E-laad.nl

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E-Laad.nl: facts

- Introduction E-laad
- E-laad: facts
- The Problem
- Possibilities to decrease costs
- Interoperability
- Adding services
- A big part of the solution
- The use of open protocols
Goal

Stimulate electric transportation

Mass adoption of electric transport will have a huge impact on the grid
e-laad foundation

• 8 Dutch DSO’s
E-Laad.nl: some facts

- 2950 public charge stations
  (3600 in total, 2600 semi-public, over 12.000 private)
  32.000 plug-in EV’s in the Netherlands
- 8 different chargestation-vendors
- Weekly energy consumption: 79.253 kWh
- No: weekly transactions: 9997
- Sharing Charge Data Records with 11 EMSP’s
- Connected with Belgium and German network through ‘e-clearing.net’
- Share static and dynamic data with over 25 parties
Why public charging infrastructure?

80% of the Dutch houses is not equipped with a garage or private driveway.
E-Laad.nl: facts & figures

Energy usage and number of transactions per week

# transactions   9.766
Usage     73.039 kWh
E-Laad.nl: facts & figures

Monthly usage and number of transactions

- Usage (kWh)
- Number of transactions

- Transacties gefactureerd aan Serviceproviders
- Transacties brutoverbruik
- Bruto verbruik (kWh)
- Facturatie aan Serviceproviders (kWh)
E-Laad.nl: facts & figures

Average number of transactions per week per type of EVSE

<table>
<thead>
<tr>
<th>Weeknr.</th>
<th>E-rijder laadpunten</th>
<th>Strategische laadpunten</th>
</tr>
</thead>
<tbody>
<tr>
<td>52</td>
<td>3.16</td>
<td>2.17</td>
</tr>
<tr>
<td>1</td>
<td>3.26</td>
<td>2.27</td>
</tr>
<tr>
<td>2</td>
<td>4.03</td>
<td>2.84</td>
</tr>
<tr>
<td>3</td>
<td>4.07</td>
<td>2.91</td>
</tr>
<tr>
<td>4</td>
<td>4.19</td>
<td>2.99</td>
</tr>
<tr>
<td>5</td>
<td>4.19</td>
<td>3.01</td>
</tr>
<tr>
<td>6</td>
<td>4.16</td>
<td>2.98</td>
</tr>
<tr>
<td>7</td>
<td>4.01</td>
<td>2.94</td>
</tr>
<tr>
<td>8</td>
<td>3.89</td>
<td>2.91</td>
</tr>
<tr>
<td>9</td>
<td>3.84</td>
<td>3.03</td>
</tr>
<tr>
<td>10</td>
<td>4.05</td>
<td>2.91</td>
</tr>
</tbody>
</table>
E-Laad.nl: facts & figures

further developments
The Problem

The Total Cost of Ownership of the public charge infrastructure is too high.

Typical for the Dutch situation this is due to several issues related to:

- DSO requirements
- Safety requirements
- Regulatory requirements
The Total Cost of Ownership of the public charge infrastructure is too high.

<table>
<thead>
<tr>
<th>CAPEX</th>
<th>€</th>
</tr>
</thead>
<tbody>
<tr>
<td>station costs (average)</td>
<td>1.750,00</td>
</tr>
<tr>
<td>collision protection</td>
<td>-</td>
</tr>
<tr>
<td>parking sign</td>
<td>-</td>
</tr>
<tr>
<td>equipe parking spot</td>
<td>-</td>
</tr>
<tr>
<td>coordination costs local community</td>
<td>-</td>
</tr>
<tr>
<td>direct personnel costs realisation</td>
<td>80,00</td>
</tr>
<tr>
<td>installation</td>
<td>720,00</td>
</tr>
<tr>
<td>direct personnel costs request/preparation</td>
<td>120,00</td>
</tr>
<tr>
<td>connection</td>
<td>700,00</td>
</tr>
<tr>
<td>Total</td>
<td>2370,00</td>
</tr>
</tbody>
</table>
Problem

The Total Cost of Ownership of the public charge infrastructure is too high.

<table>
<thead>
<tr>
<th>OPEX</th>
<th>Amount</th>
<th>Energy costs per kWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>preventive maintenance</td>
<td>€ 400,00</td>
<td>Electricity € 0,062</td>
</tr>
<tr>
<td>corrective maintenance</td>
<td>€ 3,50</td>
<td>Energy taks € 0,113</td>
</tr>
<tr>
<td>insurance</td>
<td>€ 7,50</td>
<td>VAT € 0,113</td>
</tr>
<tr>
<td>communications costs</td>
<td>€ 3,50</td>
<td>Service costs</td>
</tr>
<tr>
<td>backoffice costs</td>
<td>€ 25,00</td>
<td>Total € 0,24</td>
</tr>
<tr>
<td>meter costs</td>
<td>€ 2,20</td>
<td></td>
</tr>
<tr>
<td>capacity tariff</td>
<td>€ 651,17</td>
<td></td>
</tr>
<tr>
<td>direct personnel costs</td>
<td>€ 100,00</td>
<td></td>
</tr>
<tr>
<td>damages</td>
<td>€ 25,00</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>€ 1215,00</td>
<td></td>
</tr>
</tbody>
</table>
Possibilities to decrease costs

*To reduce cost we have not only to look to component costs but also to installation as well as operation costs.*

*But keep in mind:*

*No reduction of safety*

*Same or even increment of functionality*

*To realize this open mind and change of procedures for DSO and CPO (Charge Point Operators) are preconditions*
Possibilities to decrease costs

No regulation changes possible (at this moment):
For example energy tax:

<table>
<thead>
<tr>
<th>Elektriciteit per kWh</th>
<th>2013, ex</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 t/m 10.000</td>
<td>€ 0,1165</td>
</tr>
<tr>
<td>10.001 t/m 50.000</td>
<td>€ 0,0424</td>
</tr>
<tr>
<td>50.001 t/m 10 mln</td>
<td>€ 0,0113</td>
</tr>
<tr>
<td>boven 10 mln niet-zakelijk</td>
<td>€ 0,0010</td>
</tr>
<tr>
<td>boven 10 mln zakelijk</td>
<td>€ 0,0005</td>
</tr>
</tbody>
</table>

Focus on:
Physical DSO requirements
Intake, Installation
Metering, Data management
Typical Charge Post

- DSO compartment
- Third party compartment
Grid costs

Typical Dutch situation

The DSO **installation cost** as well as the yearly **capacity tariff** are based on the pass thru value of the MCB.

<table>
<thead>
<tr>
<th>Connection</th>
<th>average</th>
<th>Enexis</th>
</tr>
</thead>
<tbody>
<tr>
<td>t/m 25A</td>
<td>€ 569,35</td>
<td>€ 568,00</td>
</tr>
<tr>
<td>25-35</td>
<td>€ 790,52</td>
<td>€ 692,00</td>
</tr>
<tr>
<td>35-63</td>
<td>€ 833,61</td>
<td>€ 692,00</td>
</tr>
<tr>
<td>50-63</td>
<td>€ 1,093,60</td>
<td>€ 826,00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Yearly grid tariff</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>€ 164,09</td>
<td>€ 106,04</td>
</tr>
<tr>
<td>25 - 35</td>
<td>€ 651,17</td>
<td>€ 530,20</td>
</tr>
<tr>
<td>35 - 50</td>
<td>€ 966,33</td>
<td>€ 795,30</td>
</tr>
<tr>
<td>50 - 63</td>
<td>€ 1,264,60</td>
<td>€ 1,060,40</td>
</tr>
<tr>
<td>63 - 80</td>
<td>€ 1,579,43</td>
<td>€ 1,325,50</td>
</tr>
</tbody>
</table>
Reduce value
DSO protection

Even when only 16A is required a MCB of 35A is necessary

This leads to high installation cost + €120,- and high yearly costs + €500,-
Reduce value
DSO protection

Replace CB 20A by fuse of 16A
Replace MCB 35A by fuse 25A

Selectivity still guaranteed
New grid connection demands

All specific DSO demands in a 3x25A connection for a charge station

The goal of these demands is to enable Chargepoint Operators (CPO’s) to use a much smaller 3x25A grid connection

Size does matter!
Smaller means cheaper (scale)
Intake
Installation

One party takes care of everything:

One party does intake and site survey
One party installs in one labour act:
Start, placement, connect, test.

No differentiation between compartments of DSO and third party. Only one compartment is available and both have access.
Change metering

- Meter 1
- Meter 2
- Meter 3
- DSO

Com 1
Com 2

Back office
Metering system
Change metering

- Meter 1
- Meter 2
- Meter 3
- DSO
- Com 1
- Com 2
- Back office
- Com
- Metering system
Change metering

Avoid cost smart meter
Avoid cost SM com system
Reduces space (size does matter!)

Requirements on:
- meter (MID)
- meter maintenance (meterpool)
- metering com system
- Security and reliability

metering data format (P4 format) --- transparency needed: open protocol!
Interoperability

Roaming of emobility services is a very important acknowledged aspect of the EV-ecosystem

But it does not solve The Problem
“The solution for effortless cross-boarder charging”
International Roaming agreement

Starting point

- LOI signed in May 2012
- Agreement by 7 partners in 7 countries
- Agreed to roaming and cooperation

Current situation

- Further development based in NL, BE, GE
- In the cross border region (NL <-> B <-> D) ‘e-roaming is ‘business as usual’
- Organic growth in the different connected countries and Luxembourg
Open Market Model
Open, independent, custom partnerships

- Complexity reduction by central Roaming Platform
- Clearing European roaming agreements of different market roles (NSP, CSO, MSP)
- Open and established protocol: Open Clearinghouse Protocol (OCHP)
Data exchange
exchange of relevant data for an open market model

- Autorisation data (A)
- Charge data (C)
- Geo-chargestation data (G)

- Charging Station Operator (CSO)
- Mobility Service Provider (MSP)
- Navigation Service Provider (NSP)
Communications structure

Clearing House

Roaming Partner

Roaming Partner

Total communication through one unified open communications protocol: OCHP
Open Protocol: OCHP
Open Clearing House Protocol

- Open communication protocol between IT-Back-Ends
- Free to implement - usage is independent of e-clearing.net
- Open for further development

Free and without registration
Download at www.ochp.eu
Adding services helps but does not solve not the problem

- Dynamic geo-info
- Reservation
- Integration with ‘parking’
- Free choice of electricity supplier
Free choice supplier.

No Fixt supplier on the pole

Supplier will be allocated as soon as an EV-driver identifies.

Supplier of the E-mobility Service Provider is allocated. (actual end user of electricity)
Free choice supplier

Facilitates the market

Provides customer (more) choice

But has no direct impact on the business case of EV infrastructure
A big part of the solution

Smart charging

Smart Charging is the charging of an EV controlled by bidirectional communication between two or more actors to optimize all customer requirements, as well as grid management and energy production including renewables with respect to system limitations, reliability, security and safety. These four requirements which are already required by conventional non smart charging.

CEN-CENELEC
E-Mobility Coordination Group (M/468)

and

CEN-CENELEC-ETSI Smart Grid Coordination Group (M/490)
Smart Charging

We might be looking to narrow to the EV Ecosystem
We need to broaden our scope:

![Graph showing household profiles with and without EV](image-url)
Smart Charging

The development in practice
The challenge for (our) DSO’s

A

200A

8AM 6PM

time

200A

A
The challenge for (our) DSO’s

Het Open Smart Charging Protocol provides information about a forecast of the available capacity
OSCP - positioning
OSCP – what is it

Open Smart Charging Protocol
- information about available capacity for flexible loads
- possibility to request or offer extra capacity

Backoffice DSO

OSCP

Backoffice Operator Charge Spot

OCPP (2.0)

Charge Spot

Mode 3

now

time

+24h

max

A
What is OSCP not?

- Open Customer Protocol?
- Capacity Pricing Protocol?
- Extended OSCP?
- Energy Availability Protocol?
- Energy Pricing Protocol?
Where are we now

- Protocol defined
- first PoC’s delivered
- adapting back-end systems
- involvement of multiple parties

DSO’s: ENEXIS, STEDIN
EmSP’s: GreenFlux, TheNewMotion
Charge Station suppliers: ALFEN
Where are we now

- Dordrecht
- Zwijndrecht
- Amsterdam
- Aerdenhout
- Hoogkerk
- Lochem
- ‘s-Hertogenbosch
- Rosmalen
- ‘s-Hertogenbosch

stichting e-laad
Where are we now

- Amsterdam
- Aerdenhout
- Zwijndrecht
- Dordrecht
- Rosmalen
- 's-Hertogenbosch (Heijmans)
- 's-Hertogenbosch (Croon)
- Hoogkerk
- Lochem
Where do we want to go?

- International uniformity
- Smart charging as a service from DSO
- Value of flexibility determined
The use of open protocols was one of our directives when we started with e-laad
OCPP in a nutshell
(What you may already know)

- OCPP is an abbreviation for Open Charge Point Protocol
- OCPP is an open and free communication standard between charging stations and central systems
- OCPP was initiated in 2009 by the E-Laad Foundation
- OCPP has become the protocol of choice in 50 countries, is used to manage over 10,000 charge stations
- In the European market OCPP has become the de facto standard
- E-Laad established the OCPP Forum as a community supporting the development and maintenance of OCPP
What do we need to solve?

- Charge stations are expensive
  - Expensive stations
  - Expensive back office/management systems
- Limited choice with proprietary systems
- Very limited flexibility for future changes or extensions when proprietary systems are used
- Risk on many different Human Machine Interactions on charge stations when proprietary systems are used
- To many different connections to tools and apps from 3rd parties

Expensive
Not flexible
Not user friendly
Not transparent
The answer

- Development and use of open, free to use, standard interfaces between charge stations and management systems
- Pragmatic approach
  - Only develop what is necessary
  - Focus on doing instead of talking
  - Effective governance structure
  - Good test tools
  - Reliable certification
Why a new name and organization?

- Indicates we’re taking the protocol to the next level, to support growth in stakeholder types, number, and market geographies
- Emphasizes and marks a new level of maturity with OCA
  - Formalized “open and free” IPR Policy (RANDz)
  - Stronger governance structure and organization
  - More rigorous requirements management and traceability
  - Clearer working and decision processes, timelines and release cycles
  - Welcoming new and different types of users and stakeholders
  - Publication of OCPP 2.0, covering recent market requirements
  - Protocol compliance: testing, tools, and formal certification
  - Growth of OCPP adoption
Why open protocols

• First of all open standards contribute to interoperability. By using open standards the (digital) communication between different actors improves.

• In addition, open standards ensure that freedom is guaranteed. Open standards are by their very nature, not software-specific and can be installed by each supplier. They are necessary for achieving vendor independence.

• This leads to high-quality and cost-effective information exchange.

• Open standards involves creating and applying agreements on specifications of the interfaces between the co-operating applications, services, systems and networks. Characteristic of open standards is that there are no barriers to the use of the standards.
Why open protocols

• Besides vendor independence and interoperability Open standards also lead towards transparency, accountability and manageability.

• This is a very important aspect in the development of the ‘smart ecosystem’. The different building blocks e.g EVSE development, smart charging, smart grids, smart energy, smart traffic, etc. have to come together one day.

• It is impossible to design the whole ecosystem top-down, so we need to connect the building blocks by making use of open standards.
Questions?