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National Electrical Manufacturers Association (NEMA)
EV Charger Requirements Document
to
Joint Office of Energy and Transportation

The National Electrical Manufacturers Association (NEMA) is the leading U.S. trade group representing electrical equipment and medical imaging manufacturers, which are at the forefront of electrical safety, reliability, and efficiency. Our nearly 325 Member companies provide a range of products including both the transportation and utilities sectors. Collectively our membership provides some 370,000 American manufacturing jobs in more than 6,100 facilities, with worldwide industry sales exceeding $140 billion.[1]

NEMA's EV Charging Equipment Manufacturers represent companies that are currently selling, manufacturing, and operating in North America. The full list is available at the following URL: https://www.nema.org/directory/products/view/electric-vehicle-supply-equipment-system
The following document describes EV Charger Requirements for the Joint Office to utilize as it moves forward on its programs to deploy a network of EV chargers across the country.

Please direct questions on these comments to Steve Griffith, NEMA Senior Industry Director of Transportation and Cybersecurity, at steve.griffith@nema.org. We look forward to continuing to engage with the Joint Office of Energy and Transportation on this important topic.

General

Electric Vehicle Charging Infrastructure is not just a piece of equipment. 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. Infrastructure includes additional critical site elements encompassing lighting, controls, and other communication devices that enable the use of the charging equipment and enhance the security while optimizing overall energy efficiency and minimizing carbon impact. The EV charging equipment industry is heading towards smaller physical footprints, greater integration of energy management systems, and improved customer experience technologies.

[1] For more information, please visit: https://www.nema.org/.

Electric Grid Connections

EV chargers do not exist in isolation but are interconnected with the electrical distribution grid with supporting electrical equipment and infrastructure. Every charger and charging system has "customer side" power distribution equipment that supplies power to and between the chargers. In some cases, EV chargers are deployed in conjunction with on-site battery energy storage. When owners and operators of EV charging stations decide to deploy on-site battery storage with EV chargers, those systems may be distinct from the electrical systems of the building

EV Ready and EV Capable

A key component in the development of guidance for EV charging infrastructure deployment is the incorporation of EV Ready and EV Capable requirements into both commercial and residential building and energy codes. EV Capable refers to parking spaces that have listed raceway (approved wiring methods) and electrical capacity allocated in a local subpanel to accommodate future EV charging infrastructure installations. An EV Energy Management System within a building offers an opportunity to maximize the efficiency of its electrical distribution by allocating its energy usage to charge in a smart way. EV Ready refers to a parking space that includes the following components: listed raceway (approved wiring methods) sufficient electrical panel service capacity, overcurrent protection devices, wire, and suitable termination points such as a junction box with a service loop or directly landed within an EVSE (i.e., full circuit).

Operation and Maintenance

A well-developed operations and maintenance model could include a number of features, including, but not limited to:

- Scheduled preventative maintenance
- Detailed documentation and procedures to troubleshoot and repair chargers
- 24/7/365 customer call center to receive service calls
- 24/7/365 connectivity and monitoring of the operations of chargers
- Service ticketing and process to ensure service and operational issues are addressed in a reasonable timeframe
- Sufficient technicians trained to work on the make and model of charger they operate in the regions in which they operate
- Experience and capability to execute detailed service campaigns hand in hand between owner, operator, and manufacturer
- Sufficient local inventory of spare parts and logistics infrastructure

Networked Charging

All deployed EVSE should be networked and connected to the cloud. The California Energy Commission defines "networked" chargers as "a charger connected to a backend network operations center, which at a minimum enables remote diagnostics, remote start, and usage data collection."

Cyber Security

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. While charging technology and cybersecurity systems to protect them are evolving quickly, there are some foundational cybersecurity principles and techniques that public 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. To best future proof EV chargers and embrace innovative and more secure payment technologies, the promotion of contactless payment options will reduce security risks for drivers while promoting a more seamless driver experience

There are various hardware and software techniques for implementing these three principles and mitigating risks of malicious actors gaining access to public charging infrastructure and information.

Safety

EV Chargers should be compliant with the UL 2202 standard for Safety EV Charging System Equipment