OEM Roundtable recommendation #5

This document is a recommendation of the *OEM roundtable for electrified construction equipment* to Non-Road Mobile Machinery (NRMM) OEMs selling in the European market. It constitutes a recommendation to voluntarily standardize the described aspects for the benefit of end-users' ability to operate electric machines easily and safely. All recommendations and further details on the roundtable process are publicly available at https://www.emissieloosnetwerkinfra.nl/english/oem-roundtable.

Name: **Priority charging protocol for DC charging via CCS2**

Executive Summary:

ISO 15118-2 should be the default priority charging protocol, ISO15118-20 is 'nice to have'.

As the transition to zero-emission construction sites accelerates, challenges related to reliable and intelligent charging are increasingly emerging on-site. Participants of the ENI/ElaadNL OEM Roundtable are aligning on a unified message: ISO 15118-2 should be the default charging protocol for electric construction equipment to overcome these issues in the field. This standard meets current functional demands, enables smart charging, complies with EU cybersecurity requirements, and simplifies implementation compared to newer alternatives. The DIN 70121 charging protocol should not be prioritized.

The more advanced ISO 15118-20 charging protocol is seen as the logical next step for developments that are emerging. E.g. vehicle to grid functionality is expected to be utilized increasingly as construction equipment typically involves large battery capacity assets.

Problem:

Smooth interoperability between different brands as well as smart* charging features are in high demand by end users and grid operators. Results of the ElaadNL BuildZero testevents as well as experience in the field indicate that the most basic charging protocol (DIN 70121) often prevails in the handshake between machine and charger, not meeting end-user needs, causing errors and impacting grid operators.

Solution:

The OEM roundtable has discussed possible solutions to the problem described above.

Standards and its characteristics

Standardized communication protocols play a critical role in achieving interoperability, infrastructure efficiency, safety, and scalability within the charging ecosystem for electric construction machinery. ISO 15118-2 is recognized as a comprehensive protocol that supports both AC and DC charging, enables smart charging schedules, and facilitates secure communication through Transport Layer Security (TLS, a widely used method to comply with future European cyber security regulations). Its compatibility with both power types and practical feature set makes it particularly suitable for the operational demands on construction sites. This protocol not only supports TLS, in order to comply with (future) European regulations on cyber security, but also provides a robust and mature framework for smart, safe and scalable charging on construction sites.

** Short definition of Smart Charging: "Ability to remotely control the speed and timing of a (set of) charging sessions based on real-time factors."*

Elaboration: According to the Smart Charging Requirements (SCR), smart charging refers to the ability to remotely control and optimize electric vehicle (EV) charging based on real-time factors such as grid capacity, electricity prices or the availability of renewable and/or locally generated energy. It ensures that EVs charge at the most efficient times and speeds — benefiting operators, grid operators and energy providers — while maintaining the primary goal of fully charging machines by a given end time. Smart charging relies on standardized communication protocols, secure data exchange, and compatible hardware across vehicles, charge points and energy systems, enabling coordinated and flexible integration of EVs into a (local) electric system that can be managed by EMS software.

In contrast, DIN 70121 is a transitional protocol derived from early versions of ISO 15118 and lacks essential features such as TLS support and compatibility with the ISO standard. On the other hand, the newer ISO 15118-20 introduces advanced capabilities including dynamic and bidirectional charging, but it is not backward compatible with ISO 15118-2 and involves higher implementation complexity. For these reasons, ISO 15118-2 currently presents the most effective balance of maturity, functionality and ease of deployment. That makes it the most practical and widely supported standard for vehicles and charging infrastructure in the zero-emission construction sector.

Real life testing

During recent industry dialogues and field tests (e.g. during the BuildZero testevents), OEMs observed inconsistencies in charging protocol prioritization, with legacy DIN-based protocols often taking precedence over ISO 15118-2. However, participating manufacturers clarified that their machines should already give priority to ISO 15118-2, and deviations observed during testing were unexpected. Given this observation, real life testing remains an essential safeguard against unmet expectations on the construction site.

Align Charging Infrastructure

To ensure full interoperability and avoid fragmentation, charging station manufacturers and battery box providers are urged to align with this recommendation. ISO 15118-2 is sufficiently advanced to meet the current operational and cybersecurity needs of construction sites, where additional features of ISO 15118-20 are not yet justified by broad customer demands.

While ISO 15118-20 offers future-forward capabilities, its complexity and limited immediate added value in construction contexts suggest that its broad implementation is premature. And would on short notice require costly short-term adaptations by manufacturers, leading to unnecessary higher vehicle prices. Prioritizing ISO 15118-2 as the basic standard sends a clear market signal and supports rapid, harmonized deployment of (smart) charging infrastructure on the construction site. ISO 15118-20 is nonetheless seen as a value adding feature in the construction sector by frontrunners and is welcomed as an optional feature next to ISO 15118-2.

Call to Action:

To accelerate the deployment of reliable and interoperable charging solutions, we urge all stakeholders to take the following actions for all new product launches:

1. **Construction Equipment OEM**
   All OEM machines that utilize DC charging with CCS2 hardware should safeguard that all chosen protocol features fully comply with and prioritize the ISO 15118-2 protocol. This should be explicitly documented in product specifications and operational manuals.

2. **Charging Equipment Manufacturers**
   Charging station and battery container manufacturers with CCS2 hardware should also safeguard that all chosen and prioritized protocol features fully comply with the ISO 15118-2 protocol. This support should be explicitly documented in product specifications and operational manuals.

3. **Procurement Guidance**
   Contractors and site operators should require ISO 15118-2 as the default charging protocol when purchasing charging infrastructure and machines to ensure seamless interoperability.

Contractors should however also consider their future needs in terms of e.g. bi-directional capabilities or plug and charge, what are features of the more advanced ISO15118-20 standard.

4. **Standardization Leadership**
   Industry associations and regulatory bodies should formally endorse ISO 15118-2 as the baseline standard for the (zero-emission) construction sector, while allowing ISO 15118-20 as an optional pathway for advanced use cases.

By converging on ISO 15118-2 today, we establish a secure, scalable, and future-ready charging ecosystem for the construction industry. We acknowledge that ISO15118-20 functionality has additional features that are and will be valuable to construction sites and equipment owners.

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