



22nd  
ITS World Congress

Bordeaux, France

5 to 9 October

2015

SIS14: Electrification of Road Transport:  
Opportunities and Challenges

# Electromobility & FABRIC IP

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# Electromobility trends (I)

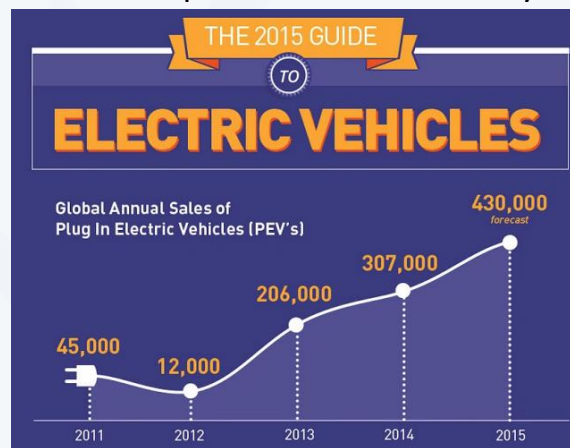
## Electric Vehicles

Range increases due to battery breakthroughs



New models

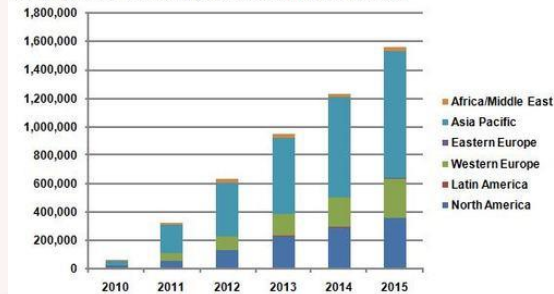
Global adoption increases steadily



## Infrastructure

Static charging infrastructure is deployed fast

Charging Station Unit Sales by Region, World Markets: 2010-2015



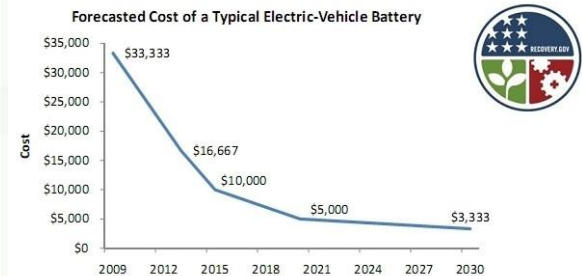
Source: Pike Research

Very fast supercharger deployment (>250km range in 20 minutes)

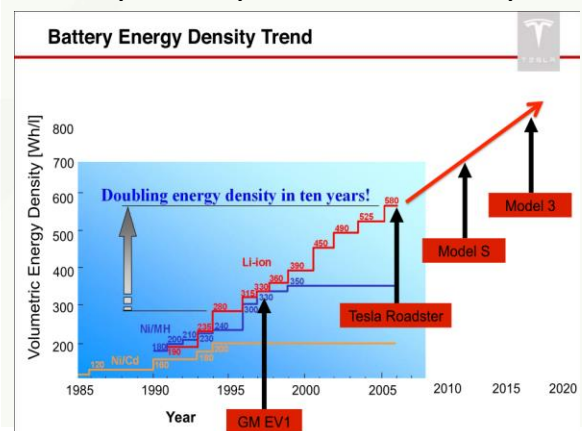


## Batteries

EV batteries' price dropping



Battery density increases linearly



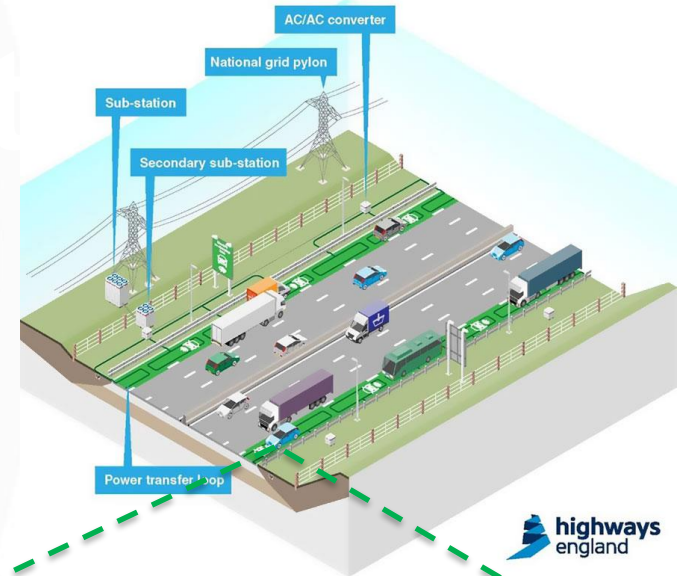
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# Electromobility trends (II)

## Investments on dynamic charging technologies

- UK government £500 million investment over the next five years for the creation and testing of electric highways.
- EU R&D project funding focused on dynamic charging
  - FABRIC
  - FASTINCHARGE
  - ...

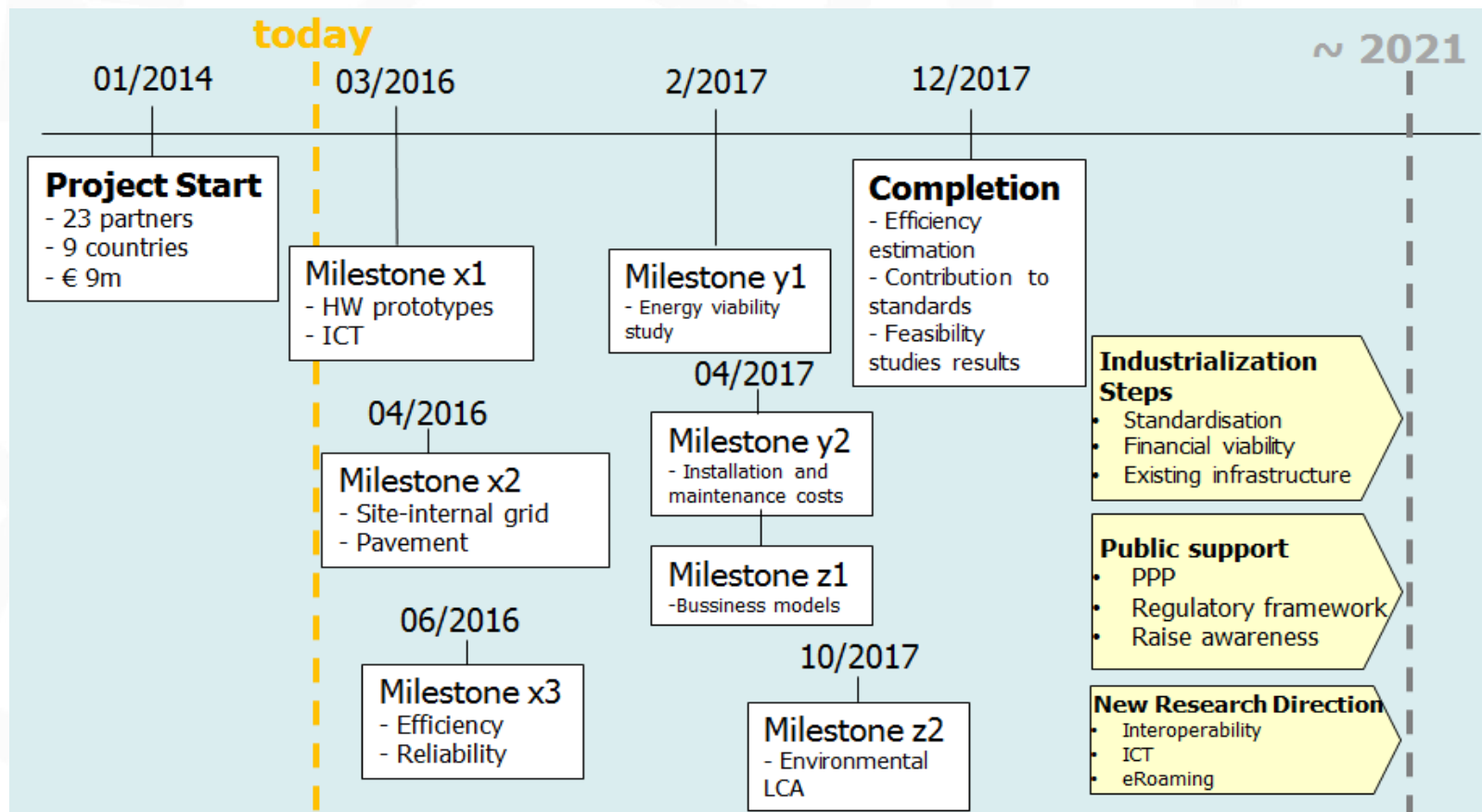


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# FABRIC overview

**Objective:** to develop, test and evaluate the efficiency of dynamic charging prototypes to assess the feasibility of large-scale deployment of dynamic wireless charging.



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# FABRIC - prototypes

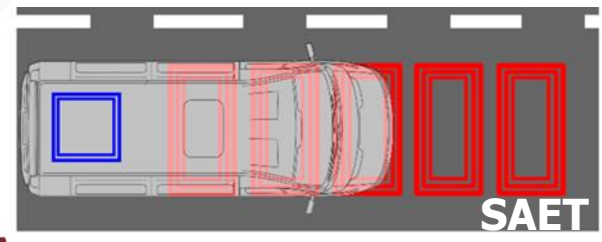
Objective: Develop three different **dynamic** charging prototype solutions to assess their efficiency and compare with existing solutions

Status: Design complete, development ongoing

- Vedecom/QUALCOMM solution: 85kHz, 20kW
- POLITO solution: 20-200kHz, 20kW
- SAET solution: 80-100kHz, 50kW

Air gaps ~20cm

Expected delivery: Early 2016 (charging pads ready for test sites)



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# FABRIC - road works

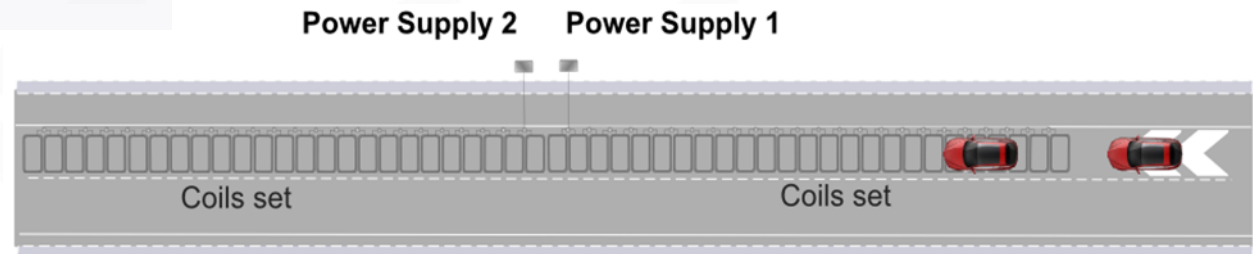
Objective: Create charging “lanes” >100m to test the functionality and efficiency

Status: On-site civil works are ongoing in Italy (Torino) and France (Satory)

Expected delivery: Early-mid 2016 (charging lanes with embedded charging pads)



Road works at Satory test site



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# FABRIC - grid works

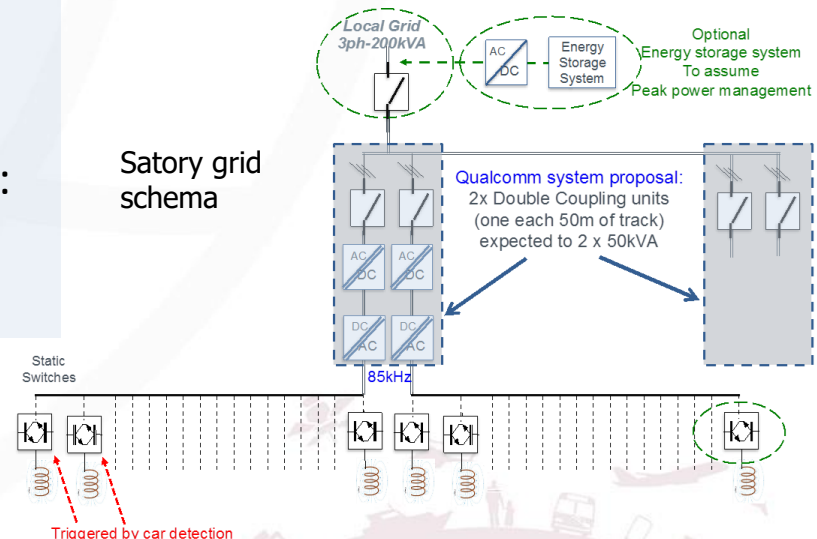
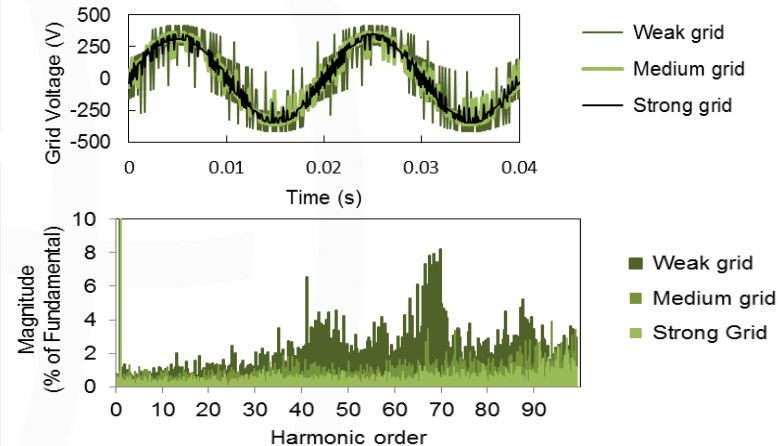
Objective: Perform impact studies on the grid,  
perform test site micro-grid to support the tests

Status: Impact study complete:

- Power demand simulations for various traffic models (demand fluctuates from 2-8 MW in some seconds)
- Harmonics and power flow analysis at the test sites (max power Satory: 100 kW, SITAF: 45 kW, minimal adaptations needed, so as to simultaneously charge 2 vehicles)
- Integration of RES and Energy Storage study (ESS: larger smoothing windows reduce daily demand peak)

Expected delivery: Early 2016 (grid adaptations at test sites completed)

## Harmonics analysis



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# FABRIC - preliminary feasibility

Status: A first feasibility study approach examined several large-scale deployment scenarios based on actors' requirements and FABRIC 1<sup>st</sup> year deliverables

Deployment scenario	Preliminary feasibility assessment
<b>Metropolitan deployment for heavy freight vehicles</b>	Possible, but high risks Strong policy involvement needed
<b>Metropolitan deployment for buses</b>	Feasible if enough incentives given
<b>Metropolitan deployment for general light vehicles</b>	High economic risks for stakeholders
<b>Metropolitan deployment for service vehicles / taxi's</b>	Economic feasibility not given
<b>International freight corridors</b>	Feasible but concerns on interoperability and legal agreements
<b>Long-haul national freight corridors</b>	Feasible, but high risks due to utilisation
<b>Short-haul freight corridors</b>	Feasible
<b>National deployment for general light vehicles</b>	Not feasible
<b>International deployment for general light vehicles</b>	Not feasible
<b>International deployment for all vehicles classes</b>	Requires large changes, thus unlikely to be feasible



# FABRIC - Next steps

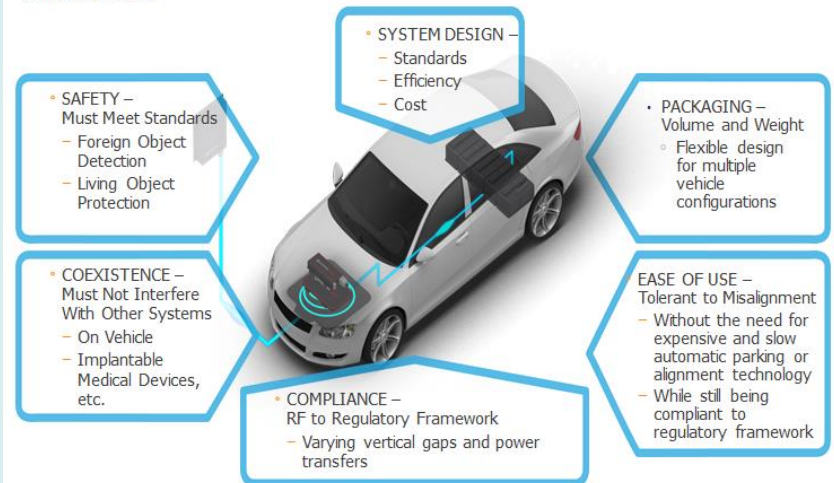
## Major activities 2016

- Grid and road adaptations at the test sites – test sites ready for testing
- Vehicle systems integration – vehicles ready for testing
- ICT modules development – On-board and Off-board load and charging management algorithms
- Testing
- Comparison with other dynamic charging solutions (VOLVO-SCANIA)

## Technical challenges

- Short range V2I communications
- Load balancing and charging management in real time
- No standardization for dynamic charging
- Vehicle alignment with the charging pads
- Creation of unobtrusive and efficient UI

Source: QUALCOMM



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# Electromobility challenges

## Public support

### Needs

- Need for direct investment or incentives by authorities and government
- Standardisation should also cover dynamic charging
- Regulations regarding the physical characteristics of the installations and safety levels

## New Research direction

### Needs

- Synergies with developers of conductive solutions, to investigate how to utilize the same electric infrastructure and grid connection systems.
- Promote communications security and reliability.
- Advance eRoaming, to achieve a sole charging network.



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# Thank you

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