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

Vehicle Manufacturers

CRF (Italy) — VOLVO (Sweden) — SCANIA (Sweden)

Energy operators

IRE (Italy)

Road Managers

TECNO (Italy) — SNF (France)

Technology suppliers

VeDeCom(France) — SAET (Italy)

Research Institutes

ICCS (Greece) — TRL (United Kingdom) — TNO (United Kingdom) — CEA (France) — FKA (Germany) — UNIGE-DITEN (Italy)

CIRCE (Spain) — POLITO (Italy) — KTH (Sweden)

SMEs

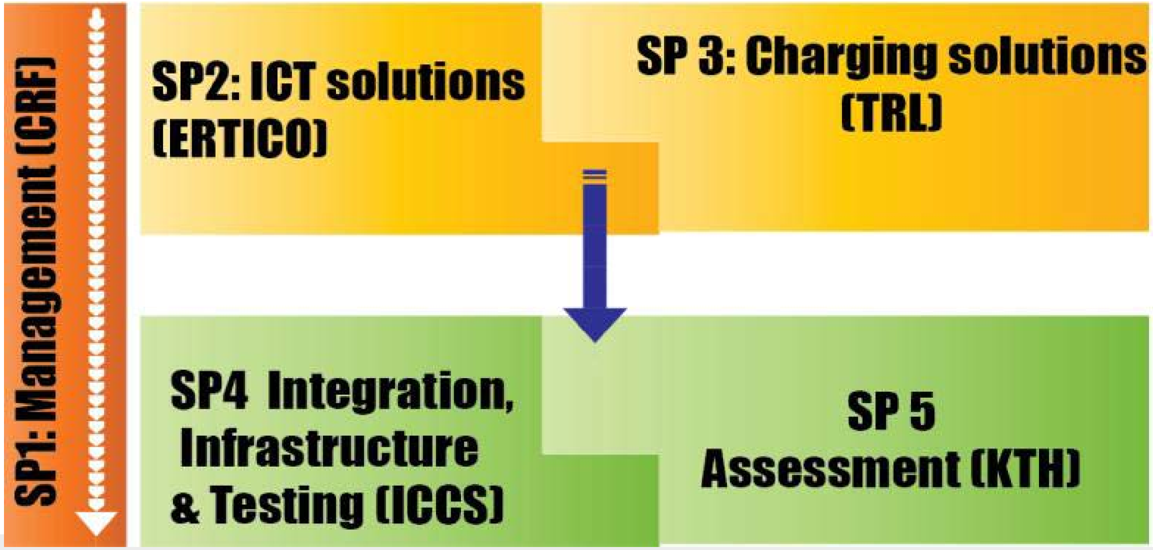
QIE (Spain) — ENIDE (Spain) — ATA (Italy) — MECT (Italy) — AMET (Italy)

Association

ERTICO (Belgium)

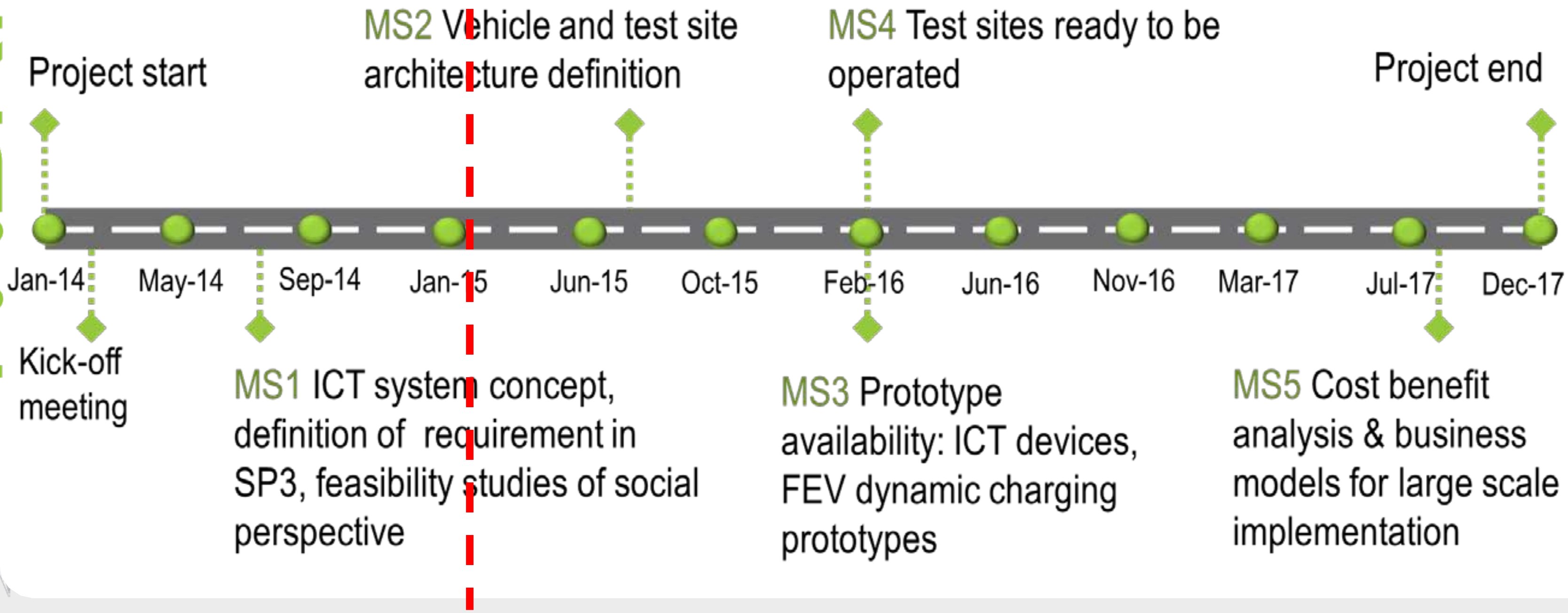
Project objectives

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

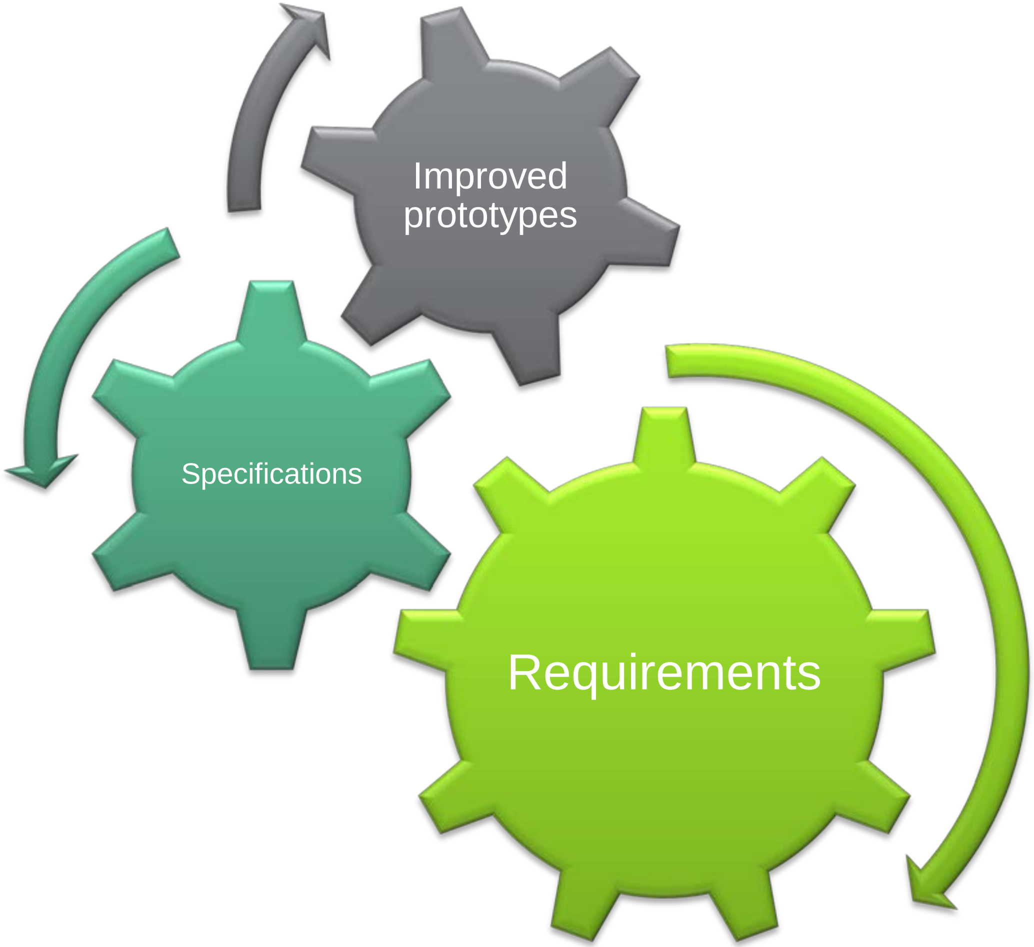


Achievements to date

- 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

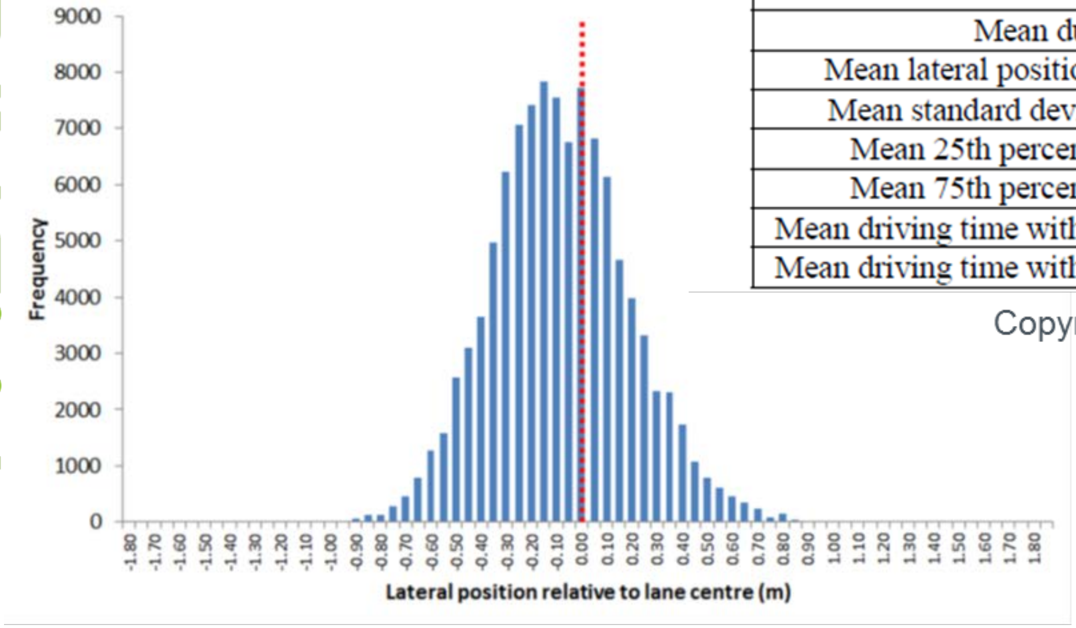
EM and Safety

Requirements for misalignment tolerance

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

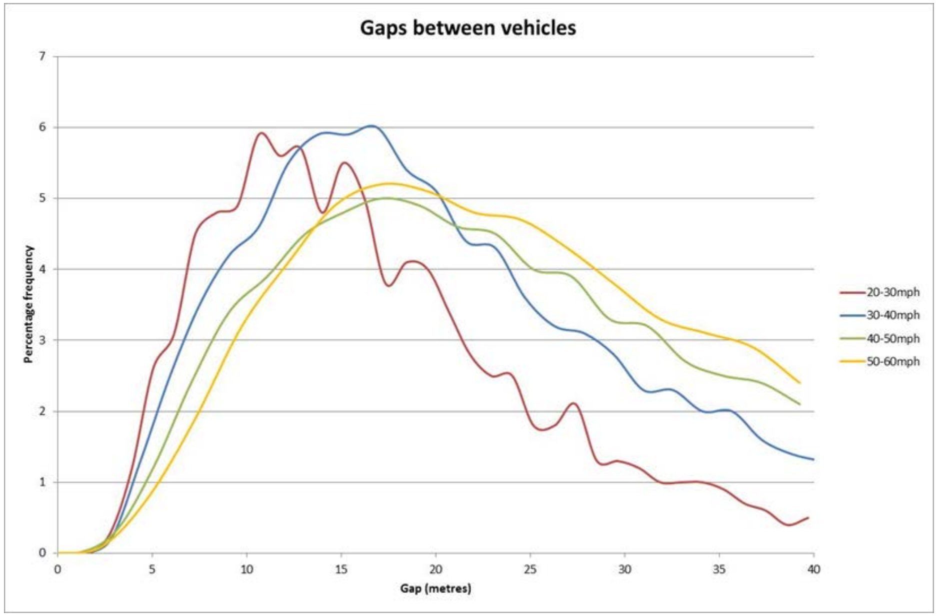
Table 1: Summary of the analysis of lateral position

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

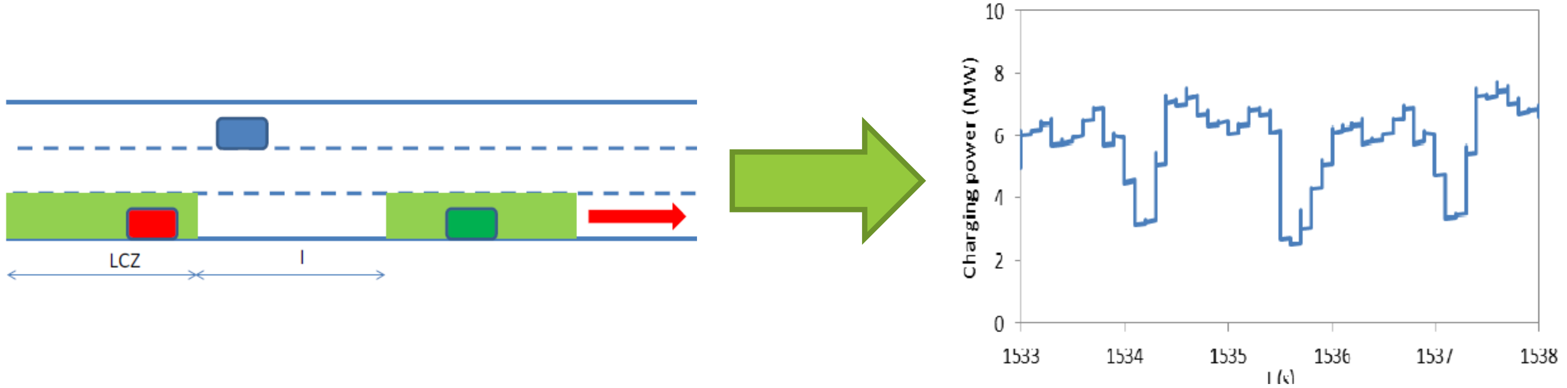
1. Most common gap between vehicles at 80.5km/h (50mph) to a gap between vehicles of 20m.
2. In motorway queues with stop-start driving, vehicles typically occupy 10m each, this equates to a 4m gap between vehicles on average
3. 1% of drivers are travelling within 4m of the vehicle in front.



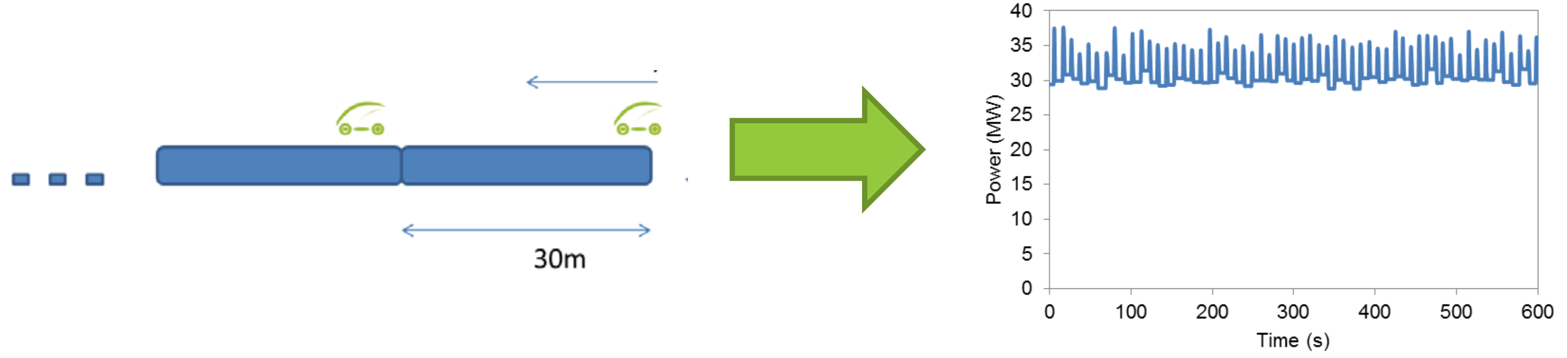
Electric grid requirements

Effect of power transfer design

- Separated Power transfer pads: large fast fluctuations



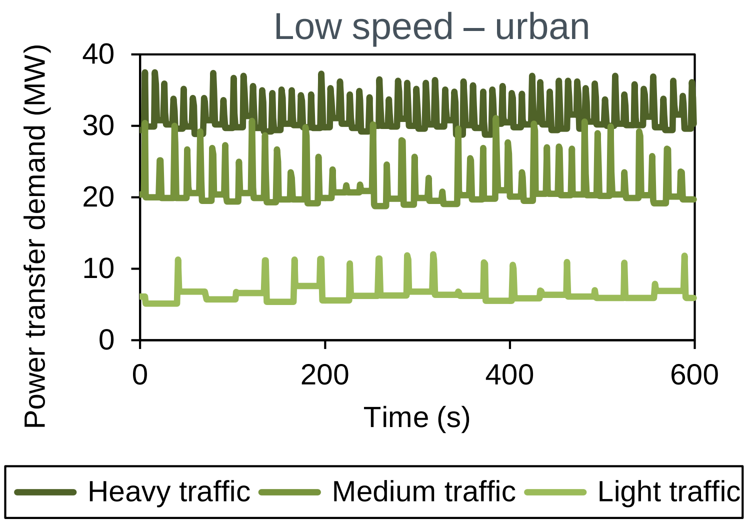
- Contiguous Power transfer pads: reduced fluctuations



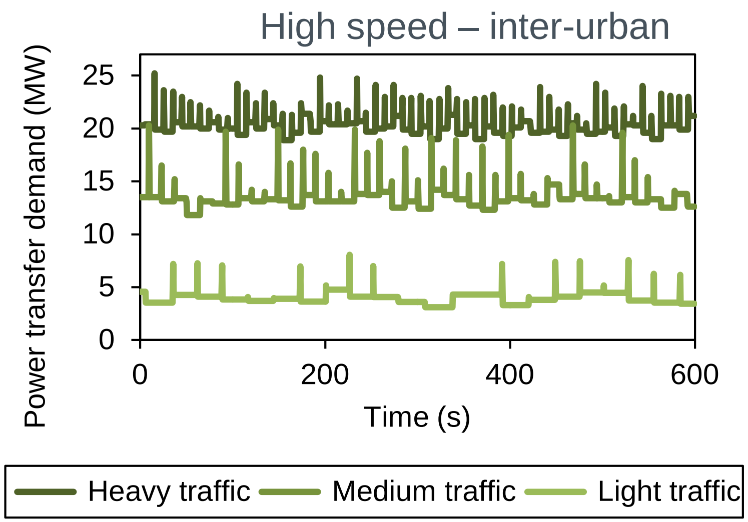
Electric grid requirements

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

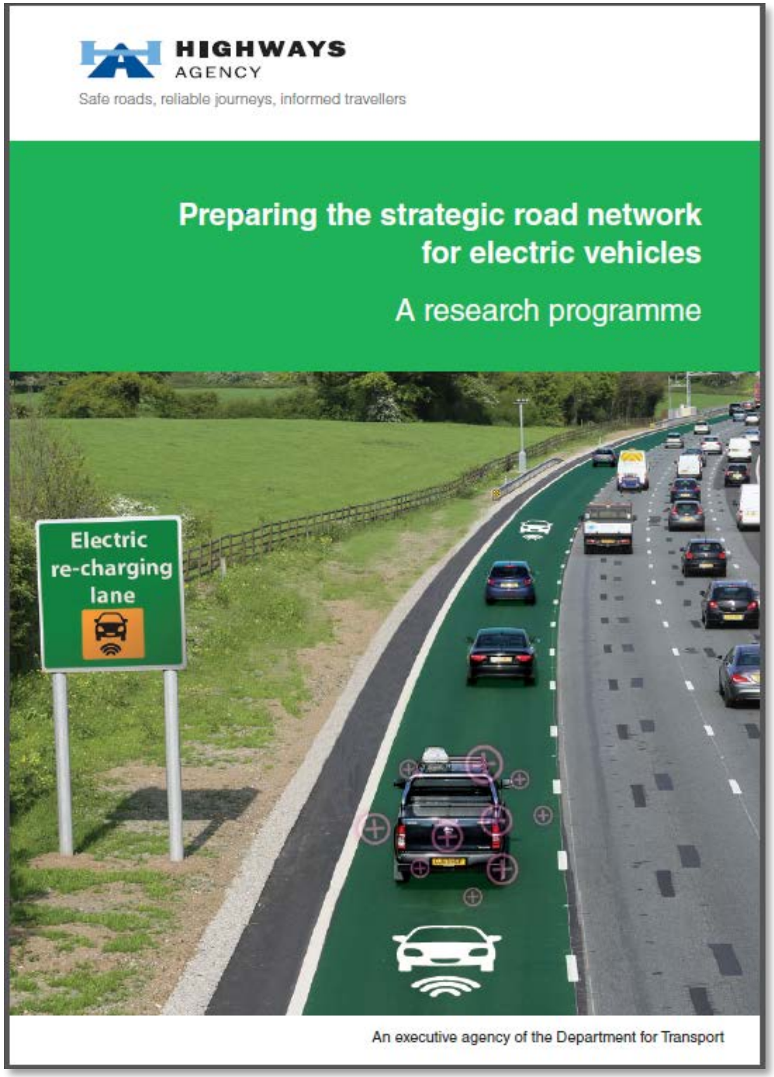
- Dynamic WPT segments must:
  - Be of appropriate length to accommodate expected vehicle densities (20m at highways speeds)
  - Cope with driver misalignment of at least 15cm
  - Allow for a depth of installation of at least 4cm
  - Cope with high temperatures (up to 200°C and high loads up to 13.5 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

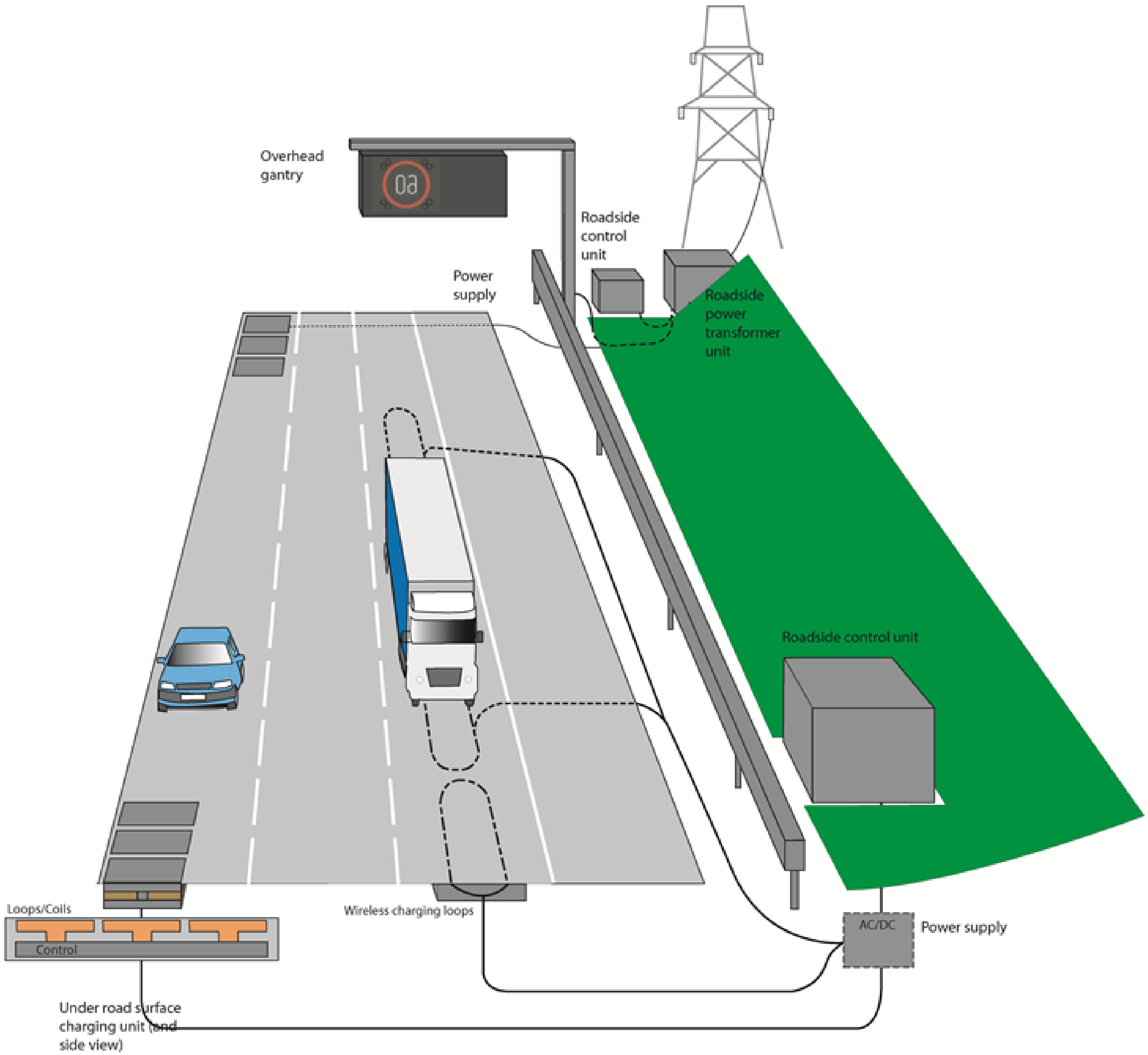
1. Vehicle and test site installation architectures defined – August 2015
2. Complete prototypes and begin test track installations – February 2016

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

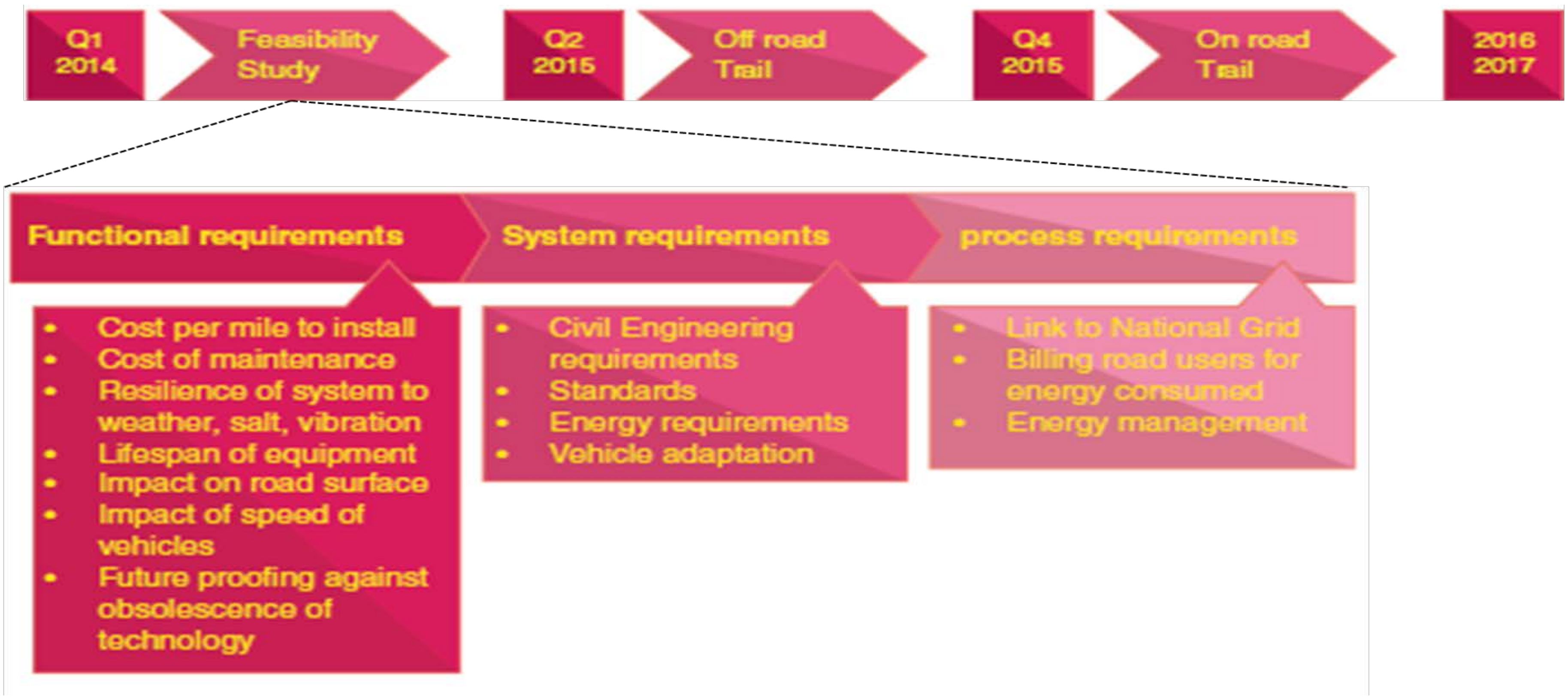


Dynamic WPT in highways concept



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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