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NEMA Comments- Docket #24-FDAS-04- RFI for Flexible Demand Appliance Standards for or Electric Vehicle Supply Equipment

Additional submitted attachment is included below.

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PUBLIC DOCUMENT

December 19, 2024

Matthew Flynn
California Energy Commission
715 P Street
Sacramento, CA 95814

Re: Docket # 24-FDAS-04- Request for Information (RFI) on Flexible Demand Appliance Standards for Electric Vehicle Supply Equipment

Dear Mr. Flynn:

The National Electrical Manufacturers Association ("NEMA"), on behalf of its members, respectfully submits the following comments in response to the California Energy Commission (CEC) on its request for information to inform staff development of a potential Flexible Demand Appliance Standard (FDAS) for electric vehicle supply equipment. We greatly appreciate the opportunity to provide these comments and look forward to working the Commission as this moves forward.

About NEMA

NEMA represents over 300 electrical equipment manufacturers that make safe, reliable, and efficient products and systems. Together, our members contribute 1% of U.S. GDP and directly provide nearly 460,000 American jobs, contributing more than $250 billion to the U.S. economy. Our members produce goods for the grid, industrial, built environment, and mobility sectors. The electroindustry is leading the transition to an all-electric economy and is a key driver of infrastructure development and future economic growth. NEMA members are leading producers of equipment for the mobility market, including electric vehicle ("EV") chargers and charging infrastructure, motors, inverters, and power control and distribution components.[1]

NEMA's Electric Vehicle Charging Equipment Manufacturers represents companies that are currently selling, manufacturing, and operating in North America. Electric vehicle charging infrastructure is not comprised of hardware alone. Rather, it represents a combination of hardware, software, cables and cable management, and analytics integrated into a network that delivers energy safely, reliably, and efficiently to a vehicle. NEMA is strongly in favor of the efforts to deploy and sustain a nationwide electric vehicle charging infrastructure to support broader electrification of transportation and, by extension, reduction of carbon emissions. This deployment should strive towards standardization and interoperability and allow for communication and coordination between the vehicle, the charging

[1] Additional information about NEMA may be found at https://www.nema.org/.

station, and grid operator to maximize the benefit and convenience for vehicle owners, while not putting overdue stress on the distribution system.

Summary

The CEC is developing flexible demand standards for appliances to meet the requirements of Senate Bill 49 (Skinner, 2019), which authorized the CEC to pursue standards that enable appliances to schedule, shift, or curtail their operations with consumer consent. The expansion of flexible demand resources in California supports the alignment of electric demand with clean energy production to reduce greenhouse gas (GHG) emissions and enhance grid reliability. The CEC has established a goal for realizing at least 7000 MW of flexible load by 2030, with at least 3000 MW expected to be enabled by FDAS or similar load flexibility standards.[2] As part of the work to develop FDAS, the CEC is investigating methods and practices for shifting the power draws by EVSE, also known as electric vehicle (EV) chargers. The goal is to enable shifting the time and rate of vehicle charging to enhance grid reliability, lower GHG emissions, and save consumers money. Bidirectional electric vehicle supply equipment employed as a gateway for mobile battery storage on electric vehicles can add resilience benefits and enhanced grid-support capabilities to a site's building infrastructure. Bidirectional vehicles can provide backup power to buildings or specific loads, sometimes as part of a microgrid, through vehicle to building (V2B) charging, or provide power to the grid through vehicle to grid (V2G) charging.

CEC staff is issuing this request for information (RFI) to assist in gathering information from interested members of the public, stakeholders, and others that will better inform CEC's load flexibility appliance standards-making process for EVSE.

Specific Comments

1. Please provide information to assist the CEC in determining whether the scope of devices in Table 1 meets the needs of FDAS or if the CEC needs to consider revisions to the scope.

Table 1: Examples of In and Out-of-Scope Electric Vehicle Supply Equipment

Potential In-Scope Devices	Potential Out-of-Scope Devices
Level 1 Electric Vehicle Supply Equipment	Pantograph Electric Vehicle Supply Equipment
Level 2 Electric Vehicle Supply Equipment	Equipment with an automated connection system
DC-output Electric Vehicle Supply Equipment	
Wireless Electric Vehicle Supply Equipment	
Medium voltage AC input supply Electric Vehicle Supply Equipment	
Power electronic components inside the vehicle	

[2] https://www.energy.ca.gov/publications/2023/senate-bill-846-load-shift-goal-report

Answer:

Of the devices listed in Table 1, NEMA recommends that Level 1 Electric Vehicle Supply Equipment, Level 2 Electric Vehicle Supply Equipment, and DC output Electric Vehicle Supply Equipment should be considered for FDAS.

2. What is the current landscape of options for charging schedules that prioritize the driver experience, emissions reductions, financial savings, and/or other factors? Please provide information or data on customer receptiveness to various charging schedules, such as charge immediately, charge by departure, etc. and the entity who possesses such information.

Answer:

EV drivers will typically opt-in to time-of-use pricing schedules that offer lower electricity costs when charging during off peak hours, typically after 9PM and lasting overnight. This charging strategy aligns with a longer battery life by charging a battery to 80%. By limiting the charge to 80% the battery is kept out of extreme ranges as a fuller charged battery requires more current which can wear out its cells.

3. Please comment on the various EVs or EVSE consumer charging preferences such as charge immediately or “charge by departure”, where the EV is charged to a specified percentage with a set time to be ready.

a. How does using charge strategy balance factors as battery life, price, etc.?

b. What consumer data is available that provides customer charging habits such as: demographics and population percentages that prefer to charge at home, at work, or in public shared spaces? What times of day?

c. What charger types are typically used?

d. How do charging patterns change as EV owners gain experience with their vehicle?

e. What percentage of battery capacity is typically charged per session?

f. How is this behavior expected to change as ownership of EVs expands beyond the early adopters?

Answer:

EV drivers will typically opt-in to time-of-use pricing schedules that offer lower electricity costs when charging during off peak hours, typically after 9PM and lasting overnight. These are usually done via Level 1 EVSE. This charging strategy can provide a longer battery life by charging a battery to 80%. By limiting the charge to 80% the battery is kept out of extreme ranges as a fuller charged battery requires more current which can wear out its cells. It’s expected that charging patterns will align to time-of-use pricings as ownership of EVs expands beyond the early adopters.

4. When will DC charging equipment be available for residential installation? What are the expected use cases, penetration, price range and power level of DC equipment used in the residential sector? Would

certain DC chargers installed at private residences require a Battery Energy Storage System to manage peak load?

Answer:

DC charging equipment is best suited for Public Charging Infrastructure. These are public areas where drivers need to recharge quickly. Residential installations are better served via either a Level 1 EVSE (single family dwelling unit) or Level 2 EVSE (multi-dwelling unit).

5. What software and hardware capabilities could enable public EVSEs to relieve/eliminate grid congestion at the Distribution (referring to Transmission and Distribution, T&D, for the grid) level? What control strategies are available to the grid operator and/or load aggregator to shift and/or curtail demand from EVSEs at the Distribution level to maintain grid reliability?

Answer:

Demand response and managed charging strategies are extremely important to mitigate the peak load. There needs to be a multiprong approach to demand side management. Currently, technologies do exist for smart charge management that could help spread the load over time. However, the market for these services will need to be strengthened in the future to support the technology adoption. Utility based managed charging programs can help lower peak demand, further lowering the demand charges. However, in case of sudden bursts on increased demand the site owners will need to have backup power solutions in place. Onsite stationary battery energy storage plays a crucial role in overcoming many of the challenges associated with grid congestion. These solutions offer numerous benefits including reducing peak demand and energy costs, maximizing charging infrastructure capacity, improving charging reliability and resiliency, as well as integrating renewable energy sources into charging operations. NEMA cautions the CEC in using any type of plug & charge protocols for managing grid congestion as a majority of EVs don’t support these types of power management capabilities and there are security-related shortcomings in these protocols that haven’t been fully addressed.

6. Similarly, what software and hardware capabilities are best suited enable residential EVSEs to relieve grid congestion at the Distribution level? What control strategies can be deployed by the grid operator and/or load aggregator to shift and/or curtail demand from residential EVSEs at the Distribution level support grid reliability?

Answer:

Demand response and managed charging strategies are extremely important to enable residential EVSEs to relieve grid congestion at the Distribution level. There needs to be a multiprong approach to demand side management. Currently, technologies do exist for smart charge management that could help spread the load over time. However, the market for these services will need to be strengthened in the future to support the technology adoption. Utility based managed charging programs can help lower peak demand, further lowering the demand charges. However, in case of sudden bursts on increased demand the site owners will need to have backup power solutions in place. Onsite stationary battery energy storage plays a crucial role in overcoming many of the challenges associated with grid congestion. These solutions offer numerous benefits including reducing peak demand and energy costs, maximizing charging infrastructure capacity, improving charging reliability and resiliency, as well as integrating renewable energy sources into charging operations. NEMA cautions the CEC in using any type of plug & charge protocols for managing grid congestions as a majority of EVs don't support these types of power management capabilities and there are security-related shortcomings in these protocols that haven't been fully addressed.

7. What hardware and software are needed on the EV's Onboard Charging System to enable load shifting? What percentage of EVs currently receive grid signals (e.g., electricity prices, GHG emissions and California Independent System Operator Flex Alerts) to schedule load shifting, demand response, and/or bi-directional charging? What percentage of EVs require the EVSE to receive grid signals to schedule load shifting, demand response, and/or bi-directional charging? What are the most common methods for communicating signals to EVSEs and EVs (e.g. Ethernet, Wi-Fi, Cellular, AM/FM broadcast)?

Answer:

NEMA recommends that the EVs Onboard Charging System need not be considered with respect to load shifting as it relates to FDAS. These techniques can be effectively done via the EVSE itself. EVSE have built in features to account for this such as load balancing, load scheduling, load sharing, and real-time monitoring.

8. (Focused on EV manufacturers) Is the EV telematics system used to receive grid signals (e.g., electricity prices, GHG emissions, and California Independent System Operator Flex Alerts) and schedule charging in response to those grid signals? If so, what is the monthly cost charged to the customer for these capabilities?

Answer:

The EV telematics system is not generally used to receive grid signals and schedule charging in response to those signals. This can be done via the EVSE itself. EVSE can monitor energy consumption and power availability in real-time to determine how much energy to pull from the grid or the battery.

9. How can medium-duty and heavy-duty (MDHD) EVs and their EVSE fit into the CEC's goal of load shifting to avoid GHG emissions?

Answer:

NEMA recommends that the CEC not account for medium-duty and heavy-duty EVs and their EVSEs when considering FDAS. These are typically charged at centralized charging locations to maintain operational readiness. They are not linked to residential dwelling units that may need FDAS.

10. Should the scope of this regulation include load shifting criteria for EVs such as forklifts, boats, and other off-road vehicles? Do off-road vehicles typically have a defined use-cycle that fits the need for load

shifting? If so, which types of off-road vehicles? Please provide off-road EV counts, types of EVSE for off-road EVs, and charging strategies for off-road EVs.

Answer:

NEMA recommends that the CEC not include load shifting criteria for EVs such as forklifts, boats, and other off-road vehicles when considering FDAS. Similar to medium and heavy duty their charging could be located in warehouses, ports, or other locations. They are not linked to residential dwelling units that may need FDAS.

11. There are currently some buses that use wireless charging to top off batteries at bus stops. What are other applicable uses for wireless charging, and is wireless charging planned in your product roadmap? If so, when is wireless charging expected to be more widely available?

Answer:

NEMA recognizes that there are emerging technologies like wireless or inductive EV Charging. However, these technologies are exceptionally nascent, not compatible with nearly every EVs currently being produced, and have only been deployed select projects so far.

12. What are the charging practices for commercial fleets? Bus fleets? Overnight depot level charging? What power levels? How is the charging of the fleet managed? Manually rotated? Management software?

Answer:

The charging practices for commercial fleets will depend mainly on the use case. For public megawatt charging, charging sessions should be targeted to be approximately 30 minutes to fit within mandatory driver breaks. For private depot charging, charge sessions should be less than 45 minutes to accommodate charging between driver shifts. For overnight charging at private or shared depots, charge sessions will typically be 4-8 hours between shifts. It is anticipated that the need for overnight or long-duration parking will grow over the next 3 to 5 years as fleets begin their conversion. Initially, it will be a combination of new sites and a retrofit of existing sites. The conversion will be gradual as the infrastructure will take time to build up. There will be spaces that are dedicated to EVs while others will be a mix of EVs and internal combustion vehicles. Further, overnight charging needs can be addressed by Level 2 charging (80A) as well as a low power DC charging infrastructure. These options offer lower operating and installation cost per charging port.

13. Which communication protocols or components of existing communication protocols are used to enable load shifting capabilities for EVs and EVSE? What is the implementation status of these communication protocols? Are industry-wide standard communications and control protocols currently in use or planned? Are there remaining gaps to enabling load shifting capabilities?

Answer:

The Open ADR standard is a generally accepted industry protocol to move electricity consumption from peak demand periods to off-peak times. It shifts the load of the grid by sending automatic signals to devices like EVSE to adjust their usage based on grid conditions. This allows utilities to manage demand during high-stress periods on the grid.

14. Does data exist on the effect of bidirectional charging on EV battery life? How is battery capacity affected by the frequency and level of bidirectional charging (for example, power level, total energy discharge, and so on)? Does this affect the warranties or insurance of the EV owner? If so, can the loss in value, if any, be quantified over the life of the battery?

Answer:

Bi-directional charging is still an emerging technology, and the CEC need not focus on this as it relates to FDAS.

15. Can a load shift program work with EVSEs/EVs responding to generic signals, or must signals be tailored for each EVSE/EV?

Answer:

EV drivers will typically opt-in to time-of-use pricing schedules that offer lower electricity costs when charging during off peak hours, typically after 9PM and lasting overnight. These time-of use pricing schedules work well in a load shift program.

16. What data or information is needed from the EV and/or EVSE to enable load shift while ensuring driver mobility and range needs are not compromised (for example, kWh needed by the vehicle)? How could this data or information be communicated across all vehicle and supply equipment models, regardless of the manufacturers' involvement?

Answer:

EV drivers will typically opt-in to time-of-use pricing schedules that offer lower electricity costs when charging during off peak hours, typically after 9PM and lasting overnight. These time-of use pricing schedules work well in a load shift program.

17. What is the energy consumption impact from adding flexible demand capability to existing EVSE?

Answer:

NEMA recommends that this question be answered by other stakeholders.

18. Please discuss strategies for EVSE to best utilize the CEC's Market Informed Demand Automation Server (MIDAS) which provides access to utilities' time-varying rates, GHG emission signals, and California Independent System Operator (California ISO) Flex Alerts?

Answer:

These types of strategies include complexities that are better handled by aggregators that the EVSE manufacturers already support. An EVSE charging aggregator acts as a central coordinator, managing and optimizing the charging process of multiple EVs. They aggregate their charging demands, allowing them to participate in the grid as a flexible load, shifting charging times to off-peak hours reducing strain on the grid, and can even provide ancillary services like demand response.

19. What are the cybersecurity challenges and needs associated with communicating signals from the grid, or a third-party, to accomplish supplying energy to electric vehicles?

Answer:

Ensuring cybersecurity and integrity of EV charging infrastructure is of paramount importance, with two main areas of concern: 1) securing user physical safety and personal information and 2) protecting operational integrity and connected infrastructure. There are some foundational cybersecurity principles and techniques that MHD charging infrastructure should adopt, including the following:

(1) “Boot Security.” Boot security uses embedded manufacturer approved and authenticated hardware devices to authenticate operating system software when an EV charger is “booted” up. If the operating system at the boot stage is not authenticated, the charger will stop the malicious operating system from loading or making changes to the charger.

(2) Secure “over the air updates.” Secure methods to update software on deployed chargers should be available such as “over the air updates” or updates that can be issued remotely. When the software components on an EV charger are updated, there should be protections in place to authenticate the software update before the update is accepted and implemented. This mitigates the risk of malicious software being loaded onto a device.

(3) Secure Customer Information. EV chargers may store sensitive data like, for example, personally identifiable information or payment information. This sensitive data should be protected and there are a variety of means to do that including, but not limited to, encryption, role-based access, and limiting the amount of such information locally stored on an EV charger.

NEMA has undertaken a new standards effort that will describe best practices for mitigating cyber-physical vulnerabilities of Electric Vehicle Charging Equipment. This standard is expected to be completed in 2025.

20. Are there any considerations to ensure equity when developing a load shifting strategy for supplying energy to electric vehicles? For example, are there concerns that flexible demand will be disproportionately accessible based on income level?

Answer:

There are equity-related considerations for planning EV charging infrastructure. The most effective one is to consider underserved communities for site selection. However, the location needs to have the infrastructure to support the buildout and potential customers to utilize load shifting strategies. Additional consideration includes the local workforce and if it can support the buildout and site operations. Independent owner operators and small fleets are nimbler and can build out faster if they can justify the business case. However, they would require more financial support early on to support the projects. This is where funding and technical assistance could help.

Conclusion

NEMA respectfully requests consideration of our comments and recommendations, and we look forward to working the CEC as the development of a potential Flexible Demand Appliance Standard for Electric Vehicle Supply Equipment. Should you have any questions or need any additional information, please contact me at (703) 307-7847 or steve.griffith@nema.org.

Sincerely,

Steve Griffith
Executive Director, Regulatory & Industry Affairs, Mobility