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The ISO standard 15118 enables simple and intelligent charging and represents an integral part for the digital interconnection of electric vehicles.

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Summary

The merge of different sectors to realize the rollout of electric mobility needs new standards and processes. Therefore, the implementation of (electric) vehicles into the electricity grid is a complex and challenging task. That's the reason, why ISO 15118 – as a baseline for all customer centric use cases is needed and highly welcomed. The two main use cases, plug and Charge and Smart Charging therefore will define the future of this industry in the next years. This article contains a short look out, at which state the industry is already, and if and which future developments are still needed.

1 A new standard for customer-friendly and connected electric mobility

Two previously independent sectors are now connected by the electric vehicle: the automotive and the energy supply industry. The synergy potential of this cooperation also depends on standardised interfaces between electric vehicles and the electricity grid. ISO, the International Organization for Standardization, has now defined the interfaces for customer-friendly and interoperable charging (Plug&Charge) as well as the integration of electric vehicles into the energy network (SmartCharging) in the international ISO standard 15118. Thus, the technical framework for different variations of integrating electric vehicles in intelligent power networks has been developed and a signal of investment safety has been created for automotive manufacturers and energy suppliers.

1.1 Secure communication

Within the scope of a global standardisation initiative, a modern IT communication process between electric vehicle and charging station was developed, which takes into account existing standards and supplements safety-relevant components. Based on certificates, the ISO standard 15118 regulates the automated and secure data exchange between electric vehicles and the charging infrastructure. It also describes general applications and information flows of charging and payment processes. Technologies such as inductive and bidirectional charging, which are still under development, are also integrated into the standard. Without further interaction with the charging station on the part of the driver, charging electric cars will become even more straightforward, which is the overall goal. This requires the vehicle and the charging station to be securely authenticated and authorised. At the same time, all processes between the electric vehicle and the charging station have to be carried out automatically and safely – EV drivers only have to connect the charging cable.

The actual communication and charging process can be divided into four steps (see graphic). First, the charging cable is to be connected to the charging station. A certificate request for the certificate in the vehicle (Mobility Operator Contract Certificate) is now submitted at the charging station, which also has a

certificate (Charge Point Operator EVSE Certificate) (step 1). There are different ways of transporting an emobility certificate into a vehicle, which builds upon a certificate already provided by car manufacturers during production. The contract identifier (EMA-ID) is sent to the charging station (step 2) over the secured plug-in connection now in place, which allows the contract to be checked in real-time by the respective energy providers or clearing houses. This completes authorisation, the charging process is confirmed (step 3) and the electric car is charged (step 4).

2 Preparing the new ISO standard for the own business model

The ISO standard 15118 laid the foundation for communication between electric vehicles and charging infrastructure. However, many processes are not yet sufficiently defined, as other players, like network operators, fleet managers and third-party providers, are involved in the value chain of charging processes and value-added services. There are already numerous reasons for all relevant players in the emobility market to include the new ISO standard in their own business models. As a result, every company that is active in the emobility industry is responsible for describing relevant processes and interfaces between the market players and assigning roles and responsibilities to all market participants. This is necessary for the implementation of the certificate-based communication described, which is based on a public-key infrastructure.

Since a very technical perspective is taken, assessing the impact of ISO standard 15118 on the own business model, however, is only possible to a limited extent. For this reason, together with market partners Hubject has developed a capability maturity model. Through this capability maturity model, every emobility company is able to carry out a quick and straightforward assessment of the impact on the own business model and the own corporate strategy.

Another reason to implement this charging standard at an early stage is the financial support of charging systems which acknowledge this standard, which includes initiatives from various national governments. For example, the German government has already made the ISO standard 15118 an integral part of the planned subsidy programme for public normal and fast-charging infrastructure which totals € 300 million, in order to build charging stations, which are equipped for the future. Likewise, the US state of California has specified that the implementation of the standard is clearly in line with the energy efficiency requirements and should be applied to all charging stations.

Through these and other market developments it is to be assumed that the integration of the charging standard will be relevant for each of the following company types in the short and long run.

The charge point operator (CPO) is a classic charging process stakeholder and, as operator of the charging station, particularly committed to implementing ISO 15118. Energy suppliers and public services occupy this role. In order to automatically communicate with the electric vehicle through the charging station, the latter must be able to process the information of the vehicle and “identify” itself. The charging station acts as a server and responds to the electric car’s messages. Corresponding requirements are the responsibility of the charging station hardware, but also the back-end software.

The mobility operator (MO) is defined to play a further elementary role in the charging process by the ISO standard 15118. On the one hand, the MO sells the electric car driver a contract, on the other hand, he is responsible for the authentication method and for issuing the contract certificate during the charging process. Since this must be done on the software side, the standard can be taken into consideration at the start of production, but implementation is only reasonable if the number of charging infrastructures compatible with ISO 15118 increases.

The original equipment manufacturer (OEM) is the connection between the charge point operator and the mobility operator. By means of a provisioning certificate the OEM has to make sure that the electric vehicle is already prepared for all possible circumstances within the certificate administration upon delivery.

For the EV drivers, the most important advantages, such as automatic authentication and authorisation at all charging points via eRoaming technology, high security against data manipulation through integrated

information security, and the optimisation of charging processes based on energy demand and departure time are all incorporated in the new standard.

At the same time, the implementation of the standard makes it possible for emobility service providers and charge point operators to forecast the energy demand and optimise grid utilisation, to integrate renewable energies into electricity offers and to provide time-variable tariffs as well as to use non-moving vehicles for temporary storage. In addition, the simplification of activating the charging station is possible by eliminating RFID cards through certificate-based communication (vehicle to charging point).

2.1 The following recommendations for action can be concluded from current developments:

- The framework of the technology to test the implementation of the ISO standard 15118 or to start a check at an early stage is already available.
- An assessment regarding integration into the company's own business model is recommended in order not to lose the connection to the market development – and, thus, avoid "stranded investments". For example, use a capability maturity model to analyse the actual situation and define a target state.
- Digitalisation in the emobility industry requires a holistic approach: as you develop your emobility products & services, check your organisation, processes, technology as well as company culture.
- The ISO standard 15118 demonstrates that emobility is based on cooperation between stakeholders from the energy, automotive, and IT industry. The establishment of relevant collaborations and partnerships helps to develop new business areas and to shape the technological development of emobility at an early stage.

2.2 Future-proof charging infrastructure

The basic conditions of the ISO standard 15118, which have a significant impact on the development of a viable charging infrastructure and the establishment of new business models, are still being clarified. Nevertheless, each of the market players described is advised to look into the subject of charging infrastructure for electric vehicles as part of current considerations. Be it in the bidding for new charging stations or in the development of new electric power or customer products.

Authors

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