MEET IN ASIA PACIFIC FOR THE
WORLD'S LEADING TRANSPORT TECHNOLOGY EVENT

ACTIVATING GLOBAL MOBILITY SOLUTIONS

ITS—ENHANCING LIVEABLE CITIES AND COMMUNITIES

2016 MELBOURNE

23rd World Congress on Intelligent Transport Systems

Melbourne Convention and Exhibition Centre

10–14 October 2016

Australian Government — PROGRAM PARTNER

VICTORIA State Government Australia — HEADLINE PARTNER

MELBOURNE Victoria Australia — SUPPORTED BY

itsaustralia Intelligent Transport Systems — HOSTED BY

ITS — CO-HOSTED BY

ERTICO — CO-HOSTED BY

ITS AMERICA — CO-HOSTED BY

www.itsworldcongress2016.com | #ITSWC16

Angelos Amditis

Research Director, ICCS

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

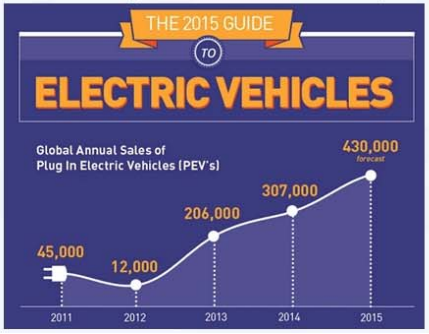
Electromobility trends (I)

Electric Vehicles

Range increases due to battery breakthroughs

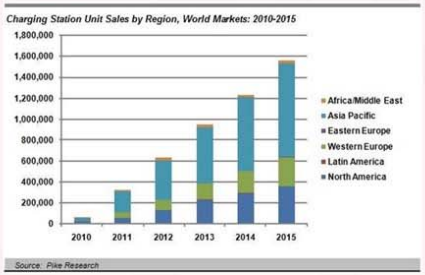
New models

Global adoption increases steadily



Infrastructure

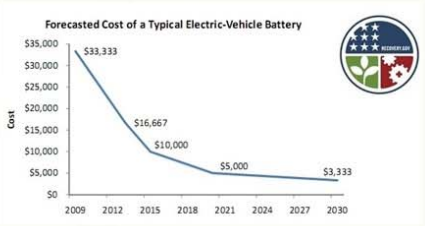
Static charging infrastructure is deployed fast



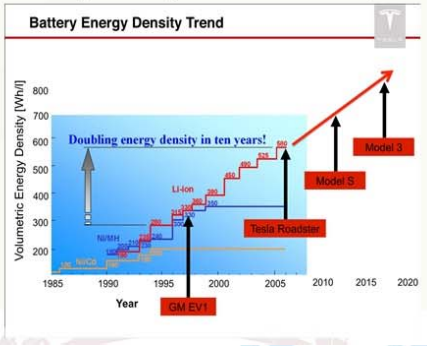
Very fast supercharger deployment (>250km range in 20 minutes)

Batteries

EV batteries' price dropping



Battery density increases linearly

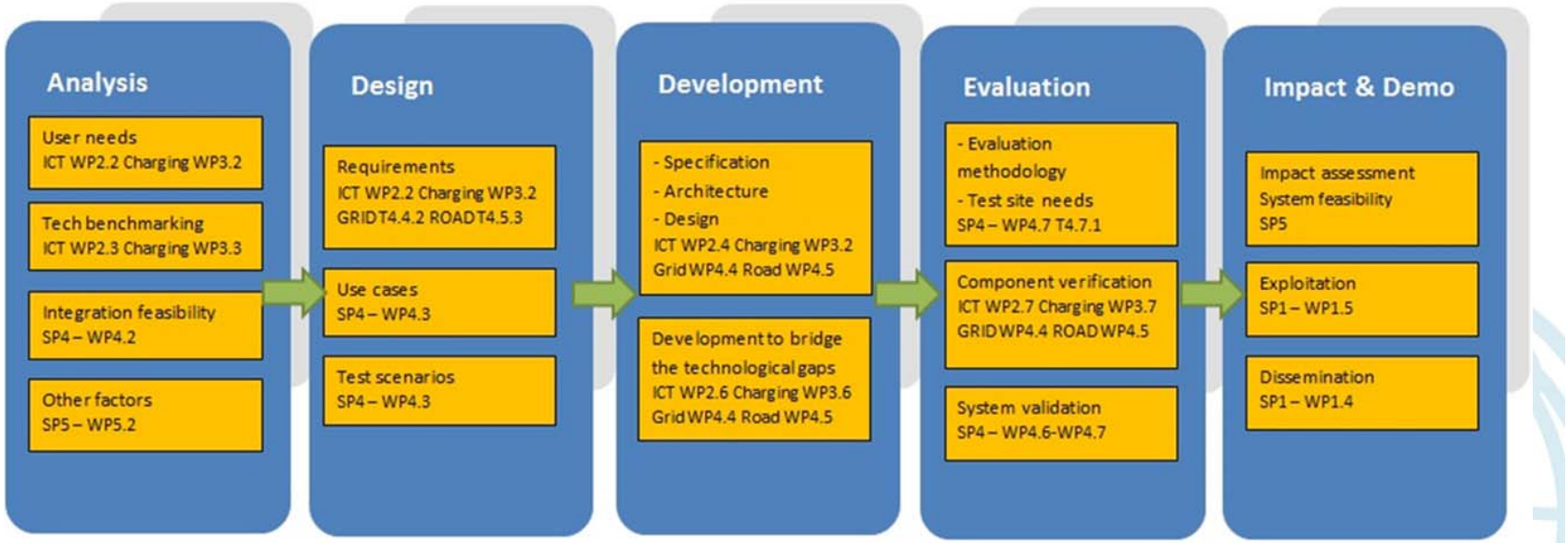


Project Overview

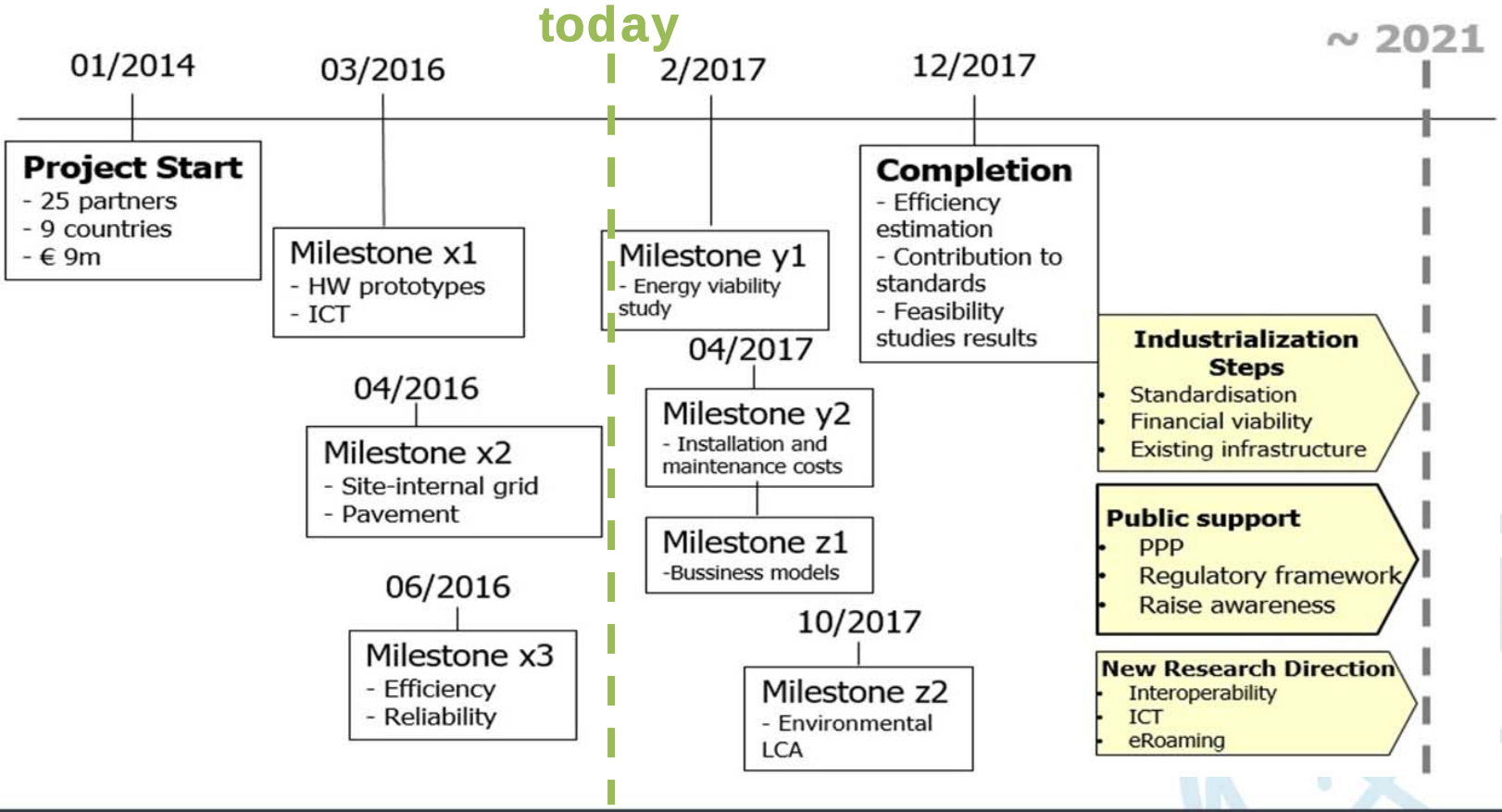
FABRIC	**FeAsiBility analysis and development of on-Road chargIng solutions for future electric vehiCles**			
EC Call	**GC.SST.2013-1** “Feasibility analysis and technological development of on-road charging for long term electric vehicle range extension”			
	Type of action	**Project budget**	**EU Funding**	**Project Start-End**
	Research & Innovation	€ 9 m	€ 6.5 m	1 January 2014
Partners	ICCS, CRF, SCANIA, VOLVO, VeDeCom (Renault), SAET, ERTICO, AMET, ATA, CEA, CIRCE, ENIDE, FKA, TUB, HITACHI, KTH, MECT, POLITO, QIE, SaNeF, TRL, TNO, TECNO, UNIGE-DITEN, IREN			

Project Overview

- Targets:
  - Range extension of EVs via dynamic wireless charging.
  - Development and testing of three dynamic wireless charging prototypes - Including ICT modules and e-roads
  - Feasibility analysis for large scale deployment of the technology.



Project Timeline

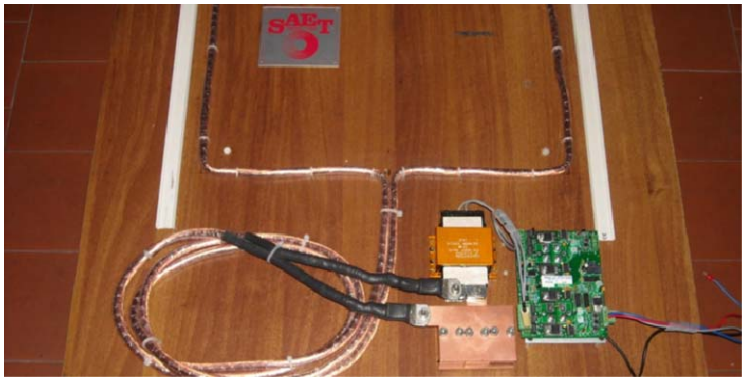


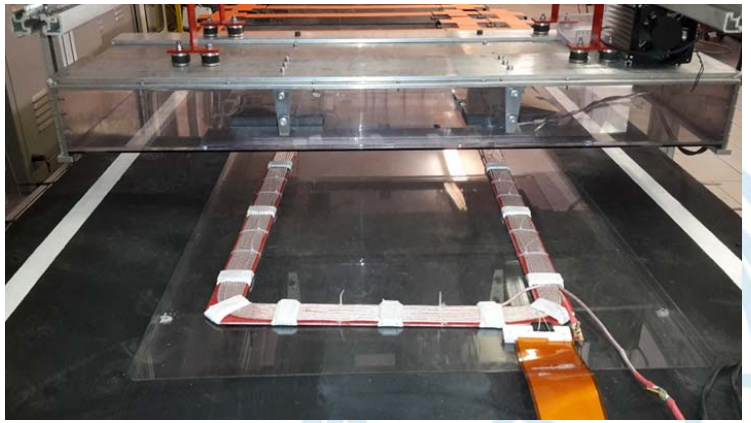
Project Result 1 – Charging prototypes (VEDE)

- Evolution of QUALCOMM HALO static charging pads for dynamic charging.
- Novelty:
  - Higher power transfer comparing to the static solution (>20kW @85kHz)
  - New proprietary communication/control protocols (Confidential)
- Improvement vs current charging technologies:
  - New charging scenarios (opportunistic, on the go) especially in urban environment
  - Higher speeds than the ones tested so far for wireless dynamic charging (aiming for 90km/h)
- Intellectual property generated:
  - QUALCOMM patents for dynamic charging pads

Project Result 2 – Charging prototypes (POLITO & SAET)

- Evolution of of ECOFEV technology by POLITO to support dynamic charging.
  Higher power transfer rate.
- Novel design by SAET. Different electrical architecture and physical design.
- Novelty:
  - Novel components to increase efficiency and reduce cost
- Improvement vs current charging technologies:
  - Potential patents for POLITO regarding the novel components
- Different solutions but interoperable: The vehicle will have the same secondary coil, developed by POLITO.





Project Result 3 – ICT for dynamic charging

- Three ICT “modules” were developed:
  - Charging management: Real time load balancing to ensure the secure grid operation, make sure that demand is kept lower than supply and distribute appropriately the supply among the charging EVs.
  - HMI for guiding and informing the driver before, during and after charging.
  - Lane keeping system that utilizes the HMI and guides the driver in order to minimize misalignment and maximize charging efficiency.

- Proprietary software, different for the two pilots.

- Several publications at IEEE transactions /conferences

- Improvement could be expected if driving was done automatically in the charging lane

Project Result 4 – 3 Test tracks (e-roads)

- Two test tracks were constructed in the project:
  - Satory (100 m) integrating VEDECOM solution
  - Susa (>100 m) integrating POLITO & SAET solutions
  - Grid adaptations to support the charging load
  - Custom made covers for Satory to withstand EV weight

- An additional test track in Malaga will be tested:
  - Supports heavier vehicle (small bus)
  - Power rating at 50kW
  - Tests at 10km/h

- Improvement over current technology:
  - Longer tracks than the SotA for DWPT
  - Reusable track for testing new pads (Satory)
  - Testing at higher speeds

Project Result 5 – Feasibility studies

- The main bulk of the feasibility studies began from the second half of 2016 and will continue until the end of the project (also based on FABRIC test results).

- A preliminary feasibility assessment examined several large-scale deployment scenarios based on actors' requirements and available FABRIC deliverables.

- Currently the following activities are taking place:
  - Integrated LCA/LCC system for evaluation of E-roads
  - Definition of technical specifications for construction, maintenance and operation of E-roads

- The corresponding reports may contribute as guidelines to decision makers, city authorities and stakeholders. Public deliverables are available at the website.

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

Next steps

- Validation of the integrated test sites
- Testing
- Test results analysis

- Feasibility studies:
  - Assessment of impact on the grid of large-scale deployment.
  - Assessment of maturity, reliability, efficiency and stability of the supply chain.
  - Cost-benefit analysis and business models of large-scale deployment.
  - Deployment scenario analyses for achieving environmental targets, standardization and harmonization.

FABRIC and more…

Implementation

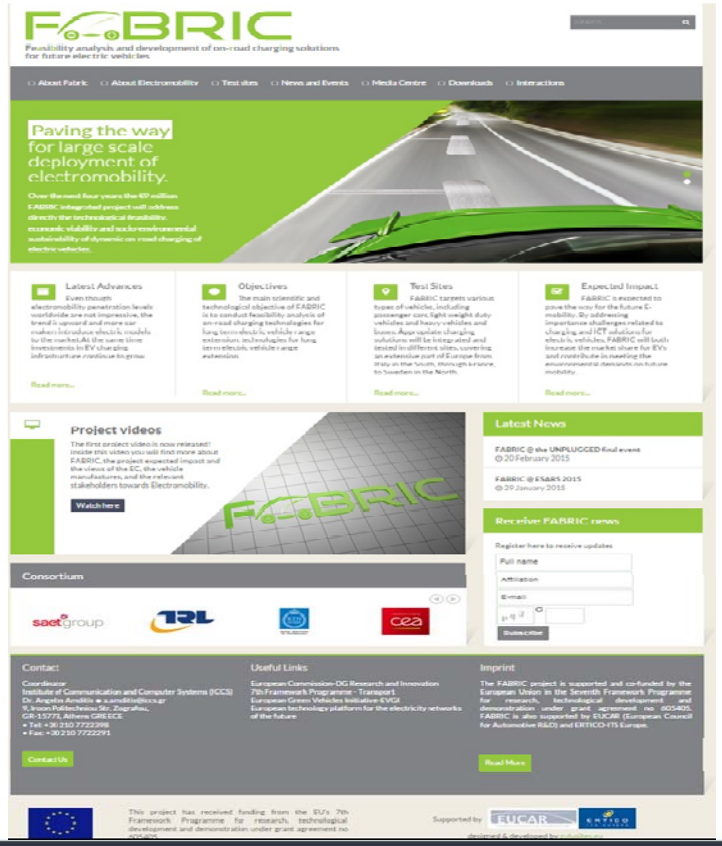
- Need for direct investment or incentives by authorities and government on modernizing the grid and making sure that it can cover the future needs of electromobility including the special characteristics of dynamic charging (high frequency of high-power, low-energy peaks).
- Standardisation efforts should include dynamic charging.
- Regulations regarding the physical characteristics of the installations and safety levels.

New research directions:

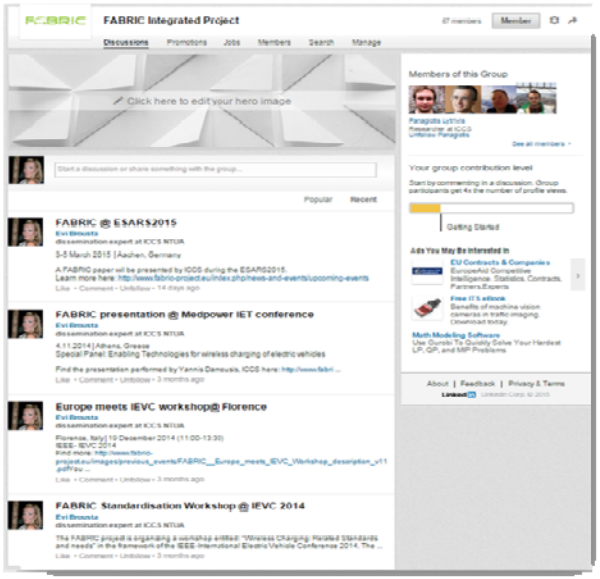
- Synergies with developers of conductive solutions, to investigate how to utilize the same electric infrastructure and grid connection systems.
- Promote communications research focusing on security and reliability.
- Advance eRoaming, to achieve seamless transition between existing charging networks thus improving drastically the business potential outlook.

How to contact FABRIC

Website www.fabric-project.eu



LinkedIn group



Join the ERG

Coordinator: a.amditis@iccs.gr

Thank you for your attention

Angelos Amditis,
Research director, ICCS
a.amditis@iccs.gr