

ECISS BENEFIT OF SMART CHARGING

ECISS DELIVERABLE 2.3

ECISS

From electric vehicle to smart society

allego

Eneco
eMobility

GreenFlux

JEDLIX

NKL

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innovation
for life

a TKI Urban Energy project

ECISS: E-MOBILITY COMMUNICATION & INFORMATION SYSTEM STRUCTURE
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ECISS benefit of smart charging electric vehicles

A charging station is normally used for a basic current draw of electricity which starts when the car is connected and ends when the battery is fully charged. But a charging station can be so much more. The ECISS project has done excessive research about the possibilities of smart charging. ECISS project partners have developed an architecture which enables market parties to provide additional services on the charging station.

This article describes the research and test results of the use of charging profiles in the context of smart charging. The result is an outcome of a collaboration between ECISS partners Jedlix, Greenflux and Eneco Emobility.

Knowledge has been gained by making use of various use cases about the technical conditions that are required to add new services to the charging system. The technical conditions will help (new) service providers in the future to continue to guarantee roaming and interoperability for all services at all charging points within the charging network. The collaboration of ECISS partners in this project has the following advantages:

- It becomes easier to implement new applications
- The use of a common protocol makes it easier for new market parties to develop other and new services without changing the overall system.

New role: Smart Charging Service Provider (SCSP)

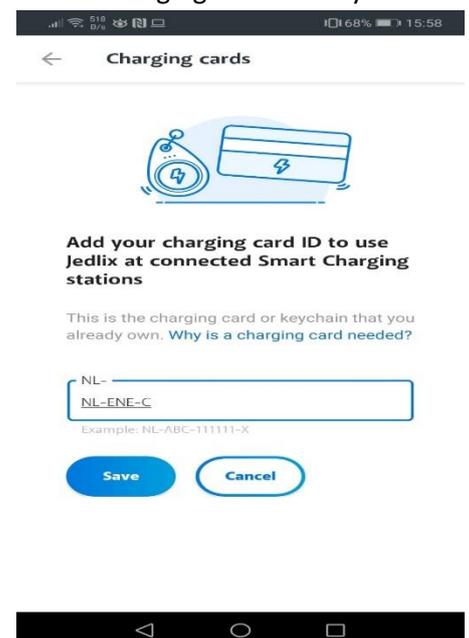
To make smart charging possible, the topology of the Open Charge Point Interface (OCPI) is expanded. Within OCPI it is already common for the roles of the electric Mobility Service Provider (eMSP) and Charge Point Operator (CPO) to communicate with each other. The role of Smart Charging Service Provider (SCSP), also described as “energy service broker”, was added as new party that helps to utilize flexibility. ECISS partner Jedlix operates as a SCSP within the ECISS-implementation and does this in addition of the existing eMSP and CPO-roles for charge points.

The principle of smart charging

By communicating charging profiles to the SCSP in advance, the car will not start charging immediately if this is not necessary. The SCSP will check capacity and availability of the energy network first instead. By delaying a charging session for example to the evening and night hours, the car can be charged faster because the energy network is used less. Of course, the EV driver can always determine whether the car starts charging.

How does it work?

A user of the Jedlix application register his charging card number (visual ID) in the Jedlix app (figure 1). Jedlix registers the customer by using the visual ID at the CPO. In this case is Jedlix the SCSP and not the electric Mobility Service Provider (eMSP) of the customer. Jedlix will not invoice the regular charging transaction based on a charge detail record like the eMSP normally do. To make smart charging possible it is necessary that the CPO shares information with the SCSP. This real time information exists of the EV driver (ID) and connection of the EV to the energy grid.

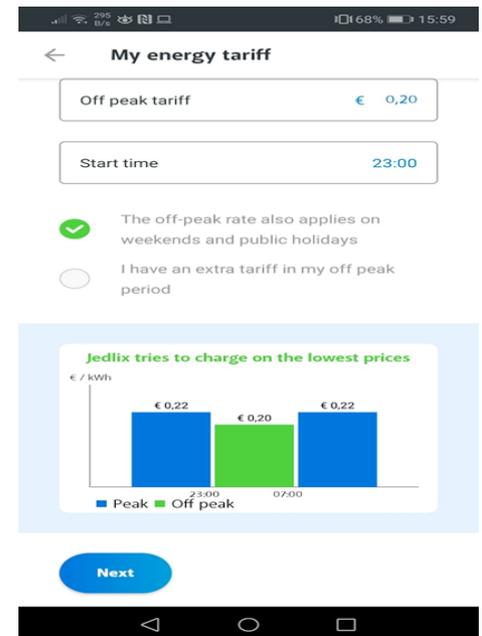


If the EV driver starts a charging session, by swiping its charging card, a (smart) charging session is triggered (“start charging session”). Jedlix, in this case the SCSP, calculates a charging profile for the charge point based on three types of input:

- 1) Users settings in the app;
- 2) Information of charge session and charge point;
- 3) Energy signals.

Jedlix sends the charge profile by an “update charging profile” to the CPO. Based on session updates from the CPO to Jedlix a charging profile is updated during a Smart Charging session. This session update provides information about kWh and time of charging. This is different compared to a regular (not smart) charging session. With a regular charging session only the total amount of kWh is relevant (CDR). When the charging session ends, a message is send to Jedlix and the smart charging session is ended.

Figure 1: user ID



Smart charging platform leads to savings EV driver

The Smart Charging Platform of Jedlix aggregates the flexibility of the battery in EVs and operates as a “virtual power station” (VPP) towards parties in the energy chain (e.g. TSO and BRP). The charge points services get access to these markets thanks to the OCPI-connection. The SCSP (Jedlix) can now manage the demand of energy of all the connected EVs and can charge when the energy is less expensive (figure 2). It is even possible to align the total energy demand of a main grid connection between home and EV or office and EV. The revenues that are earned by charging when the energy price is less expensive are shared with all the parties in the charging chain and the EV-driver. The ECISS project partners expect a saving of approximately 2 cents per smartly charged kWh for the EV driver.

Figure 2: Charging when energy is less expensive

OCPI as building block for a flexible Smart Charging architecture

Frequently the question is addressed what the exact value of Smart Charging is and what market or application gives the highest value. The overall benefit of Smart Charging is easy to understand, but it is not always possible to give a quick answer to these questions. It depends on the type of situation and user and of developments in the energy sector. An important aspect to create as much value as possible is the possibility to combine different cases (“value stacking”).

The flexible architecture of the OCPI protocol and the integration of the SCSP role makes it possible to dynamically deal with the variety of use cases. Thanks to the application of Smart Charging within OCPI, an abstract layer arises which can offer the flexibility of Smart Charging by the SCSP at multiple markets and markets parties. Currently Jedlix deploys charge points for the aFRR balancing market of Tennesse (TSO) and combines this with energy market arbitration. Flexibility, direct control and feedback are crucial in this.

Test and follow-up

The current implementation has been tested at a (home) charge point that is in the backend of Greenflux (CPO) which uses Eneco E-Mobility for its connected home charge solution. The first successful test is executed with the entire flow of messages (see the figures for an overview). This interface and control can in principle

also be applied to (semi) public charge points. As SCSP, Jedlix has to take care in parallel that the relevant information for the energy chain (e.g. European Article Numbering (EAN code)) is mapped sufficiently.

The next step is to scale up to a real life situation and to do more test with different types of electric vehicles (EV's).

Between the ECISS project Allego, Eneco eMobility, Greenflux, Jedlix, TNO and NKL work together on a sustainable, reliable and affordable energy system in the built environment.

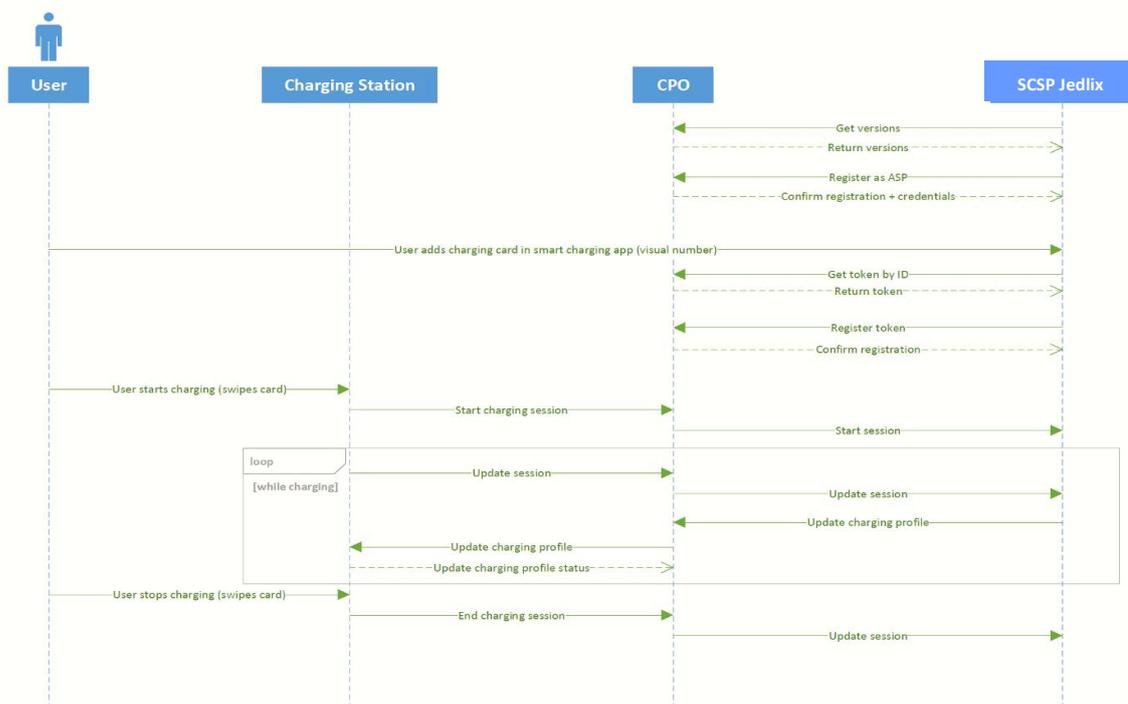
Suggestions are welcome

The ECISS project is subsidized by the TKI Urban Energy of the Ministry of Economic Affairs and Climate Policy. TKI Urban Energy stimulates the development of innovations for a sustainable, reliable and affordable energy system in the built environment. The ECISS partners the goals of the TKI Urban Energy and are open for suggestions that can help smart charging. Contact us at eciss@nklnederland.nl

Appendix: Overview of registration and process flow Smart Charging Jedlix vs CPO

1. User downloads the Jedlix app and registers itself (i.a. which charging card number, address, energy contract and type of electric car – see the print screens below)
2. Jedlix registers the card at the CPOs that are affiliated with Jedlix
3. User starts a transaction at a charge point that is managed by a 'Jedlix' CPO
4. CPO informs Jedlix that the transaction has started (indicating the charging card number)
5. During the charge session, Jedlix sends charge profiles to the CPO (which are based on the actual supply of renewable energy)
6. CPO accordingly adjusts the charge speed of the charge point
7. User ends the transaction
8. CPO informs Jedlix about the end of the charge session
9. Jedlix rewards the EV-driver with a financial amount based on the savings at the energy market

Figure 1:



Communication in the system