

CHARGING FOR HEAVY-DUTY ELECTRIC TRUCKS

Frequently Asked Questions about the Megawatt Charging System and SAE J3271

WHO NEEDS MEGAWATT CHARGING?

Megawatt-level charging is important for medium- and heavy-duty commercial vehicles. These larger commercial vehicles use a lot of energy and often must recharge quickly to avoid costly downtime. Very high-power charging equipment is necessary to quickly recharge the high-capacity batteries in those vehicles. For reference, a long-haul trucker driving a Class 8 tractor would require a 1.6-MW charge to recover 400 miles of charge within a 30-minute break. The SAE J3271, also called the Megawatt Charging System (MCS), aims to meet the unique high-reliability expectations for commercial vehicles (proposed as >99.99% success rate for startup on the first attempt with uninterrupted completion).

WHAT IS THE SAE J3271 STANDARD

The SAE J3271 charging standard is a standard currently under development for chargers that can provide charging power from 440kW (350A/1250vdc non-cooled) up to 3.75MW (3000A/1250vdc actively cooled). For reference, the direct current (DC) fast chargers used most often for charging light-duty electric vehicles (EVs) are commonly 50kW – 350kW (up to 350/500A-920vdc). SAE J3271 includes standardized coupler (plug) design, communications protocols, and safety requirements to allow interoperability between vehicles, charging stations, charging networks, and the electric grid. To date, most Class 3 or higher EVs use the J1772-combo (CCS) standard. The SAE J3271 standard will complement, not replace, J1772 CCS standards, picking up on charging power where J1772 CCS ends.

BACKGROUND: WHAT IS A CHARGING STANDARD?

Charging standards ensure that vehicles and charging equipment from different manufacturers are compatible with each other, allowing for any standards-compliant charging system to charge any standards-compliant electric vehicle. Standards exist for other technologies as well. For example, for 120V grounded wall sockets, the NEMA 5-15 or 5-20 standard is what allows you to plug a phone charger into any 120V wall socket in the U.S. with confidence that your phone



Photo: Ted Bohn, ANL

will charge safely. Charging standards include many specifications, but some key examples include the number and configuration of the pins on the charger plug as well as safety and reliability requirements.

HOW ARE SAE CHARGING STANDARDS DEVELOPED AND WHEN WILL SAE J3271 BE FINALIZED?

The process of developing standards includes progression through three key phases.

1. **Technical Information Reference (TIR):** The TIR is an initial set of requirements based on stakeholder input and testing of pre-production prototypes. The first draft of the TIR for SAE J3271 was released in December 2022. Subsequent revised drafts are expected in spring 2023 as more units are deployed. Multiple vehicle manufacturers and electric vehicle supply equipment manufacturers are expected to show their MCS products at the ACT Expo in Anaheim, California, and the EVS36 conference in Sacramento, California, both in 2023.
2. **Recommended Practice (RP):** These are more detailed requirements based on insights from pilot deployments. At the RP phase, the standard is closer to its final form but can still be changed based on insights from deployed systems and user feedback. The RP release for SAE J3271 is expected in January 2024.



Left to right, preproduction plug and vehicle inlet from Rema. MCS-equipped EVSE at Electric Island Portland, Oregon. (Photos: Ted Bohn, ANL)

3. **Industry Standard (IS):** This is the final set of standards developed once the product is mature and widely deployed. Changes to the standard after this phase are rare. SAE J3271 is anticipated to reach the IS phase in 2025 or 2026.

WHEN WILL TRUCKS AND CHARGERS START USING THE SAE J3271 STANDARD?

Trucks and chargers are being built and field tested in pilot deployments today. The SAE J3271 first draft Technical Information Reference (TIR) standard was published in December 2022. An interoperability testing event for MCS charging stations and vehicles occurred in October 2022 at a heavy-duty electric truck charging site called Electric Island in Portland, Oregon, with several manufacturers participating. Five coupler and inlet manufacturers have indicated that they will have products shipping to customers in 2023 in pilot deployments as well as fleet-level deployments under the published TIR J3271 standard in 2024.

WHAT FUNDING OPPORTUNITIES EXIST TO SUPPORT MCS PROJECTS?

The recently passed Bipartisan Infrastructure Law (BIL) and the Inflation Reduction Act (IRA) include significant federal funding opportunities potentially involving MCS projects. The BIL contains nearly \$30 billion and IRA contains about \$50 billion that MCS projects could qualify for.¹ These programs are summarized in the table below. The coming months will be essential for securing MCS project funding. States and utilities may also have funding programs that could support MCS projects.

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Funding from Recently Passed Federal Laws That Could Support MCS Projects

Description	Source	Funding Amount (\$ millions)
Congestion Mitigation and Air Quality Improvement Program	BIL Section 11115	\$13,200
Grants for charging and fueling infrastructure	BIL Section 11401	\$2,500
Reduction of Truck Emissions at Port Facilities	BIL Section 11402	\$250
Deployment of Technologies to Enhance Grid Flexibility	BIL Section 40107	\$3,000
Carbon Reduction Program	BIL Section 11403	\$6,420
State Energy Program	BIL Section 40109	\$500
Port Infrastructure Development Program	BIL Division J, Title VIII	\$2,250
Alternative Fuel Refueling Property Credit	IRA Section 13404	\$1,738
Extension of the Advanced Energy Project Credit	IRA Section 13501	\$6,255
Improving Energy Efficiency or Water Efficiency or Climate Resilience of Affordable Housing	IRA Section 30002	\$1,000
Grants to Reduce Air Pollution at Ports	IRA Section 60102	\$3,000
Climate Pollution Reduction Grants	IRA Section 60114	\$5,000
Environmental and Climate Justice Block Grants	IRA Section 60201	\$3,000
Clean Heavy-Duty Vehicles	IRA Section 60101	\$1,000
Greenhouse Gas Reduction Fund	IRA Section 60103	\$27,000
Diesel Emissions Reductions	IRA Section 60104	\$60
Neighborhood Access and Equity Grant Program	IRA Section 60501	\$3,045
TOTAL		\$79,218

¹This is based on an initial review by Atlas Public Policy of programs in the BIL and IRA that could support transportation electrification. Atlas reviewed these program summaries to try to identify programs that could support MCS projects specifically. Full summaries of transportation electrification programs in the BIL and IRA are available at <https://www.atlasevhub.com/public-policy/federal-policy/>.