



Comments of the Vehicle-Grid Integration Council on the Final Proposed Advanced Clean Cars II – ZEV Assurance Measure Proposals

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I. Introduction

The Vehicle-Grid Integration Council (VGIC)¹ is a 501(c)(6) membership-based trade association committed to advancing the role of electric vehicles (EVs) and vehicle-grid integration (VGI) through policy development, education, outreach, and research. VGIC supports the transition to a decarbonized transportation and electric sector by ensuring the value from flexible EV charging and discharging is recognized and compensated in support of a reliable, affordable, and efficient electric grid. VGIC appreciates the opportunity to provide comments to the California Air Resources Board (CARB) on the proposed Advanced Clean Cars (ACC II) regulations, particularly the ZEV Assurance Measure Proposals regarding battery durability.

II. VGI technologies and services stand to play a pivotal role in helping California achieve several important policy goals, including global leadership on greenhouse gas reductions

VGI is a broad term that includes a variety of possible technologies and use cases for EVs to employ unidirectional managed charging (V1G), provide on-site backup power and behind-the-meter customer bill management (Vehicle-to-Building, or V2B), or export power to the grid (Vehicle-to-Grid, or V2G). Additional applications include residential emergency power backup during blackouts and the use of EVs for powering homes during on-peak hours (Vehicle-to-Home or V2H), and providing emergency power backup to a section of the grid or “microgrid” (Vehicle-to-Microgrid or V2M). These technologies and services target two of the largest sectors contributing to California’s overall greenhouse gas (GHG) emissions contribution: transportation and electricity. As such, VGI will play a critical role in helping California achieve its ambitious GHG emissions reduction goals, as described below.

1. Bidirectional charging is an important state goal

In 2019, SB 676 was signed into law, which directed the state to “establish strategies and quantifiable metrics to maximize the use of feasible and cost-effective electric vehicle grid integration by January 1, 2030.”² This includes “any method of altering the time, charging level, or location at which grid-connected electric vehicles charge or **discharge**” (emphasis added).³ Additionally, the California

¹ VGIC member companies and supporters include American Honda Motor Co., Inc., dcbel, Enel X North America, Inc., Engie, Fermata Energy, FlexCharging, Inc., Flo/AddEnergie, Ford Motor Company, FreeWire, General Motors, Nissan North America, Inc., Nuvve Corporation, Stellantis N.V., Sunrun, The Mobility House, Toyota Motor North America, Inc., Veloce Energy, Inc., Wallbox, and WeaveGrid. The views expressed in these comments are those of VGIC, and do not necessarily reflect the views of all individual VGIC member companies or supporters. (<https://www.vgicouncil.org/>).

² SB 676. Bradford, 2019. https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201920200SB676. See Public Utilities Code Section 740.16(c).

³ *Id* at 740.16(b)(1)

Public Utilities Commission (“CPUC”) has ordered California’s major investor-owned utilities to implement up to \$35 million in VGI and bidirectional charging pilots⁴, offer standard interconnection pathways for bidirectional charging equipment⁵, and design rates to encourage bidirectional charging.⁶ Meanwhile, the California Energy Commission (“CEC”) Energy Research and Development division continues to prioritize bidirectional charging solutions for backup power⁷ and to support grid reliability.⁸ Recently, the Governor’s Budget Proposal earmarked \$200 million for emerging ZEV opportunities to provide “support for vehicle grid integration at scale.”⁹ Together, these actions highlight that bidirectional charging (i.e., V2G, V2H, V2B, V2M) is an important state goal for California.

2. VGI aids decarbonization of the transportation sector by accelerating EV adoption

The transportation sector is the largest source of GHG emissions in California, accounting for almost 40% of statewide emissions in 2019.¹⁰ To address this, Governor Newsom’s Executive Order N-79-20 sets a target for 100% of in-state sales of new passenger cars and trucks be zero-emission by 2035 and for 100% of medium- and heavy-duty vehicles in the state be zero-emission by 2045.¹¹ VGI can directly help California achieve these goals by accomplishing the following:

- Reducing the total cost of EV ownership by lowering charging costs and unlocking new revenue streams for EV owners and fleet operators
- Unlocking new customer value proposition beyond mobility, such as home backup power and grid services when a vehicle is not in use
- Unlocking new revenue streams for vehicle manufacturers, thereby improving the business case for scaling up EV product design, manufacturing, marketing, and sales
- Improving the utilization of public charging infrastructure so that investments in charging equipment and grid infrastructure upgrades can stretch further.

3. VGI aids decarbonization of the power sector by providing essential grid services as renewable energy penetration increases

⁴ CPUC Decision 20-12-029.

⁵ CPUC Decision 20-09-035.

⁶ CPUC Proceedings A.20-10-011 and A.21-12-008.

⁷ CEC GFO-21-303 “Vehicle-to-Building Technologies for Resilient Backup Power”

<https://www.energy.ca.gov/solicitations/2021-10/gfo-21-303-vehicle-building-technologies-resilient-backup-power>

⁸ CEC “Electric Program Investment Charge Proposed 2021-2025 Investment Plan”

<https://efiling.energy.ca.gov/GetDocument.aspx?tn=240609> at 111-126.

⁹ <https://www.ebudget.ca.gov/2022-23/pdf/BudgetSummary/ClimateChange.pdf> at 83.

¹⁰ CARB. *California Greenhouse Gas Emissions for 2000 to 2019: Trends of Emissions and Other Indicators.*

https://ww3.arb.ca.gov/cc/inventory/pubs/reports/2000_2019/ghg_inventory_trends_00-19.pdf

¹¹ Executive Order N-79-20. <https://www.gov.ca.gov/wp-content/uploads/2020/09/9.23.20-EO-N-79-20-Climate.pdf>

SB 100 requires 100% of electric retail sales to customers in California to be from renewable and zero-carbon energy resources by 2045.¹² As the share of solar and wind power on the grid increases in support of this goal, a number of essential grid reliability services will need to be provided by clean resources instead of traditional fossil fuel resources. VGI-enabled EVs can play an important role in this transition by providing these services, including:

- Load shift and demand response
- Resource adequacy
- Flexible operating reserves (spin and non-spin)
- Frequency regulation
- Frequency response

Crucially, electric vehicles with VGI capabilities stand to provide a new source of generation to the grid during critical peak load hours. This can assist in avoiding heat wave-driven blackouts, such as those California experienced in August 2020 due to a 4,400 MW capacity deficiency. Meanwhile VGI, and specifically bidirectional charging, can help to make up for some of this capacity deficiency. In fact, in July 2021, Governor Newsom signed an emergency proclamation to expedite clean energy projects that relieve demand on the electrical grid during extreme weather events this summer and in coming years.¹³ In response, the California Public Utilities Commission established a new VGI aggregation program (Emergency Load Reduction Program: Customer Group A.5) to leverage electric vehicle exports (i.e., V2G) to contribute to this effort.

In addition to these near-term, emergency reliability imperatives, California will also need 13.6 GW of battery storage capacity by 2032 and over 40 GW by 2040 to ensure reliability, according to California’s latest Integrated Energy Policy Report (“IEPR”).¹⁴ This unprecedented level of investment will likely cost many billions of dollars and could put upward pressure on electricity costs and affordability. However, V2G solutions, if unlocked through appropriate rules and regulations, is poised to become a valuable and significant class of battery storage that can contribute to this overall need in an affordable manner by leveraging EVs. In fact, VGIC estimates every 1 million EVs could, in theory, provide about 5-10 GW of V2G resources.¹⁵ In addition to GHG reductions in the transportation and power sectors, VGI can also assist the achievement of other important policy goals described below.

4. VGI can increase energy affordability by reducing electricity bills for all customers

¹² SB 100. https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180SB100

¹³ <https://www.gov.ca.gov/2021/07/30/governor-newsom-signs-emergency-proclamation-to-expedite-clean-energy-projects-and-relieve-demand-on-the-electrical-grid-during-extreme-weather-events-this-summer-as-climate-crisis-threatens-western-s/>

¹⁴ <https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M451/K412/451412947.PDF>

¹⁵ Assuming an average of 5 kW of export capability per vehicle. The actual, real-world capability of V2G for a portfolio of 1 million vehicles, for example, will be subject to certain limitations.

VGI can increase the affordability of electricity bills in two distinct ways. First, VGI can help limit overall electricity system cost increases and, in turn, limit future customer bill increases. By leveraging already deployed EVs to provide necessary grid services, VGI offers an approach that can be more cost-effective than traditional means of providing the same services. For example, it can reduce the need to build new power plants to meet peak demand. VGI can also provide more flexible resources to manage the integration of wind and solar, and it can take advantage of abundant, low-cost solar energy in the daytime to power EV charging at night. Second, in addition to directly reducing system costs, VGI can help reduce electricity bills, even for non-EV owners. Because VGI plays a role in accelerating EV adoption, it also helps place downward pressure on overall electricity rates by increasing the total volume of electricity sales (i.e., kWh) relative to the grid's fixed costs.

5. VGI can improve grid resiliency and security, including during wildfire risks events

The prospect of more frequent grid reliability events, such as extreme weather events and wildfire risk, creates an urgent need to enhance grid resiliency, as expressed by Governor Newsom's July 31st Emergency Proclamation.¹⁶ VGI capabilities can be leveraged to reduce EV charging load as well as export power to the grid to help ease peak demand and thus are particularly suitable to support contingency programs under the Emergency Proclamation. Additionally, California's public safety power shutoff (PSPS) events highlight the need for microgrids to support vulnerable communities, as well as the value of on-site backup power for customers experiencing an outage. VGI-enabled vehicles can offer a solution by using EV batteries as a source of backup power during outage events. This approach could provide a relatively cost-effective microgrid solution as well as unlock a new value proposition for customers seeking backup power during a planned or unplanned outage. Meanwhile, by using EVs as sources of backup power, this can provide a cleaner alternative to fossil fuel backup generators in support of state microgrid and resiliency priorities.

6. VGI can foster economic activity through innovation, competition, and market transformation

The multifaceted ecosystem of firms engaged in the VGI marketplace reflects the depth and diversity of private investment. As an example, over 50 automotive original equipment manufacturers (OEMs), EV supply equipment companies, and EV service providers are engaged on the topic of VGI in California, as demonstrated during the 2019-2020 Joint Agency VGI Working Group. These market participants engage with equipment and software providers, project developers, financiers, engineering, procurement, and construction companies, and operations & maintenance experts. VGI is well positioned to leverage existing strengths in the high-tech industry to build a vital new segment of the clean energy and transportation economies.

¹⁶ Proclamation of a State of Emergency. <https://www.gov.ca.gov/wp-content/uploads/2021/07/Energy-Emergency-Proc-7-30-21.pdf>

III. Battery durability requirements set by CARB through ACC II should account for VGI activities

Battery degradation is a complex topic and depends on chemistry, temperature, use case, and other factors. Some VGI activities, especially those utilizing bidirectional charging capabilities, will require additional battery cycling that will impact long-term battery durability. While the exact level of cycling will depend on the specific VGI use case and could vary based on customer behavior, it is reasonable to expect that in the future most EVs could experience some incremental level of degradation due to VGI activities.

Given the extensive public and private benefits that VGI can offer, as detailed above in Section II, it is paramount that any battery durability requirements CARB establishes for EVs not inadvertently foreclose VGI opportunities. Setting overly-stringent durability requirements that limit VGI activities – whether intentionally or not – conflicts with CARB’s larger mission of reducing emissions and accelerating EV adoption.

VGIC is concerned that the battery durability and warranty requirements currently being considered by CARB under ACC II could place arbitrary restrictions on VGI activities, while simultaneously adding cost to EVs at a time when we are all collectively looking to expand the market. VGIC appreciates CARB’s intent to ensure consumer protection and customer satisfaction with EV ownership through robust durability standards. However, overly stringent requirements that constrain battery cycling could also constrain the novel set of value propositions that VGI offers and would otherwise spur EV adoption (e.g., home backup power, payment for grid services, etc.). Overly stringent battery durability requirements could drive OEMs to limit the range, performance, and/or state of charge, or take other measures to provide for sufficient degradation margin in later years. As such, VGIC believes that CARB should consider an approach to durability requirements that balances consumer protection via battery longevity with other near-term customer benefits provided through VGI.

To this end, VGIC believes it may be premature for CARB to set durability requirements that are significantly out of step with the international community, which is in the process of trying to address these specific VGI-related concerns. For example, there are ongoing efforts by the Informal Working Group on Electric Vehicles and the Environment under the United Nations Economic Commission for Europe (UN ECE) to develop minimum performance requirements for EV batteries that include V2X considerations. This Working Group is chaired by the US Environmental Protection Agency (EPA) and includes the European Commission, individual European and Asian countries, as well as industry stakeholders from around the world. The overall battery durability requirements currently contemplated by the Working Group is 80% of battery energy after 5 years/100,000 kilometers (km) and 70% after 8 years/160,000 km, much lower than CARB’s proposed durability requirement of 80% of range for 10 years/150,000 miles (240,000 km).¹⁷ In order to account for VGI activities, the Working

¹⁷ United Nations Economic Commission for Europe – Informal Working Group on Electric Vehicles and the Environment. *Proposal for a new UN GTR on In-Vehicle Battery Durability for Electrified Vehicles.*



Group is also considering a “virtual km” mechanism, in which the energy discharged by the EV battery in bidirectional mode is converted to a km-equivalent via a predetermined formula.¹⁸ The total mileage used for confirming the compliance with the performance requirements would consist of the sum of the km driven and the virtual km. While VGIC is not necessarily endorsing this specific approach or methodology, we believe that CARB must implement an agreed upon method to account for VGI battery degradation such as the UN Global Technical Regulation “virtual miles” before adopting a final ACC II regulation. ACC II would then enable manufacturers to determine a path forward for customers to access the various additional services that EVs can provide besides mobility. VGIC believes that reduced stringency on durability standards to accommodate VGI will not only help improve the value proposition of EVs for customers, but will help accelerate California’s transition to a ZEV future.

IV. CARB should consider how ACC II could accelerate VGI technologies and services.

CARB has an opportunity in ACC II to not only remove barriers to VGI technologies and services, but also to actively promote VGI as a key strategy to reduce both primary and secondary transportation emissions. VGIC welcomes a more in-depth dialogue on this and offers itself as a resource on VGI topics for CARB staff and decision makers.

V. Conclusion

VGIC appreciates the opportunity to provide these comments and looks forward to working with CARB to ensure that EVs are fully leveraged to support California’s decarbonization goals.

Respectfully submitted,

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<https://wiki.unece.org/download/attachments/128420965/Based%20on%20GRPE-83-09%208%209%20July%202021%20EC%20US%20proposal.docx?api=v2>

¹⁸ For example, see the following presentation on V2X virtual mileage at the 50th EVE IWG meeting:
<https://wiki.unece.org/download/attachments/128420289/Input%20on%20V2X%20virtual%20mileage.pptx?api=v2>