



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

## FABRIC overview

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ICCS, FABRIC Coordinator

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# Electromobility trends (I)

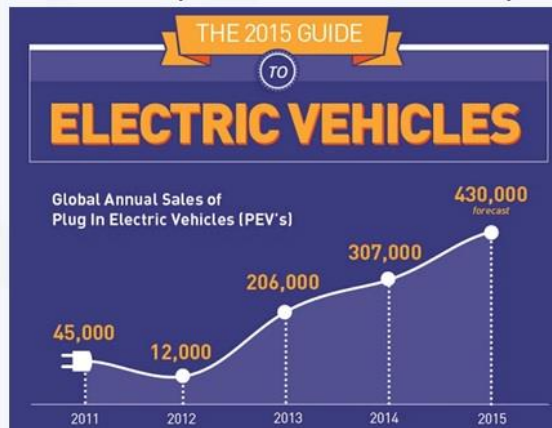
## Electric Vehicles

Range increases due to battery breakthroughs



New models

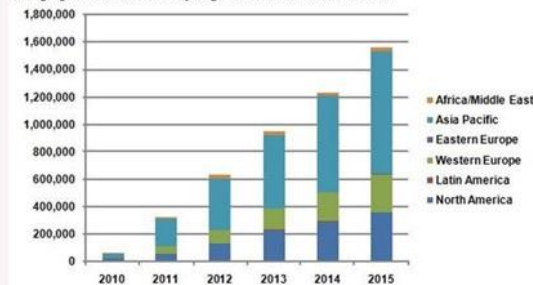
Global adoption increases steadily



## Infrastructure

Static charging infrastructure is deployed fast

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



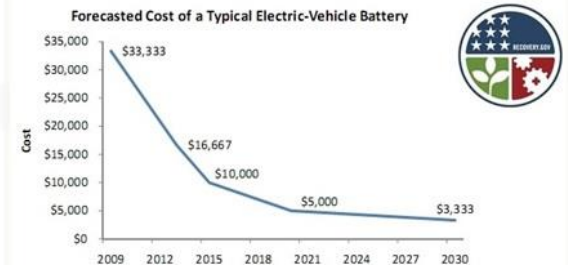
Source: Pike Research

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

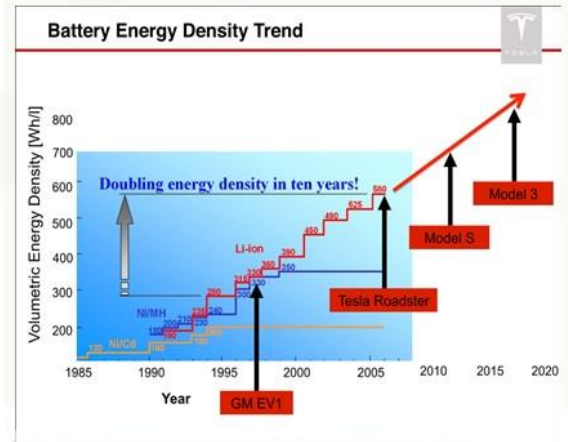


## Batteries

EV batteries' price dropping



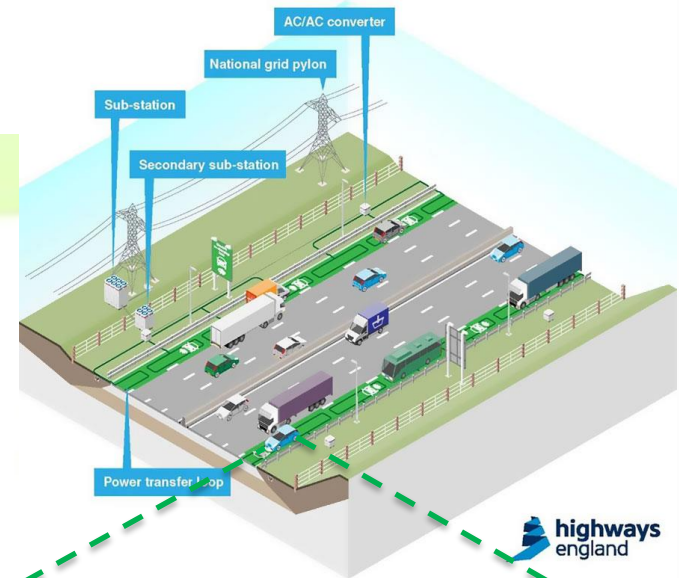
Battery density increases linearly



# Electromobility trends (II)

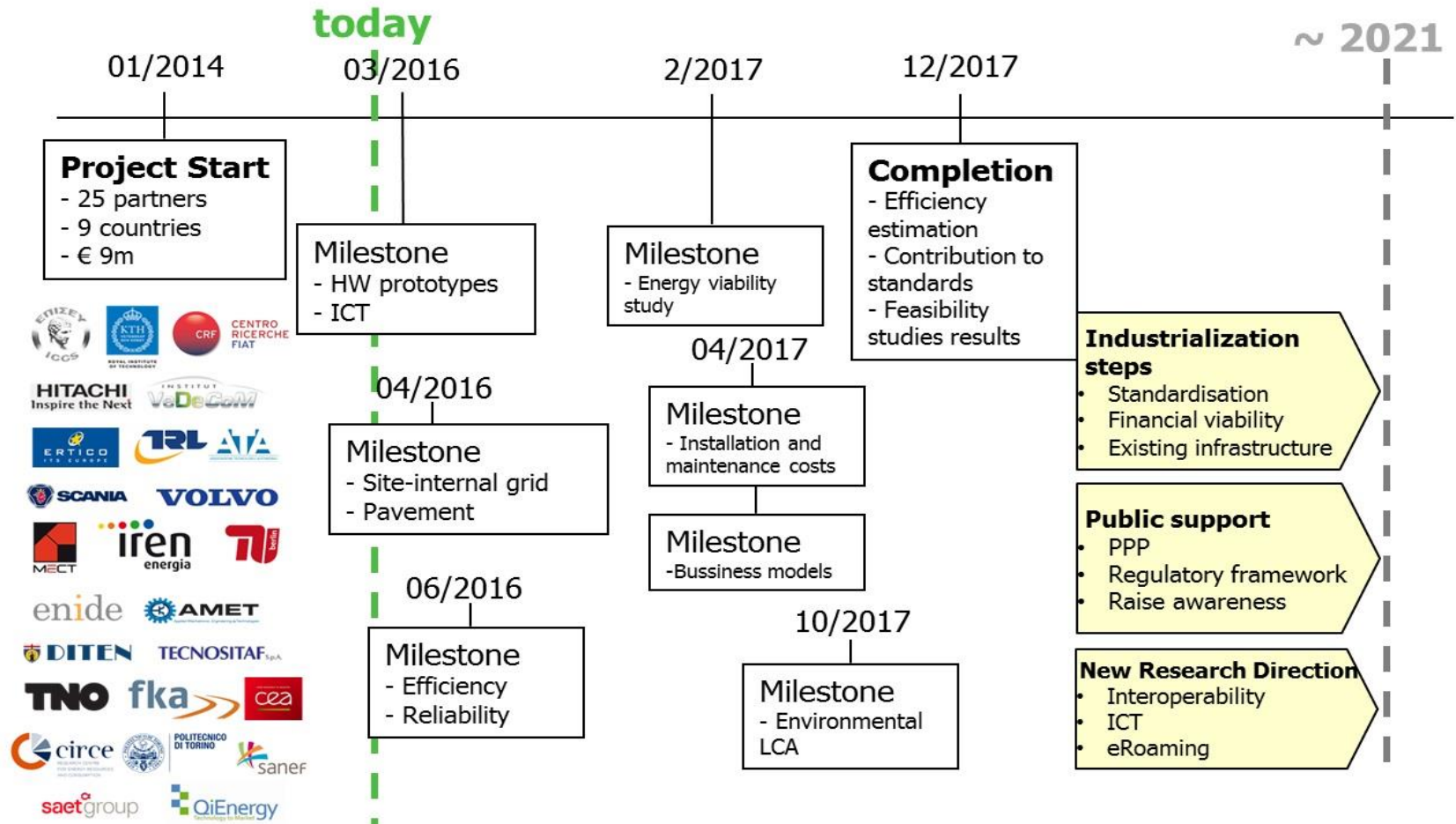
## Investments on dynamic charging technologies

- 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
  - ...



# FABRIC overview

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





# FABRIC technical objectives – charging prototypes

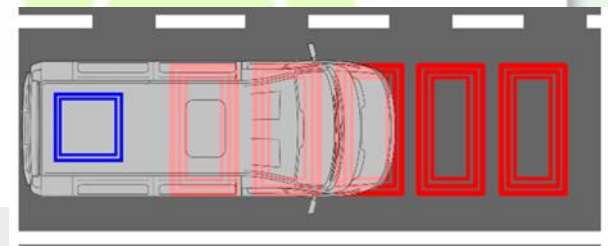
Objective: Develop three different **dynamic** charging prototype solutions to assess their efficiency and compare with existing solutions

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)



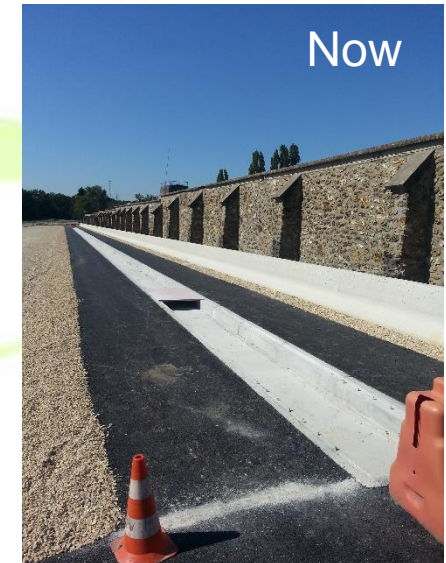
# FABRIC technical objectives – road infrastructure

## Road works at Satory test site

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

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

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



# FABRIC technical objectives – grid infrastructure

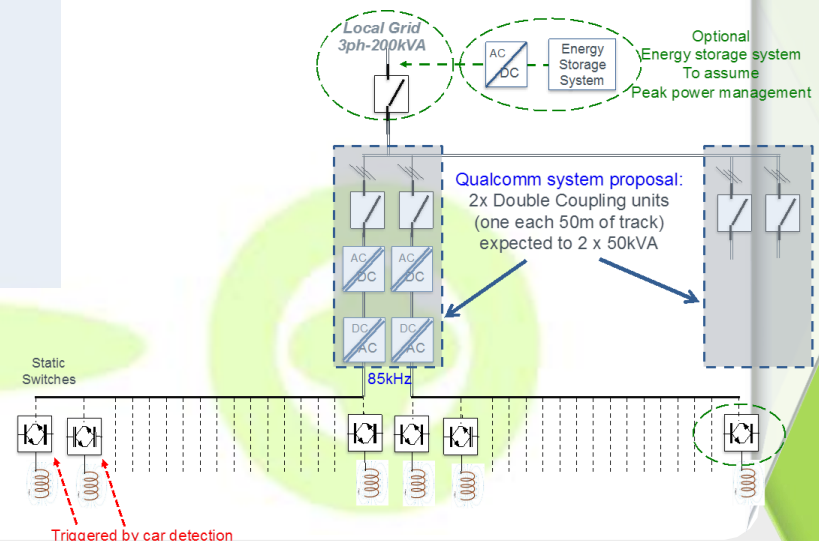
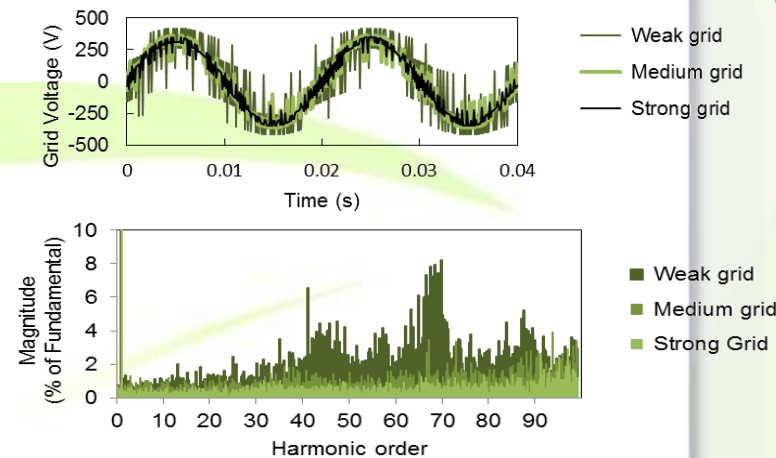
Objective: Perform impact studies on the grid, adapt test sites' micro-grid to support the tests

Status: Impact study complete:

- Power demand simulations for various traffic models (demand fluctuates from 2-8 MW in some milliseconds)
- 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 energy storage capacity reduces daily demand peaks but is expensive)

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

## Harmonics analysis





# FABRIC technical objectives – testing

## French test site:

- VeDeCoM will implement Qualcomm IPT systems on the Satory test track and on electric vehicles provided by car makers
- 100 meters charging lane
- VeDeCoM will incorporate contributions from its members (Renault, Peugeot, et al)



## Italian test site:

- Motor track, 700 meters long, located in Susa Municipalities
- Two paved lanes about 200m long equipped with embedded induction loops
- Can simulate toll collection system
- Smart grid interface including commercial and industrial (C&I) electricity meter
- POLITO and SAET inductive charging solutions will be tested



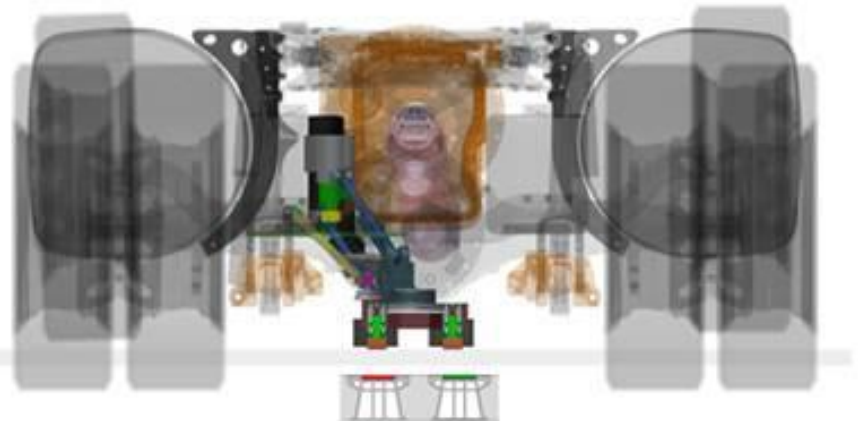


# FABRIC– comparison with conductive solution

- Volvo heavy vehicles/cars test site in Hällered
- Test track for **conductive** electrical road tests (DC 750V)
- Test track is 435m long, electrified part of the track is 275m.
- Technology evaluation results
- Demo of the track and system
- EM emissions measurements
- Conductive charging technology benchmarking



E-road in Volvo testing site



Volvo truck with pantograph

# FABRIC– preliminary feasibility assessment

A first feasibility study approach examined several large-scale deployment scenarios based on actors' requirements and FABRIC deliverables

Deployment scenario	Preliminary feasibility assessment
<b>Metropolitan deployment for heavy freight vehicles</b>	Possible, but strong policy involvement needed
<b>Metropolitan deployment for buses</b>	Feasible if enough incentives given
<b>Metropolitan deployment for general light vehicles</b>	Economic risks for stakeholders should be considered
<b>Metropolitan deployment for service vehicles / taxi's</b>	Economic feasibility uncertain
<b>International freight corridors</b>	Feasible, some concerns on interoperability and legal agreements
<b>Long-haul national freight corridors</b>	Feasible but utilisation rates should be examined carefully
<b>Short-haul freight corridors</b>	Feasible
<b>National deployment for general light vehicles</b>	With the present conditions feasible is not a given
<b>International deployment for general light vehicles</b>	With the present conditions feasible is not a given
<b>International deployment for all vehicles classes</b>	Requires significant changes to reach feasibility

# FABRIC– next steps

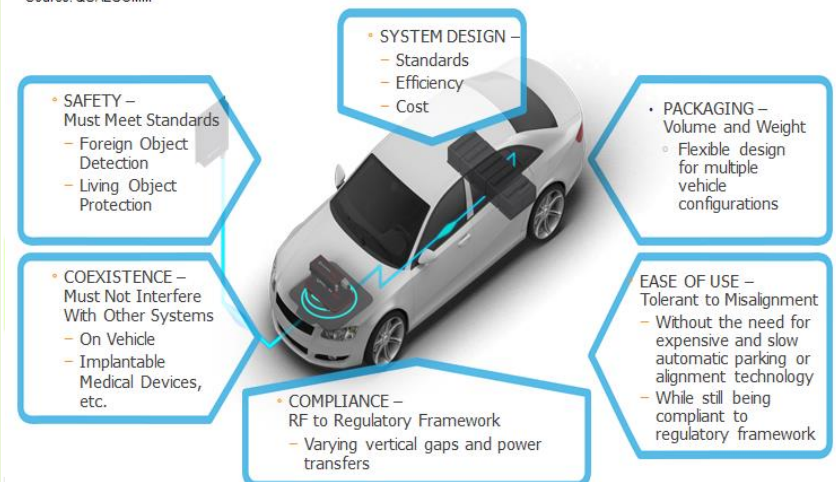
## Major activities 2016

- 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 on the move
- Creation of unobtrusive and efficient UI

Source: QUALCOMM





# FABRIC— how to contact us

Website [www.fabric-project.eu](http://www.fabric-project.eu)

The screenshot shows the FABRIC website homepage. At the top, the FABRIC logo is displayed with the tagline 'Feasibility analysis and development of on-road charging solutions for future electric vehicles'. Below the logo, there are navigation links: 'About Fabric', 'About Electromobility', 'Test sites', 'News and Events', 'Media Centre', 'Downloads', and 'Interactions'. A large banner image shows a road with a green car, with the text 'Paving the way for large scale deployment of electromobility.' and a sub-headline 'Over the next four years the €9 million FABRIC integrated project will address directly the technological feasibility, economic viability and socio-environmental sustainability of dynamic on-road charging of electric vehicles.' Below the banner, there are four columns of content: 'Latest Advances', 'Objectives', 'Test Sites', and 'Expected Impact'. Each column has a brief description and a 'Read more...' link. At the bottom, there is a 'Project videos' section with a video player, a 'Consortium' section with logos of partner organizations (saet group, TRL, etc.), and a 'Contact' section with contact information for the Coordinator, Institute of Communication and Computer Systems (ICCS), Dr. Angelos Amditis, and a 'Useful Links' section with links to European Commission DG Research and Innovation, European Green Vehicle Initiative (EGVI), and European technology platform for the electricity networks of the future. There is also an 'Imprint' section and a 'Read More' button.

LinkedIn group

The screenshot shows the FABRIC LinkedIn group page. The header includes the FABRIC logo and the group name 'FABRIC Integrated Project'. Below the header, there are tabs for 'Discussions', 'Promotions', 'Jobs', 'Members', 'Search', and 'Manage'. A large banner image shows a road with a green car, with the text 'Click here to edit your hero image'. Below the banner, there is a section for 'Members of this Group' with a list of members and a 'See all members' link. There is also a section for 'Your group contribution level' with a progress bar and a 'Getting Started' button. Below that, there is a section for 'As You May Be Interested In' with links to 'EU Contracts & Companies', 'EuropeAd Competitive Intelligence', 'Statistics, Contracts, Partners/Experts', 'Free IT eBook', and 'Math Modeling Software'. At the bottom, there is a section for 'About | Feedback | Privacy & Terms' with a 'LinkedIn' logo and a copyright notice for Unibet Corp. © 2015.

Join the ERG



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# Thank you!



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