> that the auto industry is moving toward CCS, and that CHAdeMO is decreasing in prevalence. While there may be an apparent lack of standardization in MD/HD segments<sup>7</sup>, the V2G school bus segment in particular has already converged on CCS, largely because the CEC V2G school bus program required ISO 15118, which by default indicated CCS connectors. We cannot say

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<sup>6</sup> Draft AB 2127 Assessment, p. 53

<sup>7</sup> Ibid



whether this requirement influenced the rest of the e-school bus industry, but we know of no e-school bus model today that uses CHAdeMO. To our knowledge, CCS is at this point the de facto connector standard for electric school buses in general, and V2G school buses specifically. We therefore strongly recommend that the CEC drop the dual CCS-CHAdeMO connector requirement for CEC's CALeVIP eligible equipment list, or make a new section of the CALeVIP eligible equipment that qualifies CCS-only equipment. Requiring CHAdeMO as an option for this segment merely adds cost, time, and complexity, without increasing functionality or accessibility for the current cohort of electric school buses in California.

The connector is not on its own sufficient to enable bi-directional power transfer. The communications protocol must also carry the correct messages to enable the EVSE's smart inverter. The currently-published version of the ISO 15118-2 protocol that generally pairs with CCS does not support bi-directional power transfer. The newer version of the standard (ISO 15118-20) is still under development and has not been released by the standardization body yet.<sup>4</sup> This time period is pivotal for transportation electrification, Vehicle-Grid-Integration, and Vehicle-to-Grid rollout. Nuvve, Rhombus, and Iotecha have therefore agreed to collaborate in ISO 15118 extensions that will enable bi-directional power transfer for systems we control.<sup>8</sup> It should be clearly understood, however, that while the convergence on CCS continues, CHAdeMO, proprietary communications protocols, and proprietary extensions to existing standards will remain necessary to enable V2G for the next few years. We therefore caution against requiring ISO 15118 in near-term programs meant specifically to include V2G functionalities.

### **Transportation Electrification program structure:**

As noted in Nuvve's joint IEPR comment with Enel X, The EVI-Pro, EVI Road Trip, and HEVI-LOAD modelling in this IEPR update showed the MD-HD sectors are likely to engage in daytime charging.<sup>9</sup> While co-siting of solar resources with these EVs for self-

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<sup>8</sup> <https://nuvve.com/nuvve-and-iotecha-announce-joint-global-bidirectional-electric-vehicle-charging-system/>

<sup>9</sup> Comments of Nuvve and Enel X on Draft 2020 IEPR Update, p. 5.

consumption could potentially yield myriad benefits to both customer and grid, customers in SB 350 TE programs largely do not have that option due to requirements to utilize separate service drops. As the Draft AB 2127 Assessment notes, SB 350 programs are meant not to compete with private investment in transportation electrification.<sup>10</sup> And yet, this program structure does in fact create a dynamic in which non-utility actors with VGI solutions, particularly V2G, in order to attempt co-siting of EV charging with other loads and distributed resources, must first convince customers to eschew established programs that provide ratepayer-funded infrastructure incentives. EV rates are then designed around the separate metering focus of the TE programs, and include assumptions appropriate for utility operations and financial structures.

A self-sustaining, continually accelerating market to facilitate California's TE and climate-related ambitions cannot be structured around IOU-centric models that function best in IOU frameworks. The CEC and CPUC must examine opportunities for new frameworks that encourage VGI applications, and draw in and encourage private investment rather than competing with or blocking it. Tolerating the latter, however inadvertent, produces a self-defeating loop in which private investment is hamstrung, causing the state to miss out on opportunities for synergies and efficiencies, and instead creates the need for more public investment, which then further focuses program development on publicly-funded structures, which ultimately makes it increasingly unlikely that private investments will be viable.

A structure like the avoided cost of charging model proposed by in the IEPR<sup>11</sup> is worth piloting to understand if utilities and third parties can compete for customers on a level playing field with a result that works best for the customer. While a market like this may not be a perfect fit for existing utility rate of return business models, that should not be a showstopper: the goal of such programs is to help a forming industry evolve and mature beyond dependency on publicly funded transportation electrification programs.

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<sup>10</sup> Draft AB 2127 Assessment, p. 75.

<sup>11</sup> Draft 2020 IEPR Update, Volume 1, p. 99