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

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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
FABRIC aim

- Facilitate the use of smaller and cheaper batteries
- Increase EV range.
- Reduce EV immobilization (unavailability) due to charging.
- Towards large-scale electromobility deployment.
HOW? FABRIC objectives: prototypes

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

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

Driver benefits:

  - Reduced range anxiety
  - Cheaper EVs
  - More comfort
  - Safer

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

Roosegaarde and Heijmans
HOW? FABRIC objectives: feasibility studies

- Socio-economic impact
- Performance evaluation
- Business models
- Grid impact
- Road impact

Guidelines for authorities and a priori assessment of necessary investments for large scale deployment.
FABRIC ICT architecture
FABRIC prototypes – POLITO, IT (I)

Development of dynamic charging prototype no1 – Italy (POLITO, CRF) - 200m test track, 20kW, ~150kHz
FABRIC prototypes – SAET, IT (II)

Development of dynamic charging prototype no2 – Italy (SAET)
- 50m, 10-150kHz load-resonant power frequency

Position 1: Vehicle detection & recharging system in stand-by

Position 2: Vehicle is charging by passing over the recharging pad and receiving transmitted power

Position 3: Transmitted power depends upon:
- Speed
- Power unit
- Track length

Vehicle has been automatically recharged while driving.

Source: SAET
3. Development of dynamic charging prototype no3 – France (QUALCOMM, VEDECOM) - 100m test track, QUALCOMM charging pads in series, 85kHz, >20kW
Dynamic charging challenges (I) - Road

Road adaptation – electrification
• Initial investment
• Maintenance costs
• Lifecycle assessment
• Traffic impact assessment
Dynamic charging challenges (II) - Grid

• **Increased demand**
  • RES penetration increase necessary
  • Investments on new base units
  • Incentives to charge during off-peak hours
    • Need for robust communication network with the end users

• **High frequency demand fluctuations**
  • Need for energy storage systems
    • Size, cost and feasibility assessment

• **Smart grid necessary**
  • Potential new security vulnerabilities
Dynamic charging challenges (III) - ICT

- Need for fast (real time) V2I communications
- Real time load balancing and charging management
- Unobtrusive, non-distracting user interfaces
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@iccs.gr

- Dynamic wireless charging of FEV

- User requirements
- Technical feasibility
- Standardization/Interoperability

- Relationship with other projects
  Innovation
  Collaboration

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Thank you!

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