Development of the EV Charging Infrastructure: a dynamic and competitive market

Luc Lebon
Managing Partner Blue Corner
Co-president of OpenChargePointBelgium

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Is the market for EV Charging dynamic and competitive?

**DYNAMIC:** What is the **MOTOR** for change?

1. There is a **NEED** for change
   - Climate
   - Air pollution
   - Climate conference
   - EU Directive Emissions
   - National and local governments

2. There is an **OPPORTUNITY** for a deep technology change
   - Li-ion battery Technology
   - Renewable Energy in the Smart Grid

**COMPETITIVE:** There is a **businessmodel** to develop the market for charging

- **Phase-1** ROI by consumption on the charging stations
- **Phase-2** ROI by stabilizing the smart grid
- **Phase-3** additional ROI via V2G EV Battery as an energy source (buffer) at peak moments

**Today:** There is a **HIGH RISK** for investors

Electromobility will become a reality, but the rapidity of the market development is uncertain. This creates a high risk!

**THEREFORE**

The national, regional and local governments need to:

1. **take a part of that risk**
2. In the first place, need to take the right measures to speed up market development
3. Facilitate the market players to do their job!
There is a need for change

We can do 18% of the job

Key point • Transport accounts for 18% of GHG emissions abatement in the 2DS (decarbonisation scenario) versus the 6DS (conservative projection based on the existing policy framework), by 2050.
The market for EV Charging

Market roles & market relations

First, we have the **customer**, who has a need to charge his/her electric vehicle. The **asset owner** owns the assets that are required to provide the public charging infrastructure.

The **Mobility Service Provider** provides the worry-free charging access at home, at work and on the go.

The **CP Operator** operates the network of charging systems and makes sure that the MSP and its customers have access to it.

The way MSP’s and CPO’s work together is called e-interoperability or e-roaming.
High Risk, why?
Market for EV Charging is part of larger context of different markets

- **(EV)-CAR Market**
  - Who is the customer?
  - Private – Companies - Leasing Companies

- **Providers of Parking facilities**
  - Market Roles & Relations?
  - Local Governments- Asset Owners

- **Customer**
  - Owns the EV
  - The **Mobility Service Provider** provides access

- **Asset Owner**
  - provides the infrastructure
  - **CPO Operator** operates the network

- **Market for Mobility Services**
  - Market Roles & relations?
  - Public Transport – Car Sharing – Multimodal Transport
  - Dynamics depends on Mobility Policy

- **Energy Market**
  - Market Roles & relations?
  - Energy Providers – Network Operators
  - Dynamics is depends on development of smart Grids
High Risk, why?
Market for EV Charging is part of larger context of different markets

- **(EV)-CAR Market**
  Speed of Adoption of EV’s
  Private – Companies - Leasing Companies

- **Providers of Access to Parkingspace**
  Speed of Adoption of INFRASTRUCTURE
  Local Governments – Asset Owners

- **Market for Mobility Services**
  Market Roles & relations?
  Public Transport – Car Sharing – Multimodal Transport
  Dynamics depends on Mobility Policy

- **Energy Market**
  Market Roles & relations?
  Energy Providers – Network Operators
  Dynamics is depends on development of smart Grids
Role of Government(s): Reduce Risk, Create Opportunities

Governments on different levels can facilitate the different markets to speed up the adoption of electric mobility.

- **(EV)-CAR Market**
- **Providers of Access to Parkingspace For Charging EV’s**
- **Market for Mobility Services**
  - Market Roles & relations?
  - Public Transport – Car Sharing – Multimodal Transport
  - Dynamics depends on Mobility Policy
- **Energy Market**
  - Market Roles & relations?
  - Energy Providers – Network Operators
  - Dynamics is depends on development of smart Grids
Introduction of the electromobility eco-system in our region?
How? What has to be done?
Evolution of number of electric cars on the road

Europe is entering the initial adoption phase of electric mobility, with sales moving beyond the margin of 1% in some countries.

**Deployment scenarios for the stock of electric cars to 2030**

**Evolution of the global electric car stock, 2010-15**

Key point • Reaching 2020 deployment targets for BEVs and PHEVs requires a sizeable growth of the electric car stock. Meeting 2030 decarbonisation and sustainability goals requires a major deployment of electric cars in the 2020s.

Key point • The electric car stock has been growing since 2010, with a BEV uptake slightly ahead of PHEV uptake. 80% of the electric cars on road worldwide are located in the United States, China, Japan, the Netherlands and Norway.

Scenarios

Reality, today 2017 1%

Global EV Outlook 2016
Beyond one million electric cars

IEA | Clean Energy Ministerial | Electric Vehicles Initiative
Development of the EV Charging market

Europe is entering the initial adoption phase of electric mobility, with sales moving beyond the margin of 1% in some countries.

<table>
<thead>
<tr>
<th>FACTORS FACILITATING ADOPTION</th>
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<tr>
<td>1 Relative Advantage</td>
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<tr>
<td>2 Compatibility</td>
<td></td>
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<tr>
<td>3 Complexity</td>
<td></td>
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<tr>
<td>4 Triability</td>
<td></td>
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<td>5 Visibility</td>
<td></td>
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<td>6 Social Norm</td>
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S-Curve

Adoption

Beyond 1%
Performance barriers and how to overcome

**BATTERY PERFORMANCE**

- **Range:** Energy density
- **Time to charge:** Power density
- **Network of charging stations**

**PURCHASE PRICE**

Vandaag is aankoopprijs van elektrische voertuigen hoog.

**Waarom?**
- Hoge kost van batterij $\rightarrow$ R&D $\rightarrow$ kostprijs daalt
- Nog geen massaproductie $\rightarrow$ massamarkt $\rightarrow$ prijs daalt

**Remedie:**
Financiële stimulans van overheid via autofiscaliteit 😊
Evolution of battery performance and cost

Notes: USD/kWh = United States dollars per kilowatt-hour; Wh/L = watt-hours per litre. PHEV battery cost and energy density data shown here are based on an observed industry-wide trend, include useful energy only, refer to battery packs and suppose an annual battery production of 100,000 units for each manufacturer.

Sources: US DOE (2015 and 2016) for PHEV battery cost and energy density estimates; EV Obsession (2015); and HybridCARS (2015).

Key point • The development of battery energy density and cost over the past decade gives encouraging signs on the possibility to meet targets defined by carmakers and the United States Department of Energy.
**Development of Electromobility**

**Tipping point / Overcome barriers**

<table>
<thead>
<tr>
<th>ENABLERS</th>
<th>PERFORMANCE</th>
<th>COST REDUCTION</th>
<th>REDUCE UNCERTAINTY OF THE MARKET</th>
</tr>
</thead>
<tbody>
<tr>
<td>=&gt; RANGE</td>
<td>= PURCHASE</td>
<td>= TAKE OFF!</td>
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**End of the petrol era**

**Demand for better Quality of Urban Life**

**Need for Transition in mobility system**

**electromobility**
**Crucial role of the governments**

<table>
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<tr>
<th>POLITICAL LEVELS</th>
<th>EUROPE</th>
<th>NATIONAL REGIONS</th>
<th>LOCAL LEVEL</th>
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<tbody>
<tr>
<td><strong>DOMAIN</strong></td>
<td>TEHNOLOGY PUSH STANDARDS</td>
<td>COST REMEDIATION REGULATION</td>
<td>INFRASTRUCTURE FACILITATING EV’s &amp; CHARGINGSPOTS</td>
</tr>
<tr>
<td><strong>ROLE to PLAY</strong></td>
<td>Influence on automotive sector</td>
<td>Masterplan Subsidy No purchase tax No circulation tax</td>
<td>Integration in local policy Access to charging Access to bus lanes (limited)</td>
</tr>
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</table>
What can we do as economic sector for charging

Giving Access ...

Need for interoperability on 3 layers

**Open Protocols**

- Layer-3
  - Service interoperability
    - Roaming protocol standards

- Layer-2
  - Systems interoperability
    - Charging station communication standards

- Layer-1
  - Physical interoperability
    - Connector standards
    - RFID standards

**HOW TO REALIZE?**

**BUSINESS LAYER**
- MARKET ROLES
- MARKET PLACE AGREEMENTS
- PROTOCOLS

**PROTOCOLS**

**STANDARDS:**
- Plug Type
- Authentication Medium
- EVSE connectivity

**OCPP**
Open ChargePoint Protocol
Smart Charging
Essential condition for volume market

MAXIMAL POWER AVAILABLE on SITE

AVAILABLE POWER
For CHARGING

COMMUNICATE
MAX. AVAILABLE
kW

CENTRAL SERVER

MAX. CHARGE SETTINGS
LOAD BALANCING
To vehicles

MAX. CONSUMPTION

CONSUMPTION of the GEBOUW

AVAILABLE POWER
For CHARGING
Thanks for your attention
20 January 2017