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NEMA CEC Bidirectional Charging Roadmap Comments

Additional submitted attachment is included below.



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FINAL

July 28th, 2026

California Energy Commission
Docket Unit, MS-4
715 P Street
Sacramento, CA 95814

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**Re: Docket No. Docket No. 22-EVI-06, Vehicle-Grid Integration – A Roadmap to
Unlocking the Benefits of Bidirectional Charging**

Dear Commissioners and CEC Staff:

The National Electrical Manufacturers Association (NEMA) appreciates the opportunity to submit comments in response to the California Energy Commission's (CEC) *A Roadmap to Unlocking the Benefits of Bidirectional Charging* in Docket No. 22-EVI-06. NEMA supports the CEC's continued leadership in advancing vehicle-grid integration (VGI) and agrees that bidirectional power transfer can provide meaningful benefits to consumers, buildings, fleets, utilities, and the electric grid when deployed through safe, interoperable, and standards-based pathways.

NEMA is the leading trade association representing U.S. manufacturers of electrical goods (electroindustry) with more than 300 electrical manufacturers that make safe, reliable, and efficient products and systems. Together, our members contribute a full 1% of U.S. GDP and directly provided over 590,000 American jobs, adding more than \$375 billion to the U.S. economy.¹ Through its Mobility Sector, NEMA represents manufacturers of electric vehicle supply equipment (EVSE), connected and electrified transportation infrastructure, and

¹ <https://www.makeitelectric.org/>

related electrical equipment, software, components, and systems that enable transportation electrification at scale.

NEMA encourages the CEC to continue advancing bidirectional power transfer in a manner that prioritizes safety, interoperability, cybersecurity, customer value, regulatory clarity, and consistency. These principles are essential to unlocking the benefits identified in the CEC Roadmap while avoiding fragmented requirements that could delay deployment, increase cost, or create uncertainty for manufacturers, utilities, installers, authorities having jurisdiction (AHJs), and consumers.

NEMA's Current Work Efforts on Bidirectional Power Transfer

NEMA has made bidirectional power transfer a core 2026 Mobility Sector priority. NEMA's workplan is designed to establish a unified technical and regulatory framework for safe, interoperable bidirectional power transfer by standardizing terminology, clarifying interconnection and code requirements, aligning with key standards, and supporting consistent state policy approaches. This work is directly relevant to the CEC's Roadmap and can serve as a technical resource as California considers implementation pathways under its VGI and bidirectional charging initiatives.

In support of our efforts on bidirectional power transfer, NEMA is engaged in a "thought leadership" project that is focused on translating its value into practical, accessible terms for policymakers, consumers, utilities, and industry stakeholders. The first phase examined vehicle-to-home (V2H) use cases and highlighted how EVs can serve as flexible energy assets for homes, buildings, and the grid. Vehicle-to-home technology could provide backup power during outages and give consumers more value from batteries that spend most of the day parked. When paired with Grid-tied Vehicle-to Grid (V2G) technologies daily peak demand management can also be achieved. Scaling the technology will require trusted equipment, compatible systems, clear standards, workable utility programs, trained installers, and straightforward permitting and interconnection pathways. Materials from this first phase of the thought leadership project are [available here](#).

NEMA has also begun work on a second phase of the thought leadership project focused on broader vehicle-to-grid (V2G) and commercial use cases. This will examine opportunities such as fleet applications, commercial buildings, depot charging environments, and electric school buses, where larger batteries, predictable duty cycles, and managed charging environments may provide compelling early pathways for bidirectional power transfer deployment. It will also highlight the incorporation of individual residential V2G systems into Virtual Power Plants (VPPs) for grid services. The results from this second phase will be available on [NEMA's website](#).

This thought leadership work reinforces a key point for the CEC: bidirectional power transfer should not be treated as a single, uniform use case. Vehicle-to-home, vehicle-to-building, vehicle-to-grid, vehicle-to-load, and vehicle-to-vehicle applications differ in technical configuration, customer value proposition, grid interaction, interconnection requirements, metering needs, and regulatory treatment. California's implementation strategy should preserve these distinctions and avoid imposing requirements designed for one use case on another.

NEMA's Standards Activities Relevant to the CEC Roadmap

NEMA is developing a bidirectional power transfer definitions document to clarify the standards landscape and build consensus around common terminology, including V2G, V2H, V2B, bidirectional power transfer, bidirectional current flow, EVSE power export, and related concepts. This effort responds to a recurring challenge in policy and technical discussions: stakeholders often use terms such as “bidirectional charging,” “power export,” “V2G,” and “V2H” interchangeably even though they may describe different functions, architectures, and regulatory implications.

At a high level, bidirectional power transfer describes a functional capability in which power may flow from the grid or premises to the EV for charging and from the EV back to a home, building, load, or electric power system. EVSE power export, by contrast, is a more specific operating mode focused on the controlled export of energy through EVSE and the associated electrical safety, communications, cybersecurity, permitting, and interconnection considerations.

NEMA has published NEMA EVSE 40011-2024, *Standard for EVSE Power Export*², which defines characteristics in the electrical, communications, and cybersecurity domains for permitting power export between EVSE and an electric power system. The standard was developed to help establish more consistent pathways for evaluating and authorizing EVSE power export installations and to support safe integration of EVs as mobile energy resources. That standard is currently undergoing a revision to expand beyond its initial focus and better address V2H, V2B, V2G, V2L, and V2V configurations. It is expected to provide clearer treatment of grid-following and grid-forming architectures, behind-the-meter and islanded configurations, home backup applications, building support applications, grid-interactive export, and other use cases that may have different safety, communications, and interconnection requirements.

Recommendations for the CEC

1. Use precise terminology and distinguish between V2H, V2B, V2G, V2L, and V2V use cases. The CEC should avoid treating all bidirectional applications as equivalent. V2H backup power, V2B building support, V2G grid services, V2L portable load support, and V2V energy transfer involve different technical configurations and regulatory considerations. A use-case-specific framework will better support safety, consumer value, and market development.

2. Align California requirements with voluntary consensus standards. CEC should align implementation with relevant standards and model requirements, including IEEE 1547, UL 1741, UL 9741, ISO 15118-20, SAE standards, NEC Article 625, and NEMA EVSE 40011. Alignment will reduce fragmentation, support interoperability, and provide clearer pathways for equipment manufacturers and project developers.

3. Create staged implementation pathways that recognize near-term opportunities. While their pathways may be different V2H and V2G both offer near-term customer value through resilience and bill management.

² <https://www.makeitelectric.store/us/view-details/evse-power-export-standard>



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4. Coordinate implementation with Rule 21, Title 24, utility programs, and state agency efforts. Bidirectional power transfer sits at the intersection of vehicle technology, EVSE, building systems, utility interconnection, distributed energy resources, and customer programs. Rule 21 coordination is critical right now because application fees remain a barrier to residential V2G. Aligning V2G with stationary storage frameworks can reduce costs and accelerate adoption, given the overlap between EV and battery storage owners. The CEC should coordinate with the California Public Utilities Commission to evaluate how Rule 21 treatment of residential V2G can better align with stationary storage frameworks.

5. Support demonstration, education, and market development. NEMA supports continued CEC investment in demonstrations, interoperability testing, and stakeholder education. CEC should support pilots that evaluate installation cost, customer experience, utility integration, and program baseline methodologies across residential, commercial, fleet, and school bus applications.

6 Avoid premature mandates that outpace, product availability, or market readiness. NEMA encourages CEC to pursue a flexible approach that enables bidirectional-capable technologies while preserving manufacturer innovation and customer choice. Requirements should be tied to clearly demonstrated beneficial use cases, technical readiness, and implementation feasibility, with emphasis on site-level orchestration across vehicles, EVSE, building systems, utility programs, and customer needs.

Conclusion

Thank you for considering our comments. NEMA stands ready to work with the CEC as it advances the roadmap, implements any roadmap related activities, evaluates future rulemaking needs, and develops technical guidance. NEMA would welcome the opportunity to brief CEC staff on our current work activities in this area.

Should you have any questions please feel free to contact NEMA directly.

Sincerely,

Steve Griffith
Executive Director, Regulatory & Legal Affairs, Mobility