Updated Recommendation on ISO 15118 Ready Chargers (February 2024)

California Energy Commission (CEC) staff recommends that charging providers ensure chargers using J1772/Combined Charging System (CCS) or J3400/North American Charging Standard (NACS) connectors are International Organization for Standardization (ISO) 15118 ready as defined in this document. CEC analysis indicates that ISO 15118 ready chargers are needed to support interoperability, critical vehicle-grid integration capabilities, and an improved charging experience for drivers.

This document provides an update to the [Recommendation for Deployment of ISO 15118-Ready Chargers](#) published in February 2022 (TN 241955 in docket [19-AB-2127](#)). Clarifications on the applicability of ISO 15118 readiness and additional information about ISO 15118 implementation are described below.

1. Background

ISO 15118 is an industry standard that outlines digital communication between electric vehicles (EVs) and chargers, and is already widely used for direct current charging controls. ISO 15118 also supports features that help coordinate charging with grid signals and improve the charging experience. For example, many newer EVs and chargers support ISO 15118 Plug and Charge, enabling drivers to automatically start and pay for charging simply by plugging in. Plug and Charge may increase the likelihood that charging is successful on the driver's first attempt. Notably, Plug and Charge capability using ISO 15118-2 is required for chargers funded through the federal [National Electric Vehicle Infrastructure](#) formula program. Similarly, under [Senate Bill 123](#), all direct current chargers requiring payment installed or made publicly available in California must include Plug and Charge capability using ISO 15118 no later than July 2024.

In 2023, most automakers announced that future EV models would be equipped with a J3400/NACS inlet beginning around 2025. In response to these developments, the CEC published a [NACS Statement](#) in September 2023. The original Tesla NACS specification required digital communication using powerline communication and indicated support for ISO 15118. CEC staff anticipates the SAE standardization process will formalize these specifications in the J3400 standard.

2. ISO 15118 Ready Definition

Given the continued adoption of ISO 15118 by the industry, including for products using J3400/NACS, CEC staff recommends that charging providers pursue widespread deployment of ISO 15118 hardware ready chargers. An "ISO 15118 ready" charger is defined as any alternating current or direct current charger with a J1772/CCS or J3400/NACS connector that is capable of all the following:

1. Powerline communication based digital communication as specified in ISO 15118-3.
2. Secure management and storage of keys and certificates using a hardware security module (HSM), trusted platform module, SoftHSM, or similar technology.
3. Transport Layer Security (TLS) version 1.2. Support for TLS 1.3 is recommended to support cryptographic requirements in ISO 15118-20.
4. Remotely receiving updates to activate or enable ISO 15118 use cases. Support for cryptographic agility is recommended to replace broken ciphers.
5. Connecting to a charging station management system, for example using Open Charge Point Protocol (OCPP).
6. Selecting the appropriate communication protocol requested by the EV.

The above definition is substantively consistent with the definition published in the February 2022 recommendation and includes minor clarifications. Importantly, given growing industry adoption of J3400/NACS, CEC staff highlights that the above definition applies to products using J3400/NACS.

The above definition for ISO 15118 ready does not apply to chargers equipped exclusively with connectors and charging interfaces that support ISO 15118 using physical layers other than powerline communication. For example, chargers with J3105/1 or J3105/3 automated connection devices support ISO 15118 communication using Wi-Fi, not powerline communication.

The CEC will consider requiring the exclusive use of alternating current and direct current chargers that are ISO 15118 ready, as defined above, in CEC projects as appropriate.

3. Conformance Testing

While ISO 15118 ready chargers include the needed hardware to communicate using ISO 15118, activating ISO 15118 use cases (such as Plug and Charge) requires the additional implementation of software on these chargers. The implementation of ISO 15118 software on the EV and charger must be consistent for communication to be successful, and data suggest that this is not always the case. Inconsistent implementation of ISO 15118 software across brands and product models contributes to charging interoperability problems and failed charging sessions.

To advance interoperability across brands, charging providers should verify that their ISO 15118 software implementation is consistent with the ISO 15118 specification. CEC staff recommends that charging providers work with third party labs to test for ISO 15118 conformance, which can help identify implementation errors. For example, ISO 15118 conformance testing services are offered at the DEKRA Vehicle-Grid Innovation Lab, which is partly supported by CEC funds. Charging providers may also self test for conformance using test cases, for example those outlined in ISO 15118-4.

At a December 2023 workshop, CEC staff proposed phasing in ISO 15118 conformance testing and certification requirements for certain CEC funded chargers. A conformance certification would go beyond simply ensuring hardware readiness for ISO 15118 and additionally verify that the charger's software implementation is consistent with the ISO 15118 specification. Similarly, at a November 2023 workshop, the California Air Resources Board proposed phasing in communication standards requirements for EVs, such as ISO 15118-2 and ISO 15118-20. The California Air Resources Board also proposed developing and implementing conformance tests for required communication standards.

4. ISO 15118-20 Ready and ISO 15118-20 Light

Unlike ISO 15118-2, ISO 15118-20 includes bidirectional charging and stronger cybersecurity requirements. An ISO 15118 ready charger as defined in Section 2 may not necessarily support TLS 1.3 or the minimum key lengths described in ISO 15118-20. Accordingly, CEC staff recommends that all bidirectional chargers and chargers used in settings where strong security is a priority meet a more stringent "ISO 15118-20 ready" definition.

An ISO 15118-**20** ready charger meets all the following requirements:

1. Is ISO 15118 ready as defined in Section 2.
2. Supports TLS 1.3.
3. Has sufficient computational support for both ISO 15118-2 and -20 keys and certificates.

Some market actors have indicated that hardware platforms used in existing or near term products may not be sufficient to support the cryptographic demands of ISO 15118-20, including TLS 1.3 and longer key lengths. To mitigate this near term concern, some standards bodies have formalized an "ISO 15118-20 Light" option for private settings which utilizes TLS 1.2 with ISO 15118-20 messaging. Details for implementation of ISO 15118-20 Light are described in Section 6.11 in SAE J2847/2. ISO 15118-20 Light may be an appropriate near term bridge implementation for chargers in private settings such as residences or behind-the-fence lots.

Powerline Communication Chipset Updates

Since the publication of the February 2022 recommendation, CEC staff has observed greater market availability of and improvements to powerline communication chipsets. For example, one chipset supplier began mass production of their automotive grade product, while another supplier announced plans to launch an updated, automotive grade chipset in the coming years. Suppliers are also offering updates to existing products, such as firmware patches (which may shorten times for initial connection and signal level attenuation characterization) and tools to automate signal amplitude calibration. CEC staff recommends that charging providers work with their powerline communication chipset supplier to access updates that may aid product development and ISO 15118 implementation.

Availability of Open Source Software Stacks

To accelerate and simplify ISO 15118 software implementation, the Joint Office of Energy and Transportation, in conjunction with the Linux Foundation, is supporting the development of an open source software stack for chargers called EVerest. EVerest includes support for ISO 15118-2 (including Plug and Charge), DIN 70121, as well as OCPP 1.6 and parts of OCPP 2.0.1. Pending updates will add support for ISO 15118-20. EVerest may reduce the time and resources needed for charging providers to implement ISO 15118 and other protocols on chargers.