CHAdeMO DC Fast Charge and E-Mobility in Europe

CHAdeMO Association

July 2014
CHAdemo Members

- CHAdemo is an international association with 400 members in the world
- There are 70 entities from 18 European countries

Note: This represents a selection of CHAdemo members
CHAdemo Organization

General Assembly

Executive Board
General CHAdemo strategy decision making

Technical Work Group
Protocol development and evolution
Certification process definition

Infrastructure Work Group
Infrastructure deployment experience sharing

Secretariat
Main Office (Tokyo)
EU Office (Paris)

CHAdemo Europe SC
CHAdemo's European strategy definition
CHAdEMO Chargers in Europe

TOTAL = 1181

Note: Data as of July 2014

Israel = 11
CHAdEMO EVs

- 160,000 CHAdEMO compatible EVs are already on the road globally, accounting for 62% of all EVs available.

Nissan: LEAF
Mitsubishi Motors: Outlander PHEV
Subaru: Plug-in Stella
Peugeot: Partner
Citroen: C-ZERO
Mistubishi Motors: i-MiEV
Toyota: eQ
Citroen: Berlingo

Mitsubishi Motors: MINICAB-MiEV
BD Otomotive: eTRAFIC
BD Otomotive: eKANGOO
BD Otomotive: eScudo
BD Otomotive: e-Fiorino
Mitsubishi Motors: MINICAB-MiEV (Truck)
Peugeot: iON
Mazda: Demio EV

Note: data as of May 2014
European EV market Snapshot

- A great majority of fast-charge enabled EVs on the roads in Europe are CHAdeMO compatible

**CHAdeMO EV market share in Europe**

- **Fast-Chargeable Evs** (68,935)
  - CHAdeMO 60% (41,274)
  - 17%
  - 12%
  - 11%

- **All Passeger Evs** (85,938)
  - 48%
  - 13%
  - 10%
  - 9%
  - 7%
  - 4%

Note: Data based on registrations from 1 January 2010 to 31st May 2014, not including electric light commercial vehicles (LCVs) or e-quadricycles.
CHAdEMO Installation in Europe

- Over 1100 chargers installed in Europe with the north-west corridor countries scoring high on the charger density

DC fast charger density

- < 1 charger / 1 m people
- < 2 charger / 1 m people
- < 3 charger / 1 m people
- < 4 charger / 1 m people
- < 5 charger / 1 m people
- >= 5 charger / 1 m people

Note: Missing Iceland (2) from the map.
Total number of installations as of April 2014 = 1117
Emerging Finding 1
“The more fast chargers, the further EVs can drive”

- DC fast charge contributes to alleviating “range anxiety” of EV drivers and extending driving mileage

**Before**

- CHAdeMO units: 2
- 19% of EV drivers using a highway

**After**

- CHAdeMO units: 6
- 46% of EV drivers using a highway

Note: Comparison of Q1, 2011 and Q2, 2012. Sample size 1,500 and 1,900 EV owners registered respectively.
Emerging Finding 2
“The more fast chargers, the more EVs”

- Fast charge availability positively correlates with EV adoption in the region

Note: EV sale as of end March 2013 (about 20,000 EVs in total); fast charger count as of May, 2013, data from Japan
Emerging Finding 3a
“Fast chargers are used”

- FCs are actually used and not just a ‘confidence builder’

Sample size: 100 DC fast chargers in 8 regions of the U.S.A.
Emerging Finding 3b
“Fast chargers are used”

- When part of the same infrastructure as normal chargers, fast chargers deliver disproportionately higher amount of energy, despite their lower unit numbers.

Breakdown of charger units vs. energy delivered by charger type

<table>
<thead>
<tr>
<th>Charger Unit</th>
<th>Work place</th>
<th>Public place</th>
<th>Commercial Place</th>
<th>Street</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy delivered</td>
<td>42%</td>
<td>23%</td>
<td>13%</td>
<td>3%</td>
</tr>
</tbody>
</table>

Fast chargers contribute 19% of the total energy delivered, even though they account for only 2% of the charger units.

Source: Charge Your Car network UK. Data gathered April 2010 - June 2013
Note: Total 737 charger units. Non-residential chargers only. 725 Standard AC charge points (3 and 7 kW), 12 fast chargers (2 ports each: 1 DC 50 kWh & 1 AC 23kWh). Total energy delivered: 17 8832 kWh.
Emerging Finding 4
“Public infrastructure + business users = a win-win solution”

- Private business EV users using public infrastructure speed up return on investment

**Average number of charging sessions**
(per day per charger)

<table>
<thead>
<tr>
<th></th>
<th>Tallinn</th>
<th>Other cities (93)</th>
<th>Tartu</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.19</td>
<td>0.26</td>
<td>2.75</td>
<td></td>
</tr>
</tbody>
</table>

**Tartu E-Taxi Company**
- 10 e-taxis
- Driving 150-300 km, charging 4-5 per day per taxi
- 95% of charging is fast charging

Note: Number of fast chargers installed are 32 (Tallinn), 110 (Other cities), 11 (Tartu) respectively
Source: ELMO, Q2 2013
### CHAdeMO and Standards Legislation

- The IEC DC charging system catalog standards were published in March 2014
- CHAdeMO is the only technology with world-wide presence with proven record

#### IEC DC Charging Systems

<table>
<thead>
<tr>
<th></th>
<th>System A</th>
<th>System B</th>
<th>System C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CHAdeMO (Japan)</td>
<td>GB/T (PRC)</td>
<td>COMBO1 (US)</td>
</tr>
<tr>
<td>Connector</td>
<td><img src="image" alt="Connector A" /></td>
<td><img src="image" alt="Connector B" /></td>
<td><img src="image" alt="Connector C" /></td>
</tr>
<tr>
<td>Vehicle Inlet</td>
<td><img src="image" alt="Vehicle Inlet A" /></td>
<td><img src="image" alt="Vehicle Inlet B" /></td>
<td><img src="image" alt="Vehicle Inlet C" /></td>
</tr>
<tr>
<td>Communication Protocol</td>
<td>CAN</td>
<td>PLC</td>
<td></td>
</tr>
</tbody>
</table>

EU Directive on the Deployment of Alternative Fuels Infrastructure

The Law

- Annex III 1.1.2.
  - Direct Current (DC) high power recharging points for electric vehicles shall be equipped, for interoperability purposes, at least with connectors of Type "Combo 2" as described in standard EN62196-3

- Applied 3 years after the law goes into effect (Fall 2014)

Myths

- CHAdeMO will be banned in Europe after 2018
- CHAdeMO-only chargers can no longer be built
- All CHAdeMO chargers will have to be retrofitted with Combo2 connectors

CHAdeMO can be built as long as there are EVs needing CHAdeMO
# Key dates and CHAdeMO Implications

<table>
<thead>
<tr>
<th>CHAdeMO</th>
<th>Public</th>
<th>Possible without Combo2</th>
<th>Obligatory to have a Combo2 connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solo chargers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private (Existing***</td>
<td>Possible (no end date)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multisystem chargers</td>
<td>Public</td>
<td>Possible without Combo2</td>
<td>Obligatory to have a Combo2 connector</td>
</tr>
<tr>
<td>Private (Existing***</td>
<td>Possible (no end date)</td>
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</tr>
</tbody>
</table>

Note: * this should include national targets (charge points), measures necessary to reach targets, designation of urban/suburban agglomerations, other densely populated areas and networks to be equipped with charge points. **in the designated areas. ***Existing chargers can continue operations with no need to retrofit or disinstallation.
Multi-system Chargers

**EV USERS**
- More charge stations for all

**OPERATORS / INVESTORS**
- Limited incremental cost (5-10% of overall cost)
- Faster recovery of cost

**OEM’S**
- Competition with cars (not with charge standards)
Multi-system Chargers: At Work and on The Way

- Multi-standard charger corridors are on the way in a variety of countries

**Rapid Charge Network, The UK & Ireland**
An EU-funded trial of 74 fast charging stations covering over 1,100 km along major UK and Irish road network routes

**Evite, The Switzerland**
A Swiss eMobility project aims to set up 150-250 fast chargers
Thank You!