Feasibility analysis and development of on-road charging solutions for future electric vehicles

Wireless dynamic charging – benefits and challenges

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Global initiatives towards electromobility

**NORTH AMERICA**
- The US Transportation Electrification Program represents the world's largest EV demonstration project. $400 million funding. Target: 1 million plug-in EVs by 2015.

**ASIA**
- China, Japan, Korea: government incentives, regulations promoting awareness and adoption of EVs.
- Toyota, Nissan, Honda, Mitsubishi joint development of charging infrastructure. Target: 8000 new normal chargers, 4000 new fast chargers.

**EUROPE**
- 2013 European Parliament resolution requiring member states to install a specified number of EV charging stations and hydrogen and natural gas stations by 2020. Targets: Germany 86000, Italy 72000, UK minimum of 70000.
- Many EU funded R&D projects: EcoFEV, UNPLUGGED, FABRIC…
- Several national projects: Fastned (NL), ELMO (EE), CLEVER (DK)…
Why wireless charging

- Allows EV charging while travelling (dynamic) or during short stops ideal for urban environment (stationary)

- Driver benefits:
  - Reduced range anxiety
  - Cheaper EVs
  - More comfort
  - Safer

- Increased range
- Smaller batteries
- Increased mobility
- No visual pollution

- Drivers do not have to deal with dirty and potentially dangerous cables (rain, cable vandalism, cable wear, etc) + Easier charging process
Roadblocks for large scale electromobility adoption

EVs as percentage of the whole fleet:

- France 0.83%
- US 0.62% (96000 sold in 2013)
- Japan 0.59%
- Germany 0.25% (7400 sold in 2013)

Current penetration of EVs very small. Reasons:

- Weight and size of batteries.
- Cost of battery manufacturing.
- EV price premium over conventional vehicles.
- Small or non-existent charging infrastructure network.
- Long duration of charging.
- Plugging the EV in is not a user friendly experience.

Solutions:

- ITS
- Novel charging technologies
ITS solutions facilitating electromobility

- Accurate range estimation allows for “range anxiety” reduction and efficient trip planning.

- Cooperative ITS allow for robust traveling via re-routing, e-call, infrastructure pre-booking (charging stations, parking spots…).

- ITS functions such as automatic identification, authorization and accounting improve user convenience.

- Accurate and dependable charging infrastructure POI and maps combined with pre-booking and dynamic trip planning potentially allow the use of smaller batteries.

- ITS facilitate the implementation of new charging technologies (e.g. dynamic charging).
### Charging technology trends – why go wireless?

<table>
<thead>
<tr>
<th>Present</th>
<th>Future</th>
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<tbody>
<tr>
<td><strong>Plug-in static</strong></td>
<td><strong>Conductive dynamic</strong></td>
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<tr>
<td>Cons</td>
<td>Pros</td>
</tr>
<tr>
<td>User discomfort</td>
<td>Mature technology</td>
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<tr>
<td>Long charging duration</td>
<td>Expensive pantograph systems</td>
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<tr>
<td>Large and expensive batteries</td>
<td>Extended range</td>
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<tr>
<td>Expensive EVs</td>
<td>Comfort</td>
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<tr>
<td>Vehicle must be parked</td>
<td>Increased mobility</td>
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FABRIC Integrated Project

Budget: 9 M€
Duration: 48 months
Coordinator: Angelos Amditis, ICCS
Website: www.fabric-project.eu

Funding: 6.5 M€
Start: 1 January 2014
Contact: a.amditis@ccs.gr

Dynamic wireless charging of FEV
Relationship with other projects
Innovation
Collaboration

User requirements
Technical feasibility
Standardization/Interoperability

Jan 2014
Jan 2018

10/09/2014 FABRIC, ITS World Congress Detroit
Session highlights

• eCo-FEV project and system presentation: Functionalities, architecture and standardization towards large scale deployment - Andrea Tomatis, Deputy Laboratory Manager and Senior Researcher at ICTL of Hitachi in Europe, France

• Dynamic wireless EV charging and the related R&D studies being performed in FABRIC SP3 – Denis Naberezhnykh, Head of Low Carbon Vehicle and ITS Technology, TRL LIMITED, UK

• The future of transportation and an overview of QUALCOMM R&D in wireless static and (semi)dynamic EV charging technology - Chris Borroni-Bird, VP Strategic Development, Qualcomm Technologies Inc, USA

• Description of a major breakthrough that allows a 10-inch gap between primary/secondary coils for HDV inductive charging - John Inglish, Board of Directors member, WAVE (Wireless advanced Vehicle electrification) Company, USA

• Assessment framework and challenges for EVs wide introduction - Sebastiaan Meijer, Associate Professor, Head of GaPSlabs, KTH Royal Institute of Technology, Sweden
Thank you!

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