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# Recommendation for Deployment of ISO 15118-Ready Chargers

*This document supersedes TN 240210 in docket 19-AB-2127.*

California Energy Commission (CEC) staff recommends that charging providers pursue widespread deployment of ISO 15118-ready chargers. CEC analysis indicates that ISO 15118-ready chargers are needed to support current and upcoming vehicle features, critical vehicle-grid integration capabilities, and an easier-than-gas user experience.

## Background

ISO 15118 is an industry standard that supports high-level communication between the vehicle and the charger, and is already widely used for basic DC charging controls with the Combined Charging System (CCS) connector. ISO 15118 also supports use cases that help coordinate charging with grid signals and improve the charging experience. For example, some vehicles today support ISO 15118's Plug and Charge feature, allowing drivers to automatically start and pay for a charging session simply by plugging in. Given the growing use and capabilities of ISO 15118, CEC staff recommends that charging providers pursue widespread deployment of ISO 15118-ready chargers.

## ISO 15118-Ready Hardware Definition

Based on dozens of stakeholder conversations, CEC staff has identified the following capabilities needed to support ISO 15118 communication for chargers using the J1772 or CCS connector. An "ISO 15118-ready" charger is capable of, at minimum:

1. Powerline carrier (PLC) based high-level communication as specified in ISO 15118-3.
2. Secure management and storage of keys and certificates.
3. Transport Layer Security (TLS) version 1.2; additional support for TLS 1.3 or subsequent versions is recommended to prepare for future updates to the ISO 15118 standard.
4. Remotely receiving updates to activate or enable ISO 15118 use cases.
5. Connecting to a backend network.
6. Selecting the appropriate communication protocol used by the vehicle.

An ISO 15118-ready charger uses at least one J1772 or CCS connector; this includes multiple-connector DC chargers with at least one CCS connector. ISO 15118-ready chargers should have onboard hardware to support the above capabilities, although software implementation of specific ISO 15118 use cases is not included in the scope of this recommendation. For example, an ISO 15118-ready charger should have the onboard hardware needed for Plug and Charge, but might not yet have Plug and Charge software implemented.

ISO 15118-ready chargers should be capable of selecting the appropriate communication protocol used by the vehicle. AC chargers should support pulse-width modulation control as specified in J1772 and be capable of communicating using ISO 15118-2 and/or ISO 15118-20. DC chargers should support DIN 70121 and be capable of communicating using ISO 15118-2 and/or ISO 15118-20.

CEC staff estimates that the marginal hardware components needed for ISO 15118 readiness cost less than \$6 per charger. Despite the growing number of electric vehicle models using ISO 15118 for Plug and Charge and grid-integration features, many existing chargers, particularly AC chargers, are not equipped to reciprocate such communication. To fully support these vehicle models and capabilities, CEC staff recommends widespread deployment of ISO 15118-ready chargers.

The capabilities of an ISO 15118-ready charger identified above outline a hardware baseline for chargers using the J1772 or CCS connector and do not discourage additional functionality. ISO 15118-ready chargers may optionally support bidirectional charging. ISO 15118-ready chargers do not affect the use of other communication pathways (such as vehicle telematics).

### **Market Readiness for ISO 15118-Ready Chargers**

CEC analysis indicates that the DC charger market is prepared to transition to ISO 15118-ready chargers more quickly than the AC charger market. All existing CCS chargers are already equipped with a PLC transceiver to support digital communication using DIN 70121, and CEC staff expects that such chargers can be made ISO 15118-ready with minimal modification. CEC staff recommends that charging providers pursue widespread deployment of ISO 15118-ready DC chargers in 2022.

Most existing AC chargers are not equipped with a PLC transceiver to support digital communication, and CEC staff expects that the AC charger market will require time to transition toward ISO 15118-ready hardware designs. CEC staff recommends that charging providers pursue widespread deployment of ISO 15118-ready AC chargers beginning in late 2022 or 2023, depending on market indicators described below.

CEC staff plans to monitor the number of commercially available ISO 15118-ready charger models and brands to gauge market readiness for widespread deployment. Discussions with stakeholders indicate that, for the DC charger market, the availability of five or more ISO 15118-ready DC charger brands (not models) is reasonably indicative of a market prepared for widespread deployment of ISO 15118-ready DC chargers. For the AC charger market, the availability of eight or more ISO 15118-ready AC charger brands (not models) is reasonably indicative of a market prepared for widespread deployment of ISO 15118-ready AC chargers. CEC staff also plans to monitor related market indicators, such as PLC transceiver lead times.

### **Questions & Answers**

**What is an "ISO 15118-ready" charger?** An ISO 15118-ready charger is any charger with a J1772 or CCS connector that is capable of powerline communication as outlined in ISO 15118-3, secure management and storage of keys and certificates, TLS version 1.2 (additional support for TLS 1.3 or subsequent versions is also recommended), and connecting to a backend network. Manufacturers can self-test for ISO 15118-3 conformance using tests defined in ISO 15118-5. ISO 15118-ready chargers should be capable of remotely receiving updates to activate or enable ISO 15118 use cases. ISO 15118-ready chargers should be capable of selecting the appropriate communication protocol used by the vehicle.

**Which ISO 15118 use cases should an ISO 15118-ready charger support?** The capabilities of an ISO 15118-ready charger outlined above provide a hardware baseline to support important user experience and grid-integration capabilities. The content above focuses on hardware readiness; software implementation of specific use cases is not discussed at this time. For example, an ISO 15118-ready charger should be capable of Plug and Charge and energy management features, but might not have these use cases already implemented in software. Fully implementing use cases will require further collaboration between automakers, charging providers, software providers, other hardware suppliers, and testing laboratories. As such, ISO 15118-ready chargers should be capable of receiving updates to activate or enable ISO 15118 use cases.

**Why does CEC staff recommend deployment of ISO 15118-ready AC chargers?** Near-term industry implementation of ISO 15118 is focused on Plug and Charge, particularly for public DC chargers. However, ISO 15118 also provides a communication link to coordinate charging with local grid conditions, and it supports the exchange of data including estimated departure time, energy (kWh) needed by the vehicle, current electricity prices, current carbon intensity of local electricity, and other relevant information. CEC staff expects AC

chargers to comprise the bulk of the state's chargers (for example, those located at homes and workplaces), so it is critical to ensure that AC chargers support grid integration and reliability.

**Will ISO 15118-ready chargers work with existing vehicles?** Yes. ISO 15118-ready chargers should be capable of selecting the appropriate communication protocol used by the vehicle. AC chargers should continue supporting pulse-width modulation control as defined in J1772 and may support multiple versions of ISO 15118 (-2 and -20). DC chargers should continue supporting DIN 70121 and may support multiple versions of ISO 15118 (-2 and -20).

**Which electric vehicles use ISO 15118?** The CEC documented a non-exhaustive list of light-duty electric vehicle manufacturers with plans to implement ISO 15118 in Chapter 5 of the [AB 2127 Electric Vehicle Charging Infrastructure Assessment](#).

**Is there sufficient supply of transceiver hardware to support the deployment of ISO 15118-ready chargers?** CEC staff has identified four manufacturers of HomePlug Green PHY transceivers used to implement PLC-based high-level communication, including Qualcomm, ST Microelectronics, Lumissil, and Vertexcom. Suppliers have stated that it is feasible to supply HomePlug Green PHY transceivers at a level consistent with the infrastructure trajectories described in the AB 2127 report. In addition, one charging provider has stated that it is possible to enable high-level communication for ISO 15118 without a HomePlug Green PHY transceiver.

**What about other communication pathways, such as telematics?** The capabilities identified for an ISO 15118-ready charger do not discourage the use of other pathways for charging communication. CEC staff expects that some automakers will use ISO 15118 in concert with their vehicle telematics systems.

**What about CHAdeMO and Tesla connectors?** The recommendations above apply to any charger with a J1772 or CCS connector. For DC chargers, this includes multiple-port chargers with at least one CCS connector. The recommendations above do not apply to chargers using only CHAdeMO and/or Tesla connectors. CEC staff continues to monitor the market to ensure that it supports deployment of chargers that provide appropriate levels of support for vehicles that do not use CCS.