



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

Project VICTORIA

The first Spanish showcase for DWPT

Hans Bludszuweit
CIRCE Foundation, Zaragoza, Spain

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Agenda



1. Project VICTORIA at a glance
2. Inductive system: Infrastructure
3. The Bus
4. Inductive Charger
5. Results

1. Project VICTORIA at a glance

Objective:

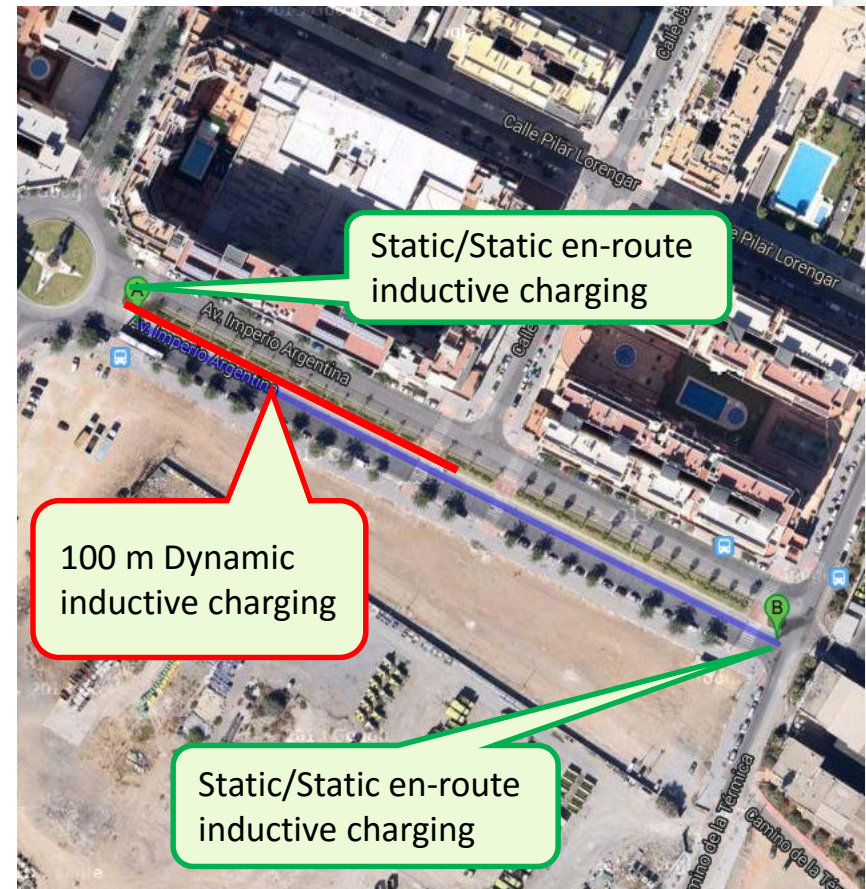
- Inductive charging for urban bus

Project partners:

- Utility Endesa (Lead)
- Malaga city council
- CIRCE
- other companies

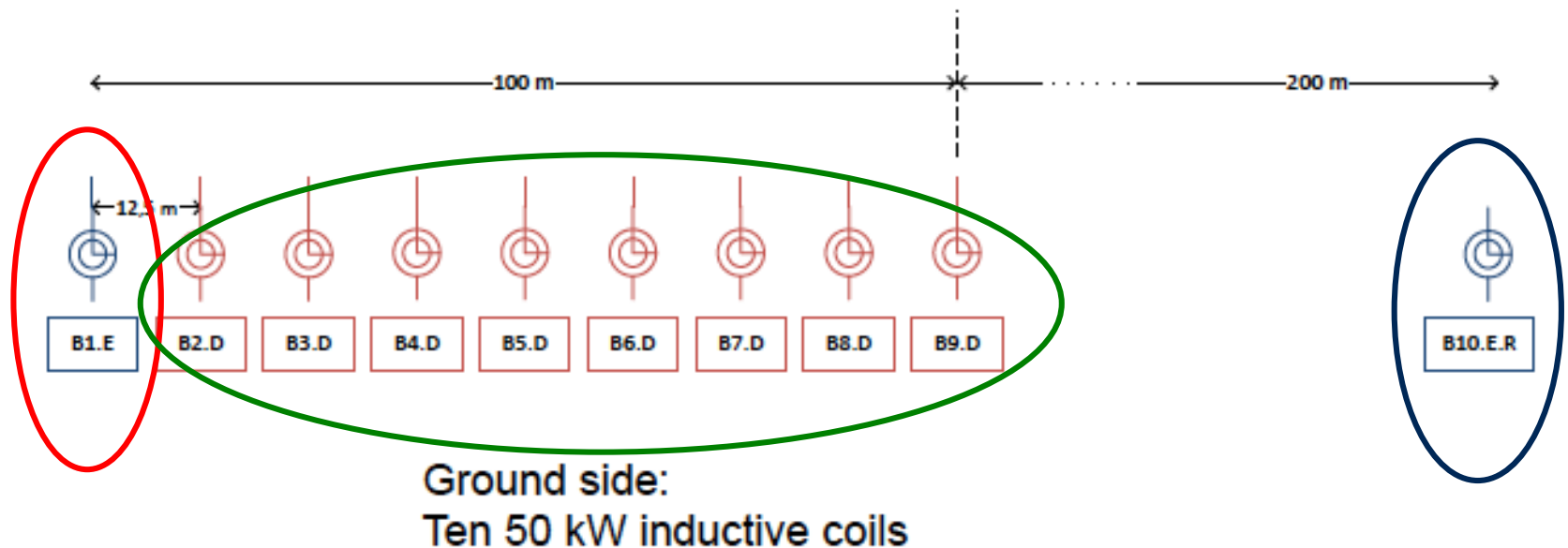
Developments

- CIRCE:
 - Conductive 50 kW CHAdeMO
 - Static inductive
 - Static en-route inductive
 - Dynamic inductive 50 kW
- Others:
 - Self guided bus



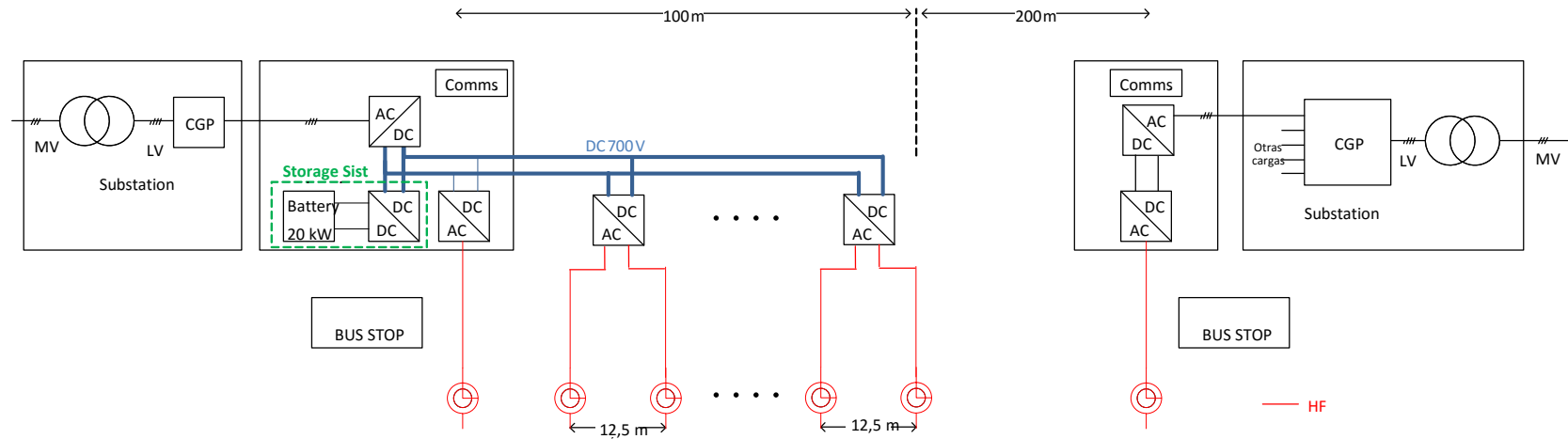
2. Inductive system: infrastructure

- ➔ Static charge: at initial bus stop
- ➔ Static on route charge: at initial and final bus stop
- ➔ Dynamic charge: 8 coils separated 12.5 m



Inductive system: infrastructure

2. Inductive system: infrastructure



- 2 distribution substations
- 2 static inductive chargers
- 700 VDC bus for dynamic inductive
- 1 cabinet for each 2 dynamic coils
- 20 kW/20 kWh Li-ion battery pack

3. The Bus

- Gulliver U520 ESP/LR
- 5.3 m length
- 100% electric
- Self-guided control to assure proper speed/ misalignment
- Adapted for conductive and inductive charging



3. The Bus



Testing at CIRCE's facilities (Zaragoza)

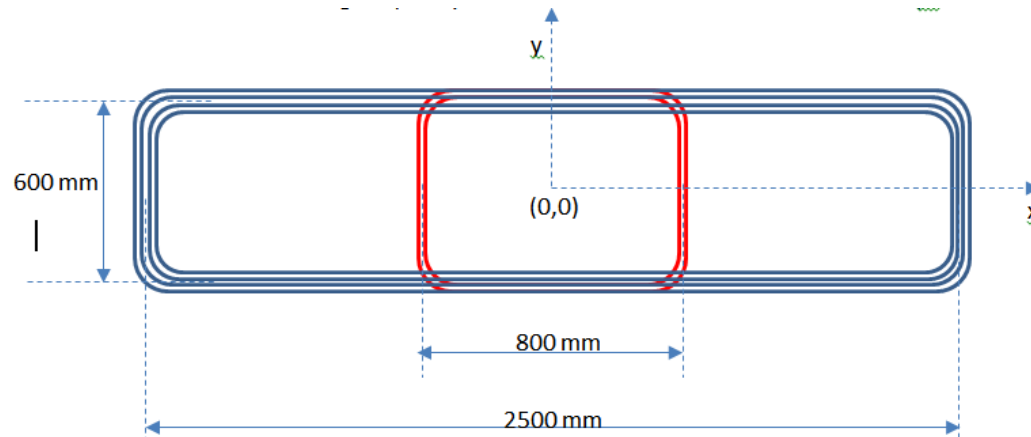
Testing at test site (Málaga)



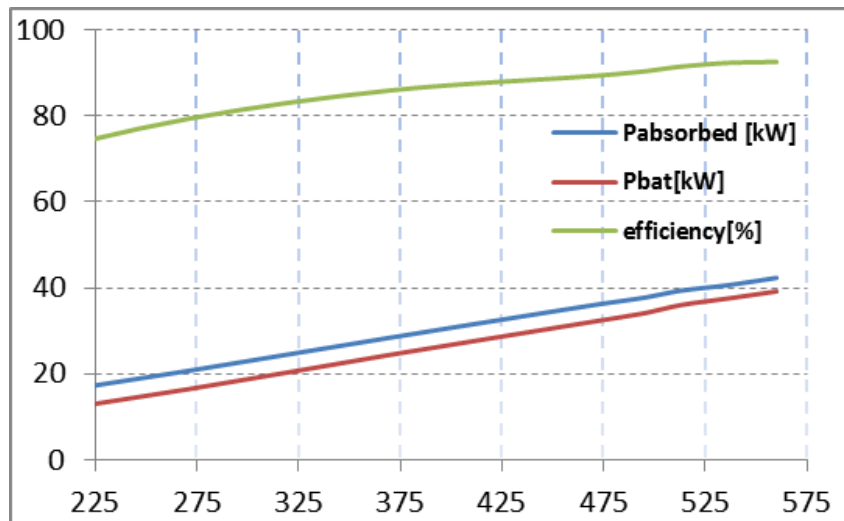
4. Inductive charger

- Topology: SPS (CIRCE's patent)
- Ground side coil: 800 x 600 mm
- Onboard coil: 2500 x 600 mm (due to dynamic charging if only static charging is needed it can be reduced)
- Misalignment: +/- 30% of the ground side surface
- Airgap: 0.15-0.25 m
- Total efficiency > 85% (prototype)
- EMI Shielding complying with ICNIRP 2010 and IEC 61851

4. Inductive charger

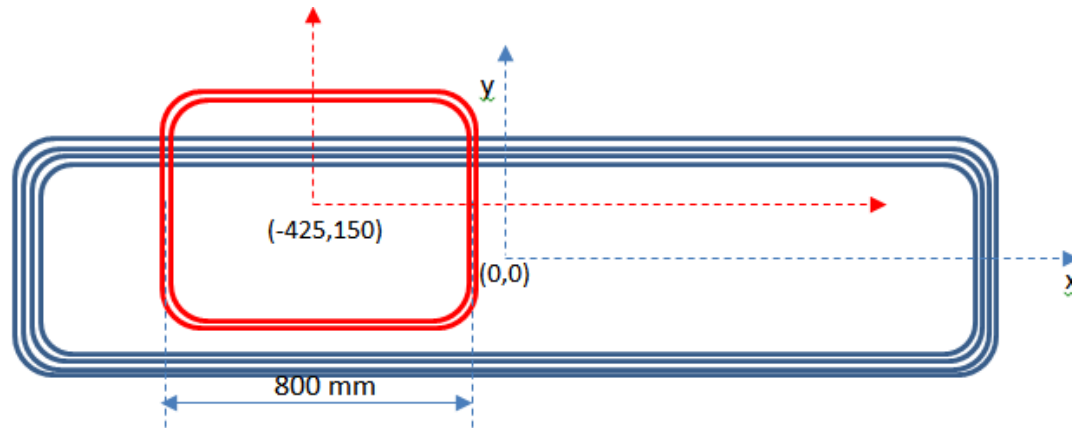


Coils size:
Red (ground coil),
Blue (onboard coil)

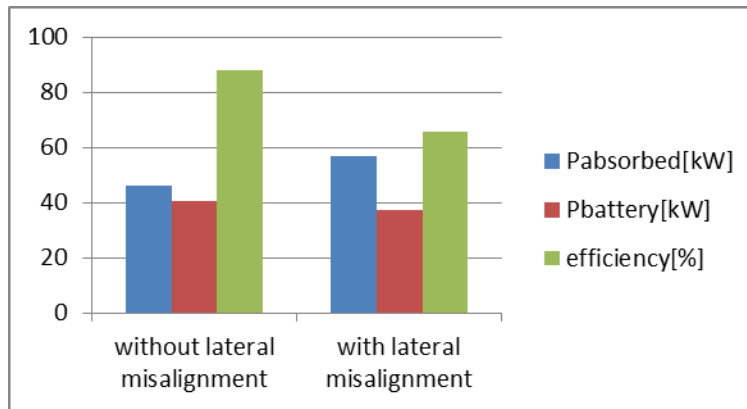


IPT Efficiency

4. Inductive charger

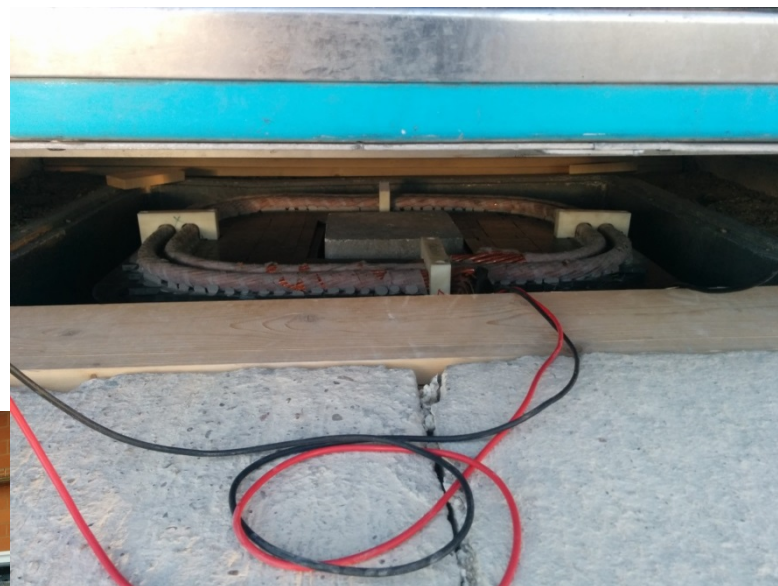


Lateral misalignment



IPT Efficiency

4. Inductive charger



4. Inductive charger



On-Board unit



5. Results

- Solutions with high power transfer capability (**50 kW**)
- Improved power quality → **THD less than 1%**
- Reactive Power fully controllable
- **Total efficiency over 85%**
- IPT efficiency over 91 %
- Fewer EMC certification problems due to reduced noise
- **Small filters** → Reduction of cost and size
- Integrated with **Li-ion static storage** and ready to integrate with PV



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Thank you!



Hans Bludszuweit
CIRCE Foundation
hblud@fcirce.es

