FABRIC

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

FAST IN CHARGE

Static and Dynamic Fast Inductive Charging
The FastInCharge project

www.fastincharge.eu

Evangelos Karfopoulos
PhD Candidate at NTUA
Research of SmartRue Research Team

SMART RUE

FABRIC Conference, Brussels, 2 Feb. 2016

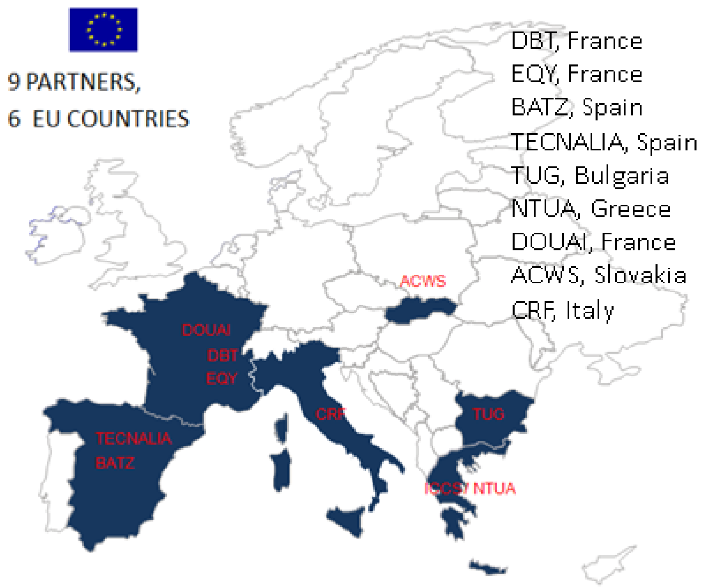
FastInCharge Project – EU FP7

❖ Budget: Approximately 2.4M€.

❖ Duration: 36 months (Oct. 2012-Sept 2015).

❖ The consortium comprises 9 organizations from 6 European Member States. Particularly:

- 1 Company specialized in charging infrastructure for electric vehicles (DBT)
- 1 automotive industry (CRF).
- 1 industrial group of automotive engineering (BATZ),
- 3 research organizations, specialists of automotive engineering, contactless power and management systems (Tecnalia, TU Gabrovo, NTU Athens),
- 1 end-user, demonstration site (Douai),
- 1 autocluster (ACWS) ,
- 1 Company specialized in innovation management (EQY)



FastInCharge Project

Scope:

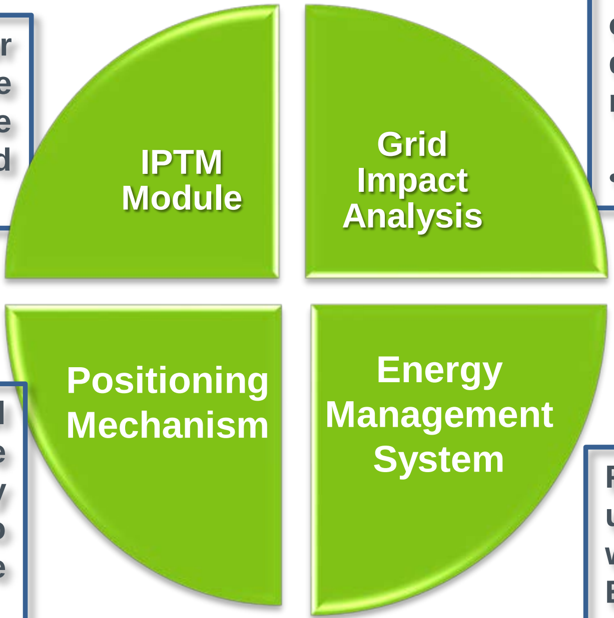
Fostering the implementation of electric vehicles in the urban environment by developing appropriate fast charging infrastructures that responds to EV user's major concerns: charging duration, driving autonomy, charging infrastructure availability. For this scope, two fast wireless charging stations (static and dynamic) were designed, developed and demonstrated in a real life context (city of Douai, France)

Objectives:

Development of an inductive power transfer module that enables the continuous wireless transfer of the energy at high power rates and efficiency

•Estimation of the energy profile of fast inductive (static and dynamic) charging station network.

•Perform grid impact analysis



Development of a mechanical system that will ensure the appropriate placement of the primary and secondary coils of the IPTM so as to achieve the maximum possible power transfer rate

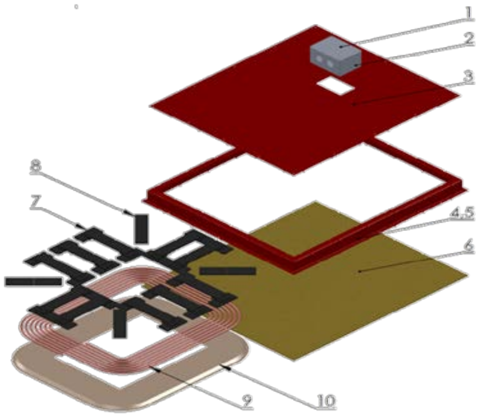
Facilitate EV charging in an urban environment offering fast wireless charging capabilities to EV users while considering the network capacity limitation

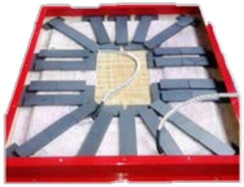
IPTM Module

- A rectangular shaped pad comprising
  - ferrite plates
  - aluminum shielding
  - a 4cm thickness of polymer-concrete Class B 125

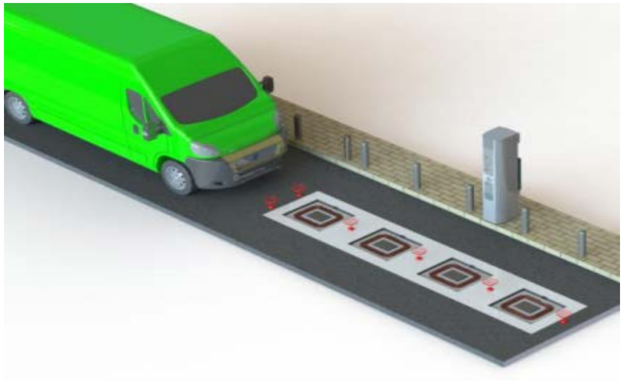
- IPTM specifications:
  - output power ~30kW,
  - efficiency ~ 92%.
  - Air gap of up to 90mm between the two coils,
  - Allowable horizontal misalignment is equal to ± 200mm.
  - Primary winding: 700mm x 800mm x 90mm – 28kg
  - Secondary winding: 700mm x 800mm x 60mm – 24kg

- The on-route or dynamic station comprises four successively placed primary coils and magnetic sensors for detecting EV presence.





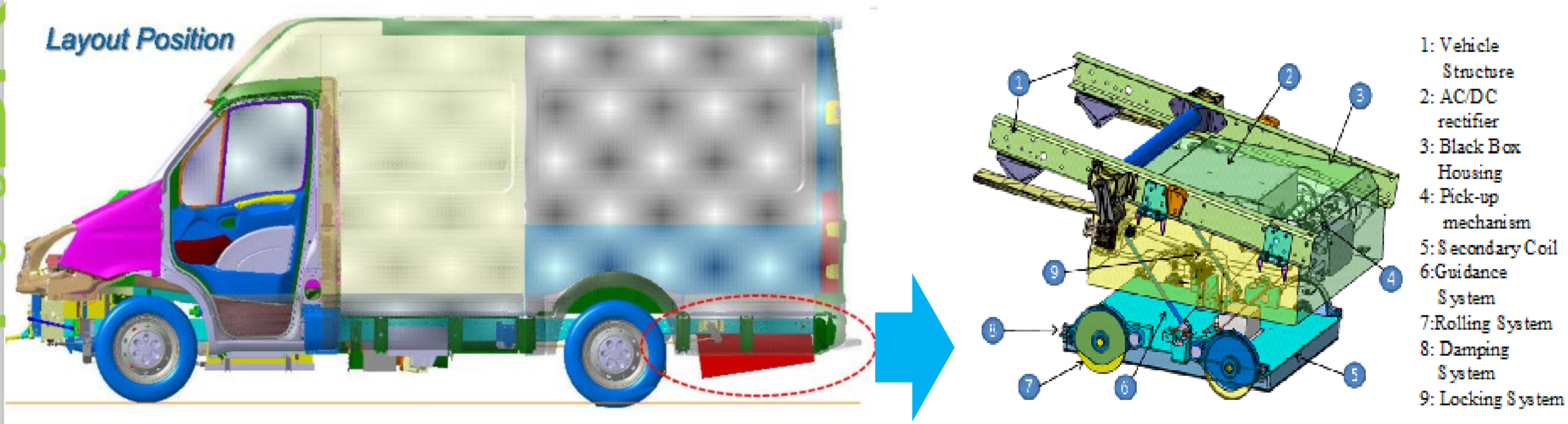
N°	PART
1	Junction box
2	Aluminium box
3	Cage cover
4	Cage frame components
5	Cage frame
6	Bottom cover
7	Ferrite cluster
8	Ferrite cluster
9	HF Winding
10	Coil former



Positioning Mechanism

- Ensures a 9cm airgap between the charging plate placed underneath the EV the coupling charging plate place on the road.

- The mechanical system was designed considering all the different elements that should be integrated in the demonstration EV i.e secondary coil, motors, AC/DC rectifier, magnetic sensors.



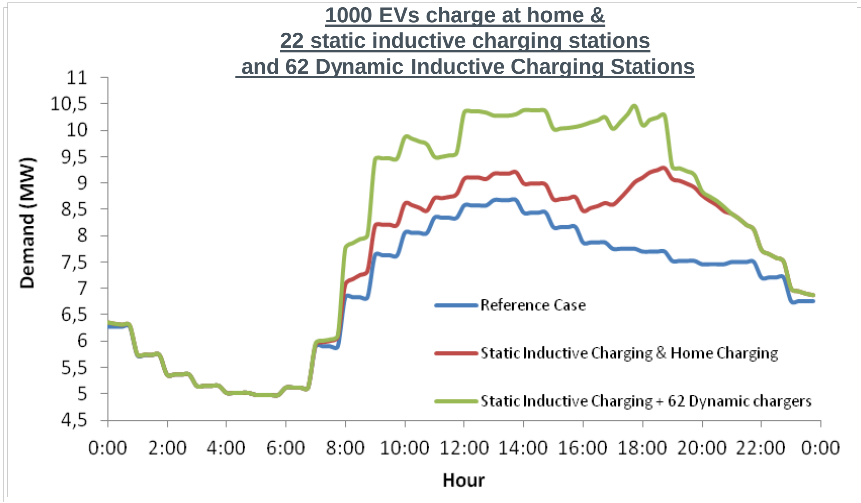
Demonstration of FiC solution

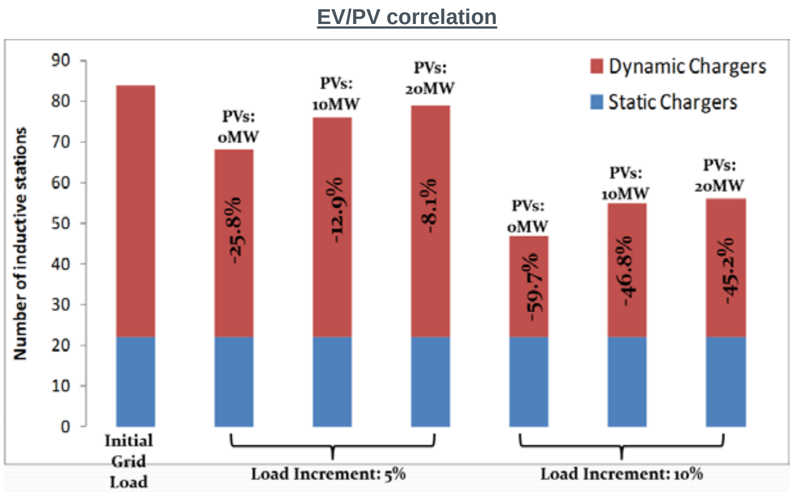
Douai, France (June 2015).

Grid Impact Analysis

A simulation tool was developed for defining the maximum number of static and dynamic chargers that can be integrated in a distribution network without violating network operational constraints.

- The max number of static chargers is defined considering the number of charging sessions required within a day and the charging duration.
- The max number of dynamic chargers is defined considering the network technical specifications.





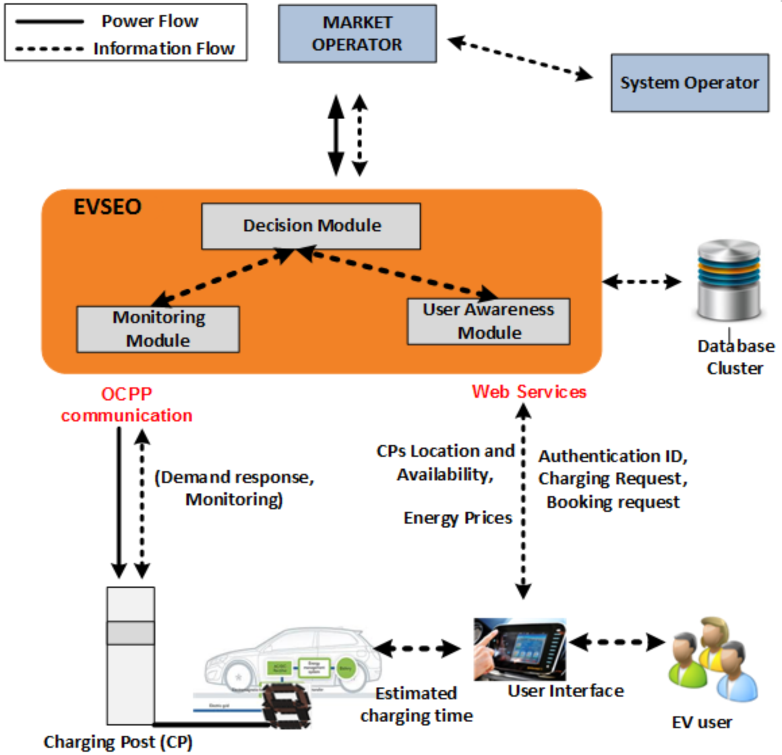
Energy Management System

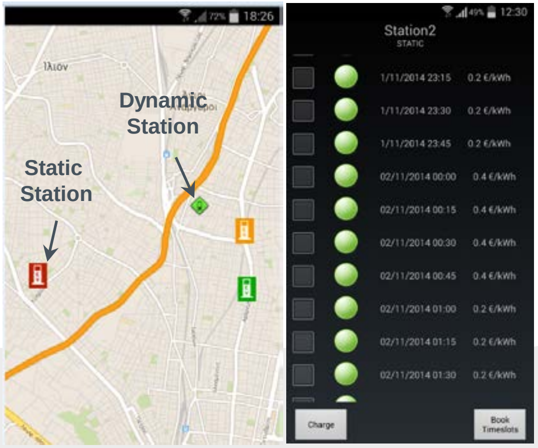
❖ The management system considers:

- *EV charging drivers needs*
- *Existing grid infrastructure.*

❖ The management system fulfills the following objectives:

- *Monitoring*
- *User awareness*
- *Booking services*
- *Remote control*





FABRIC

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

Thank you!

Evangelos Karfopoulos

PhD Candidate at NTUA

Researcher of SmartRue Research Team

Mail: ekarf@power.ntua.gr

Website: www.smartrue.gr