FABRIC

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

Dynamic Wireless Power Transfer

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Project facts

Integrated Programme

1. **Duration:**
   - 1 January 2014 - 31 December 2017
2. **Total cost:**
   - 9.000.580,64€
3. **EC contribution:**
   - 6.495.000,00€.
4. **Coordinator:**
   - Institute of Communication and Computer Systems

Project partners

23 Partners

9 EU countries

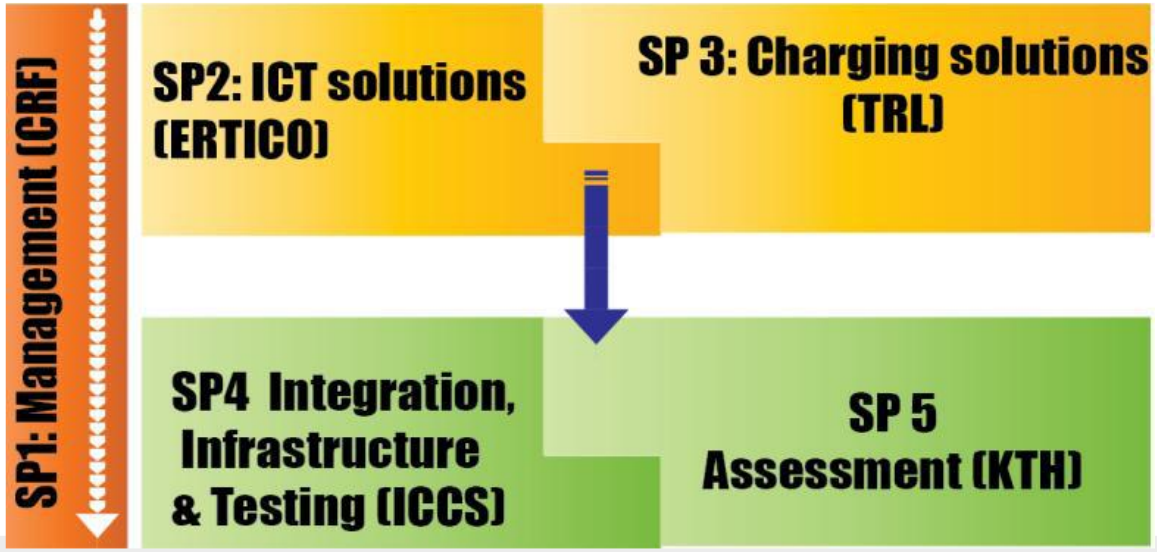
Large stakeholder group of international industrial and research organisations

Project objectives

1. Development and testing of advanced ICT and charging solutions

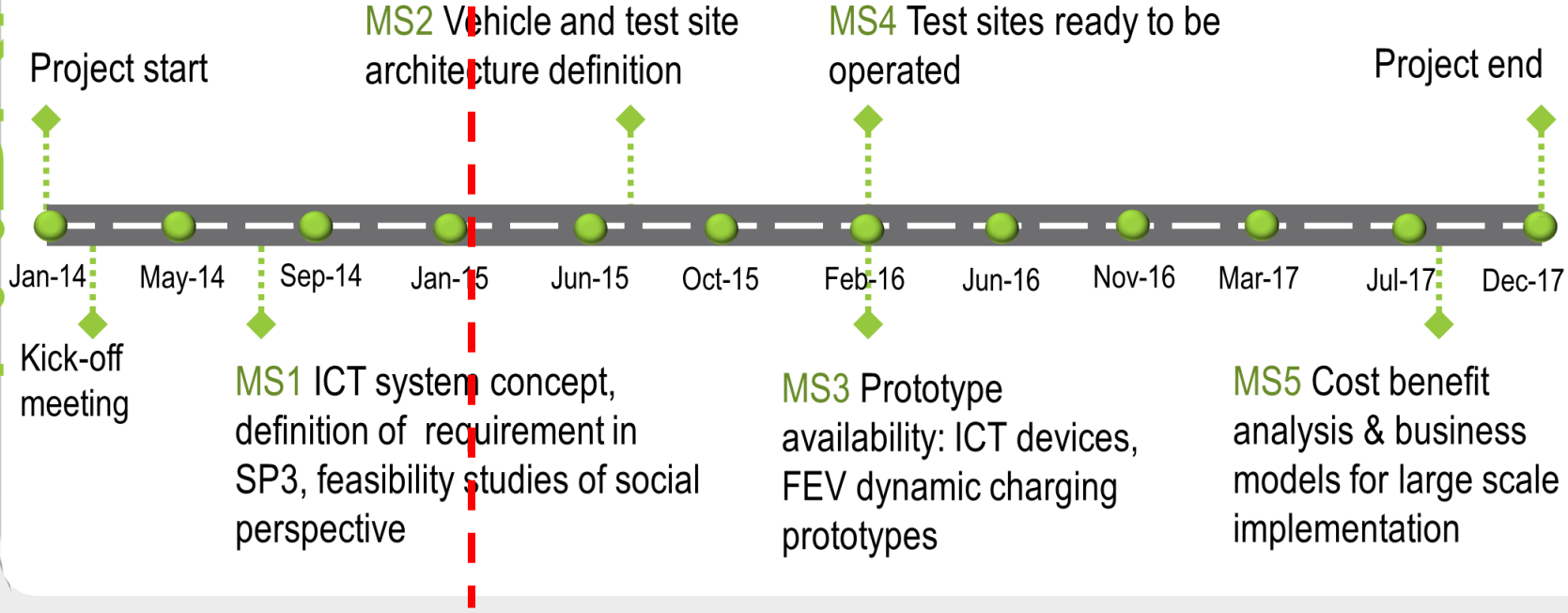
2. Sustainable integration with road and grid infrastructure / development of specifications

3. Long-term socioeconomic impact and feasibility studies for large scale electromobility implementation

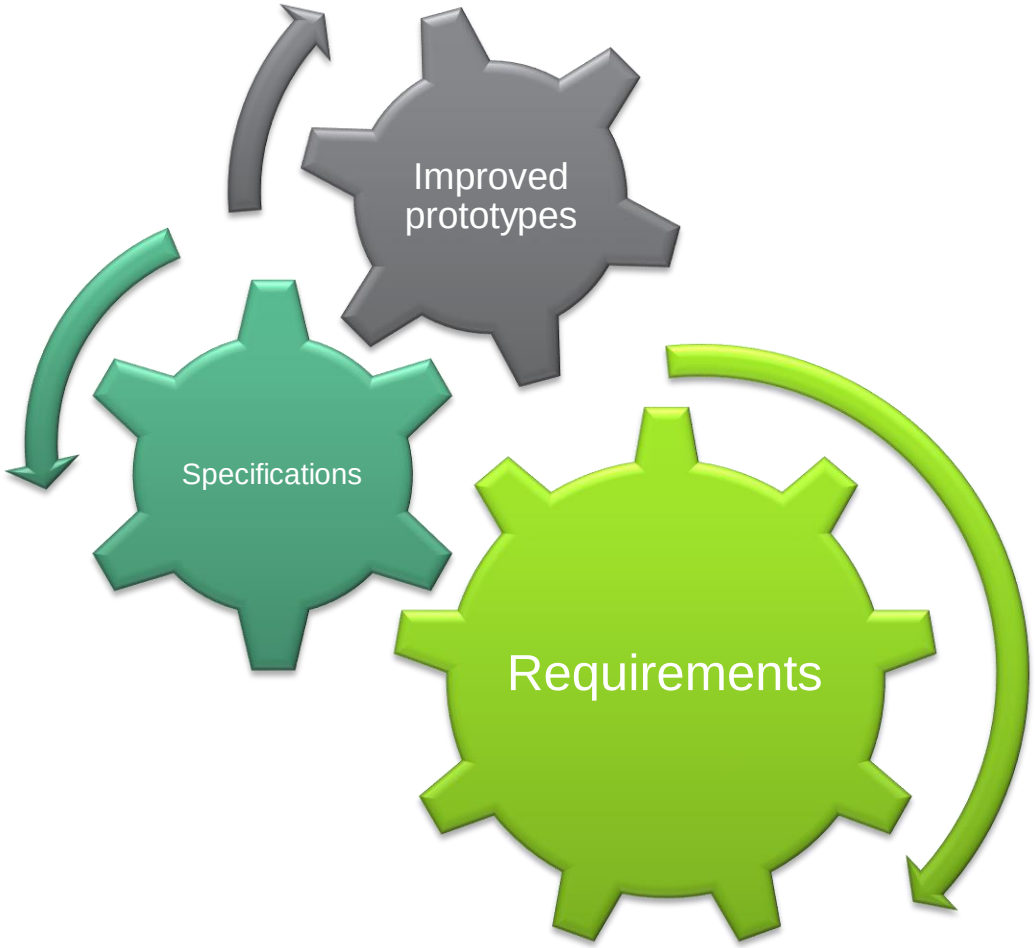


Achievements to date

- SotA and technical benchmarking of ICT and dynamic charging solutions
- Definition of FABRIC use cases
- Definition of requirements
- Existing dynamic charging solution market readiness study.



Development of solutions



- Road Operator
- Distribution System Operator
- City and Local Authority
- Vehicle Manufacturer
- EM and Safety

Requirements for misalignment tolerance

1. In total, 36 drives were complete
2. Aged between 25 and 45 years old

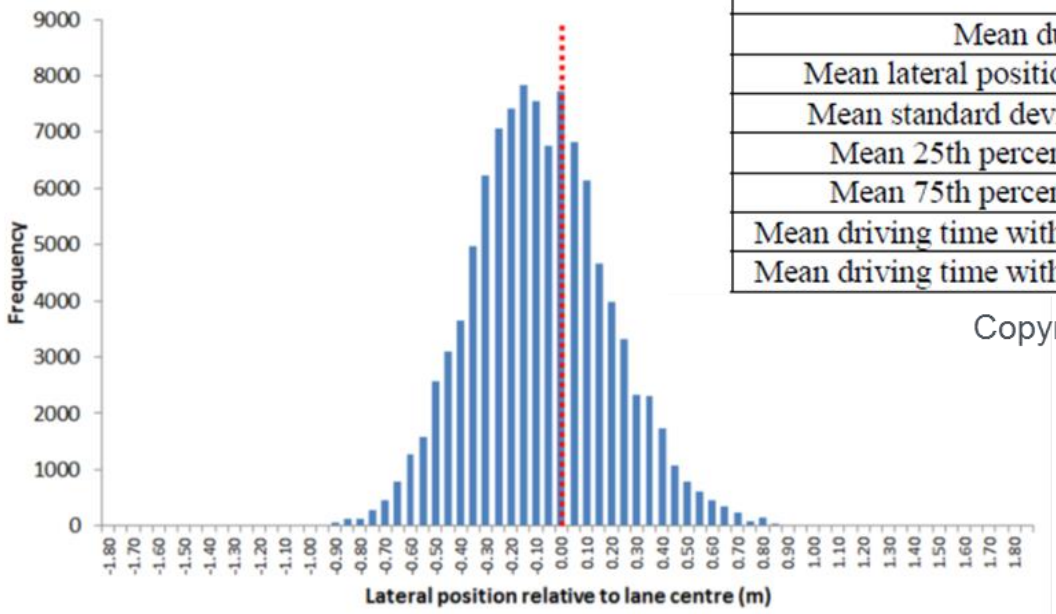
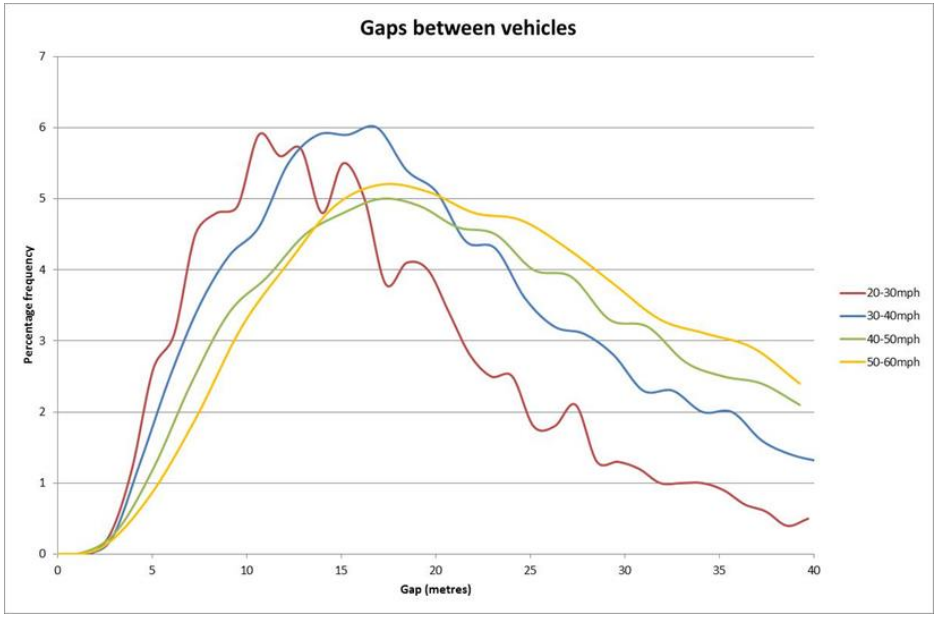


Table 1: Summary of the analysis of lateral position

Measure	Value
N	36
Mean duration (seconds)	145.3
Mean lateral position relative to lane centre (m)	-0.108
Mean standard deviation of lateral position (m)	0.181
Mean 25th percentile of lateral position (m)	-0.230
Mean 75th percentile of lateral position (m)	0.020
Mean driving time within ±0.05m from lane centre (%)	13.9
Mean driving time within ±0.15m from lane centre (%)	37.9

Considerations of segment lengths and spacing

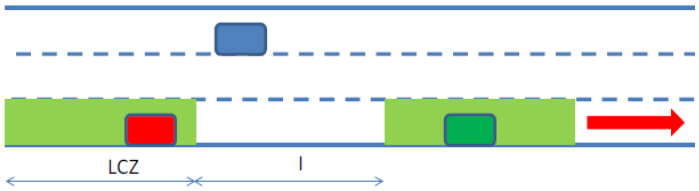
1. Most common gap between vehicles at 80.5km/h (50mph) to a gap between vehicles of 20m.
2. In motorway queues with stop-start driving, vehicles typically occupy 10m each, this equates to a 4m gap between vehicles on average
3. 1% of drivers are travelling within 4m of the vehicle in front.

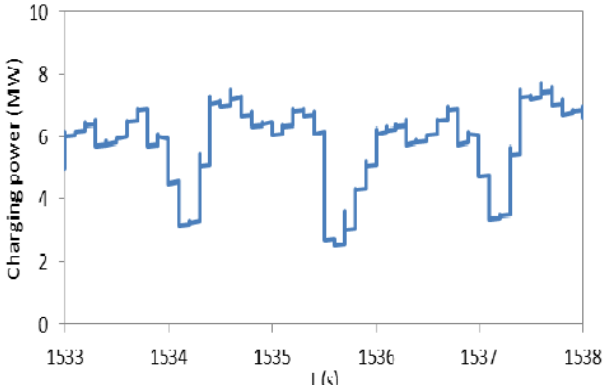


Electric grid requirements

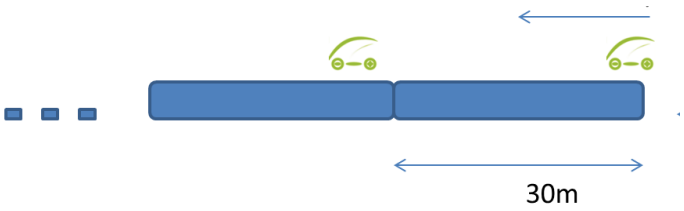
Effect of power transfer design

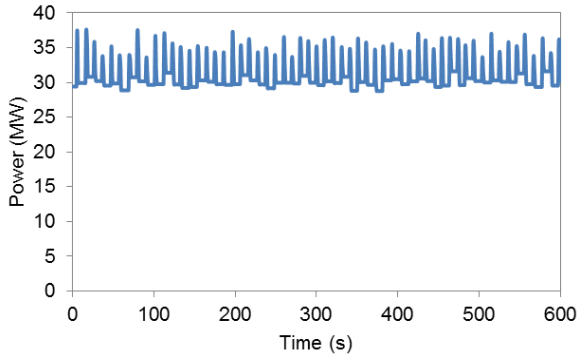
- Separated Power transfer pads: large fast fluctuations





- Contiguous Power transfer pads: reduced fluctuations



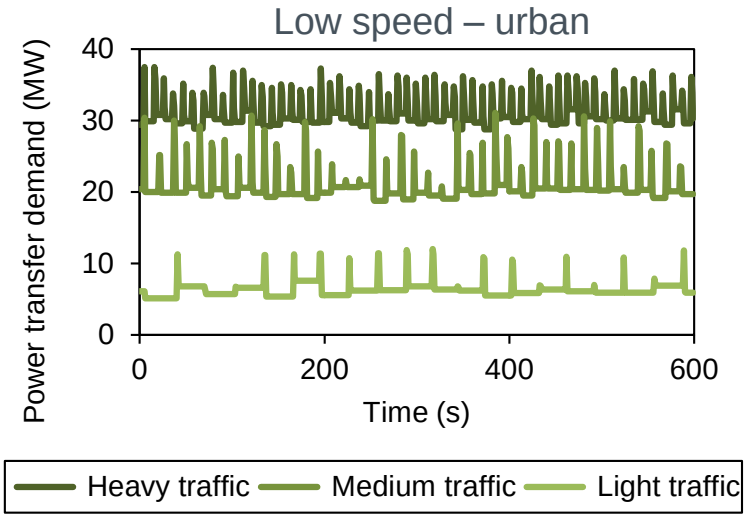


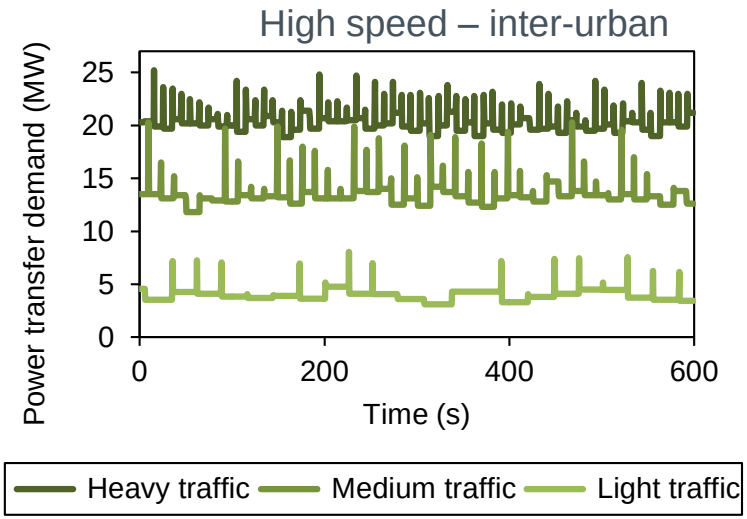
Electric grid requirements

Effect of traffic conditions

- Different densities at low speed (urban traffic, 36 km/h)
  - Higher demand
  - Larger fluctuations

- Different densities at high speed (inter-urban traffic , 108 km/h)
  - Lower demand
  - Less fluctuations





Road infrastructure requirements

- Requires a considerable amount of further research to optimise installation method
- Examples of key requirements and considerations:
  - Load and temperature limits (10—13.5 tonnes per axel, 120-200°C, temperature gradient of around 60°C in 3 minutes)
  - Function at motorway speeds (up to 65mph)
  - Must function through at least 4cm of wearing course of road surface (plus air gap surface and secondary coil)
  - Road side power supply must be at least 2m from safety barrier
  - Must be bale to remain in the road without degrading the structure for at least 20 years
  - Should be able to cope with resurfacing works every 10-12 years
  - Number of new interfaces between road structure material s (joints) should be minimised
  - Must have same coefficient of friction as the surrounding surface.

Conclusions so far

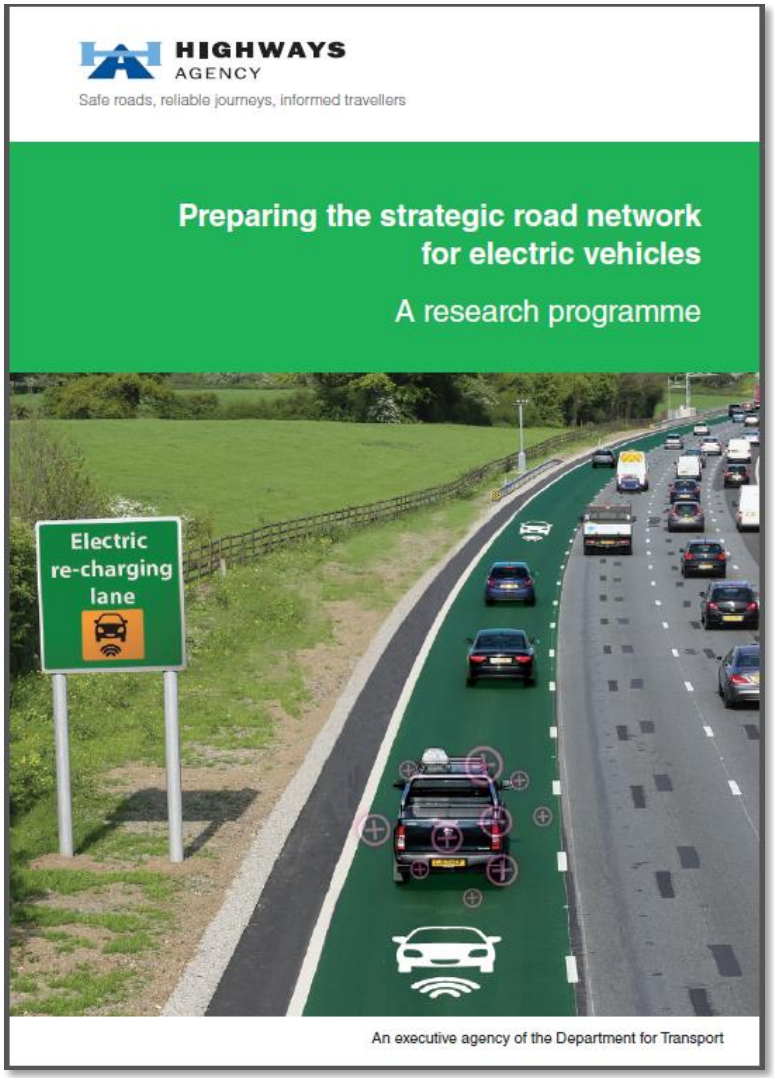
- Dynamic WPT segments must:
  - Be of appropriate length to accommodate expected vehicle densities (20m at highways speeds)
  - Cope with driver misalignment of at least 15cm
  - Allow for a depth of installation of at least 4cm
  - Cope with high temperatures (up to 200°C and high loads up to 13.5 tonne per axle)
  - Not require maintenance for at least 10 to 12 years
- Dynamic WPT solutions can be made grid friendly by
  - Adequate design
  - Additional infrastructure: energy storage
  - Additional systems: traffic control

Next steps

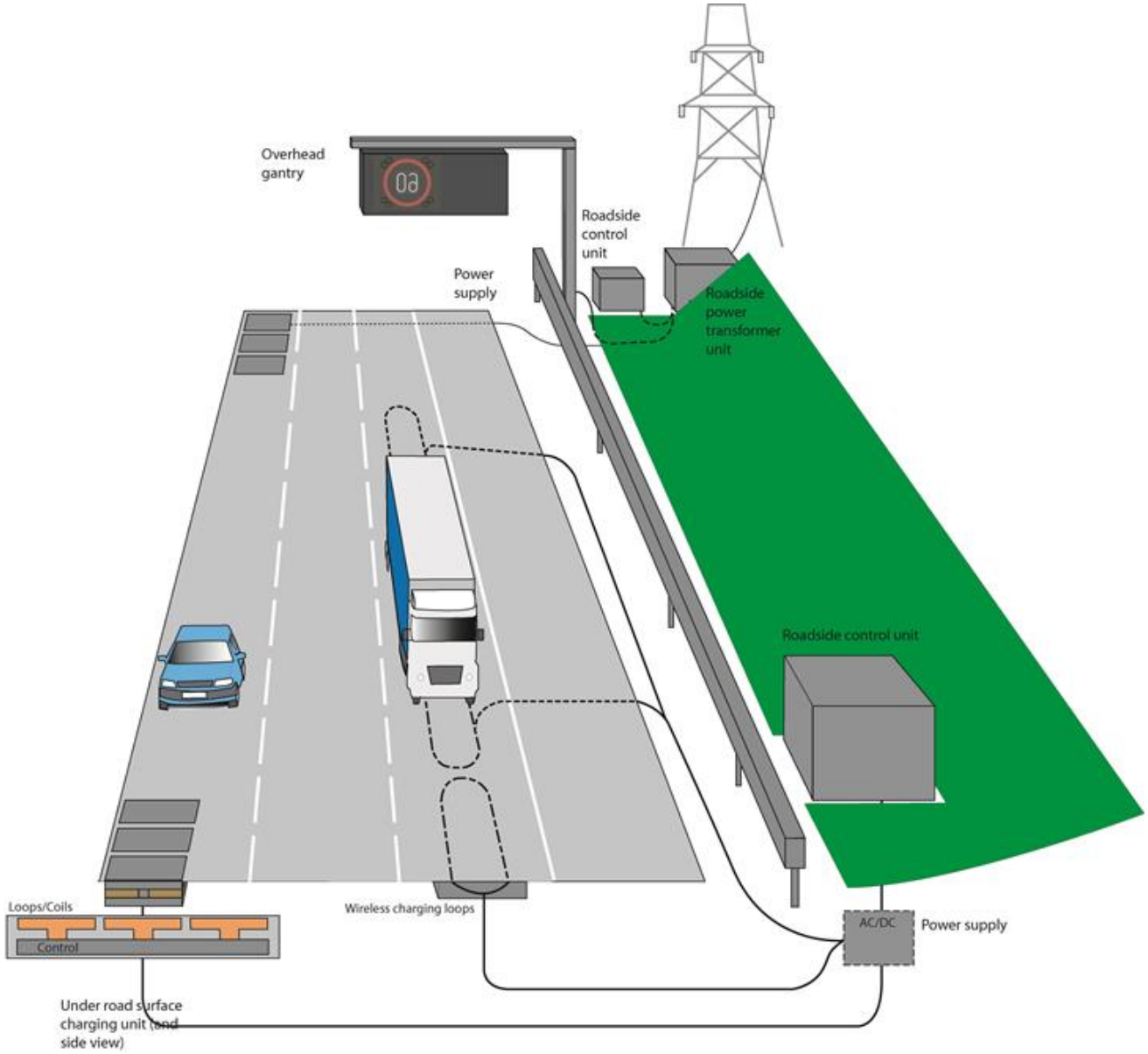
1. Vehicle and test site installation architectures defined – August 2015
2. Complete prototypes and begin test track installations – February 2016

Dynamic WPT research in the UK

- TRL commissioned to do the feasibility study
- Expected to be completed by April 2015
- Followed by off-road and on-road trials of multiple technologies
- Prepare the SRN for future EV take up and facilitate their adoption
- Contribute to reducing GHG emissions and air pollution

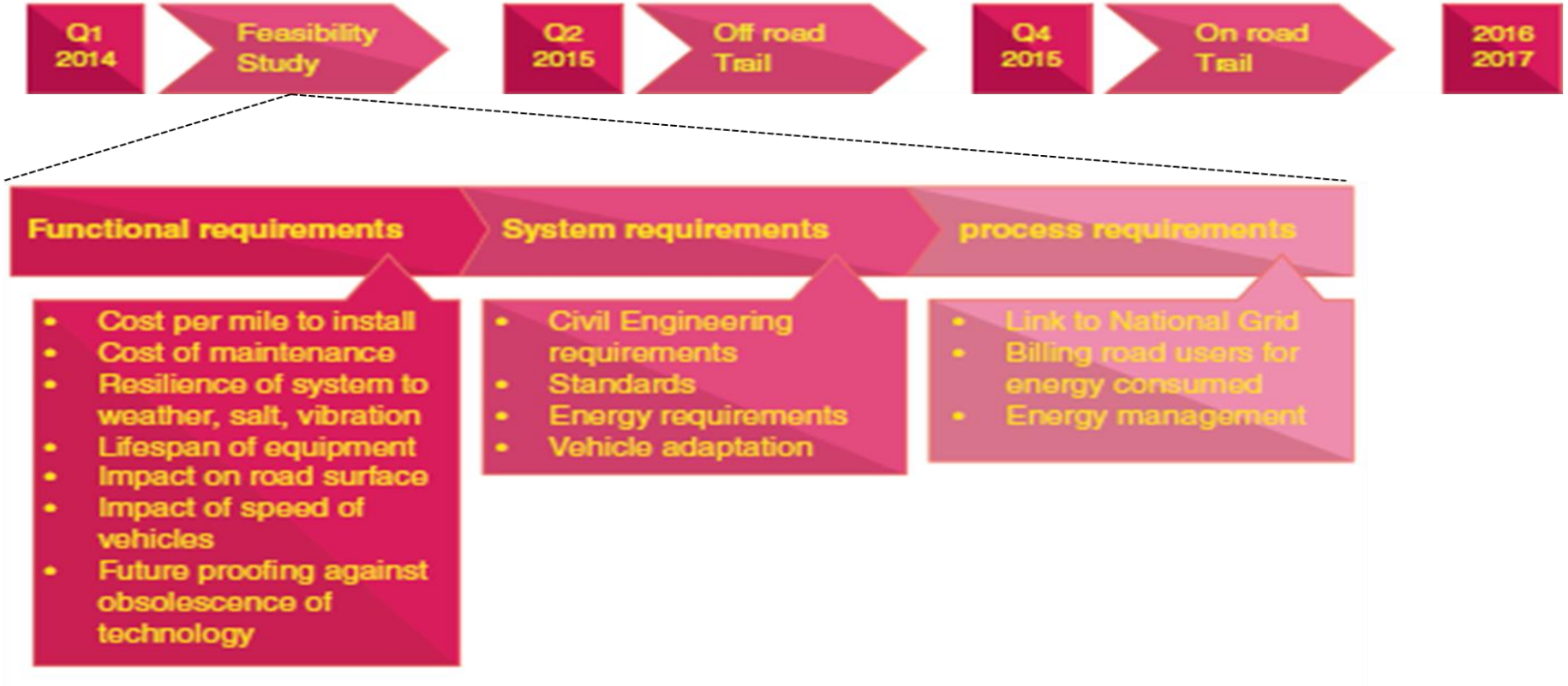


Dynamic WPT in highways concept



UK feasibility for dynamic WPT – project team

UK feasibility for dynamic WPT – Plan



Draft plan – details are being finalised

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Thank you!

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