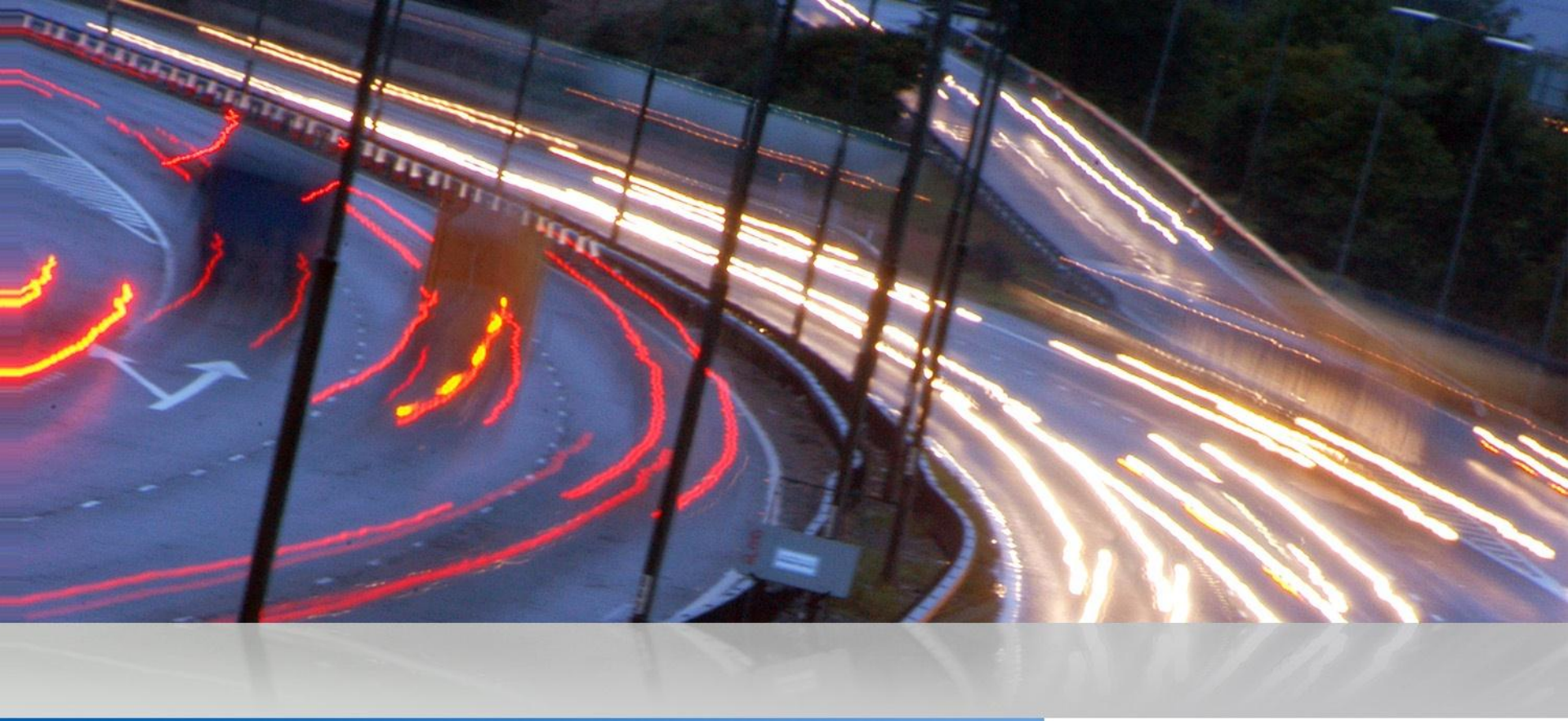


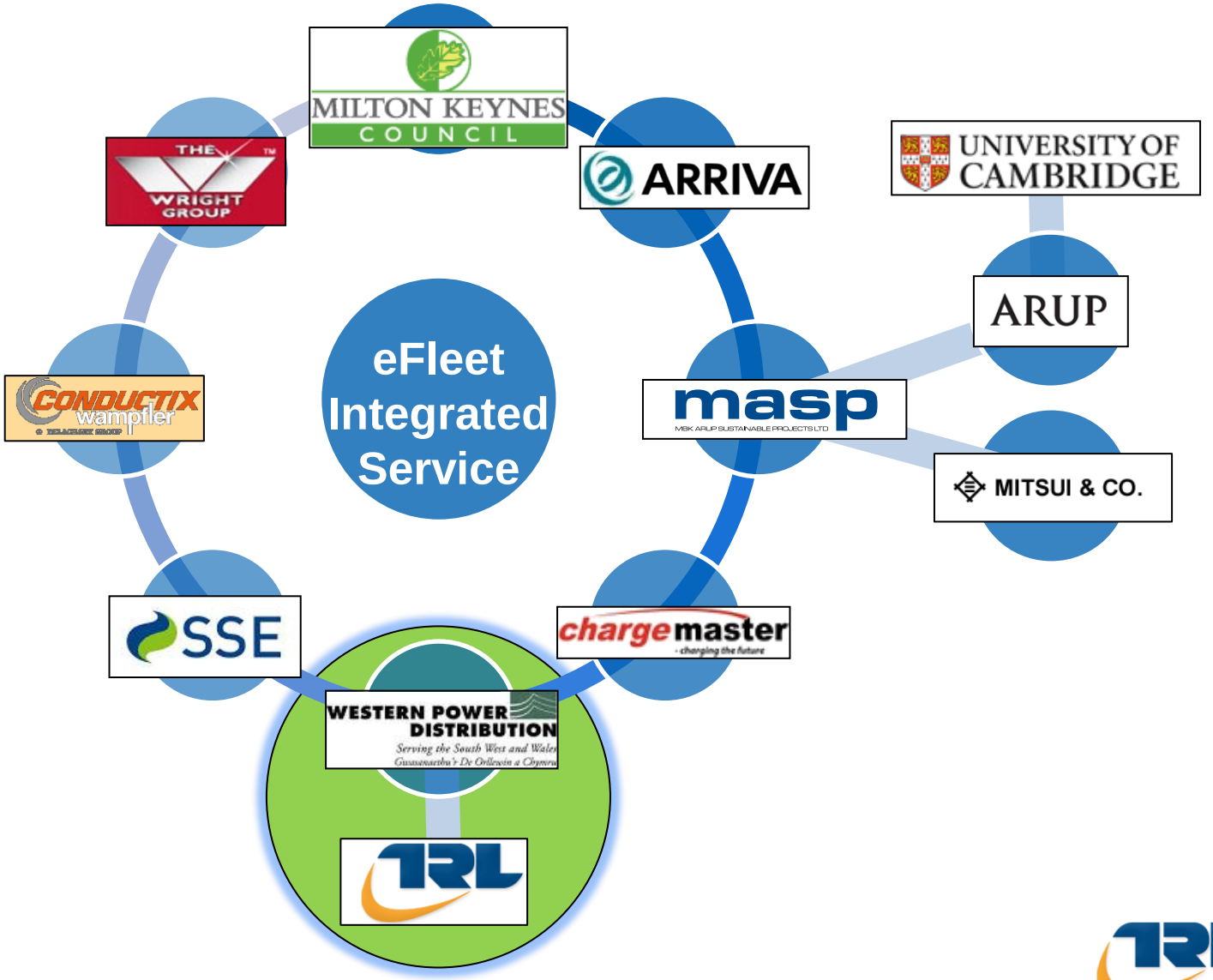
Impact of inductive charging of electric buses on the distribution network

EVE Meeting, Geneva

Denis Naberezhnykh

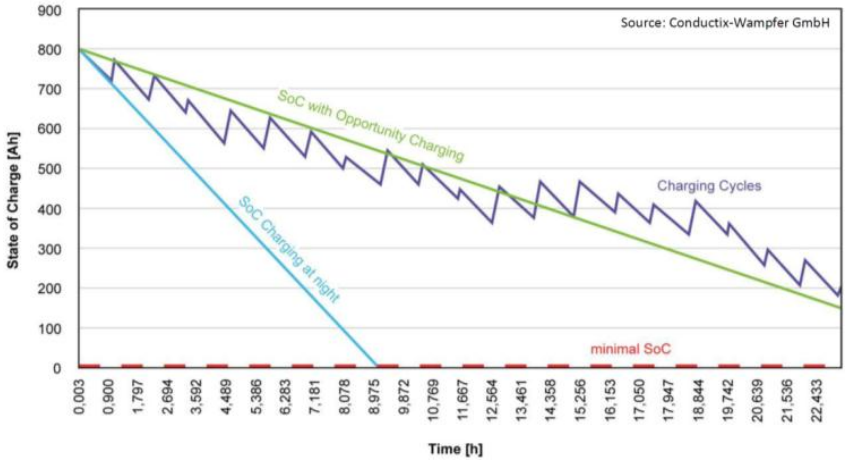
3 June2013

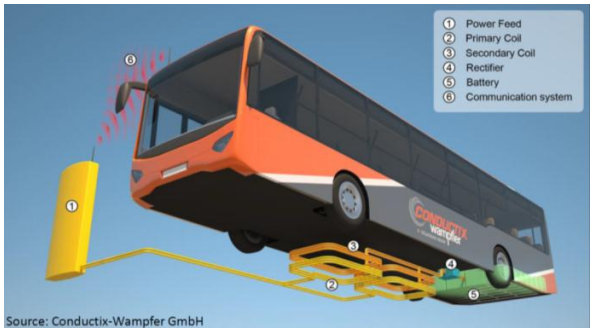
Introduction to the project



Reasons behind the project

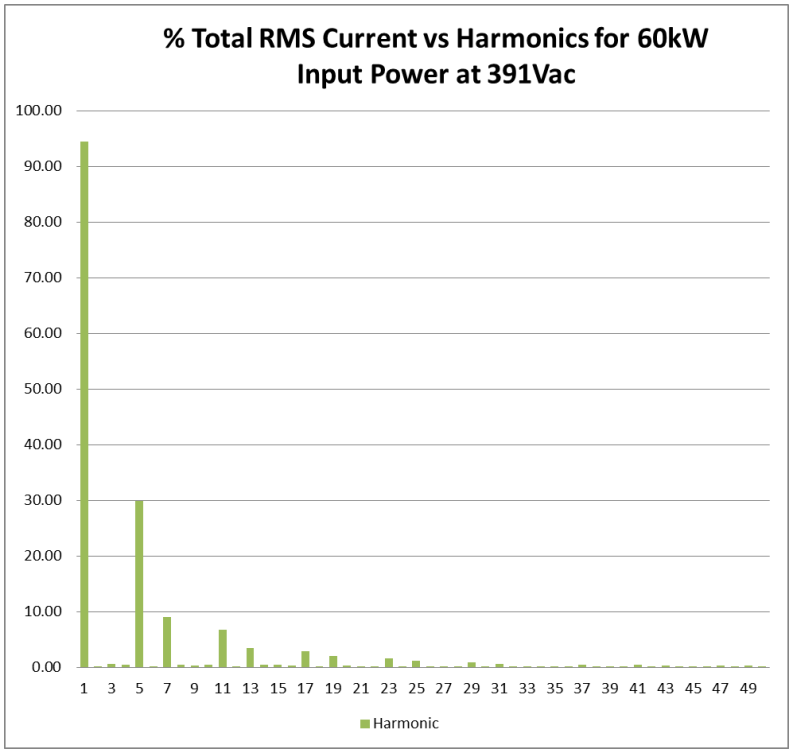
- Electrification of transport is required to improve air quality in urban centers and reduce carbon emissions overall
  - Public transport offers more controlled environments for implementing new systems
- Battery size/weight and cost is a barrier at present
- A possible solution is to use opportunistic charging
  - Plug-in charging is impractical in this scenario
- Use of wireless charging (inductive charging) is a possible solution





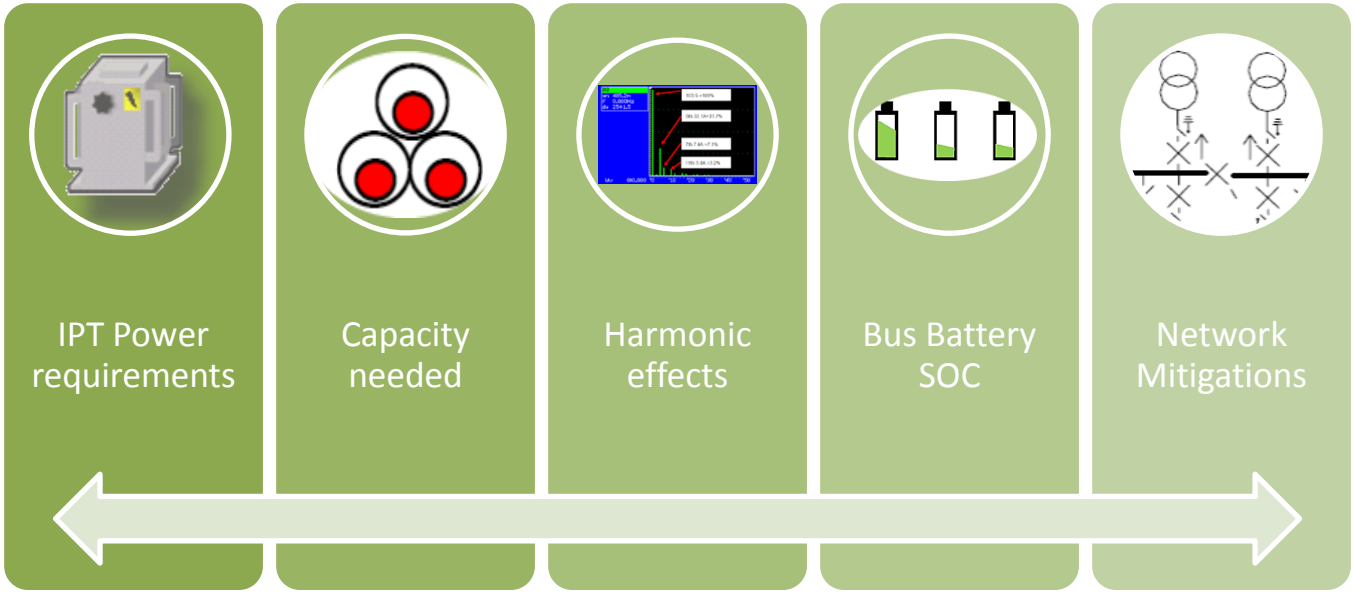
Issues around the use of inductive charging

- Very high-power (120kW) and fast-switching charging equipment (20kHz)
- Highly utilised during the day
- Harmonic Disturbances on the network
- High demand could lead to necessary reinforcement of infrastructure if matched with peak demand



Solutions

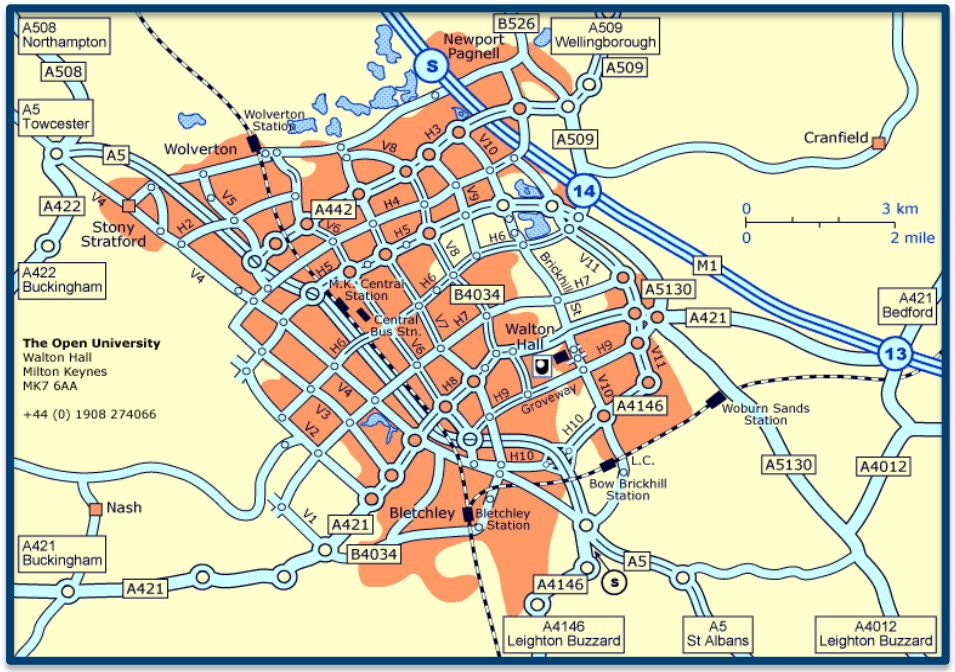
- DNOs are seeking to be the enablers of Electric Vehicle adoption, not barriers
- Need to understand what the impacts are of the vehicles and charging infrastructure on the network in order to intelligently manage the demand
- No longer thought of as “Issues” but rather as possible “Solutions” to address greater demand from the network



Progress

- Early stages of the project – Buses due to go into operation at the end of August 2013.
- Current focus is on finalising data recording and bus telematics

- Fully electric service
- Regular IPT charging periods without any disruption to the existing timetabled service
- Principal urban route through city centre
- High capacity service, operating between 06:00 and 23:00
- 5 year demonstration period
- 1.5 year project to study impacts on the network

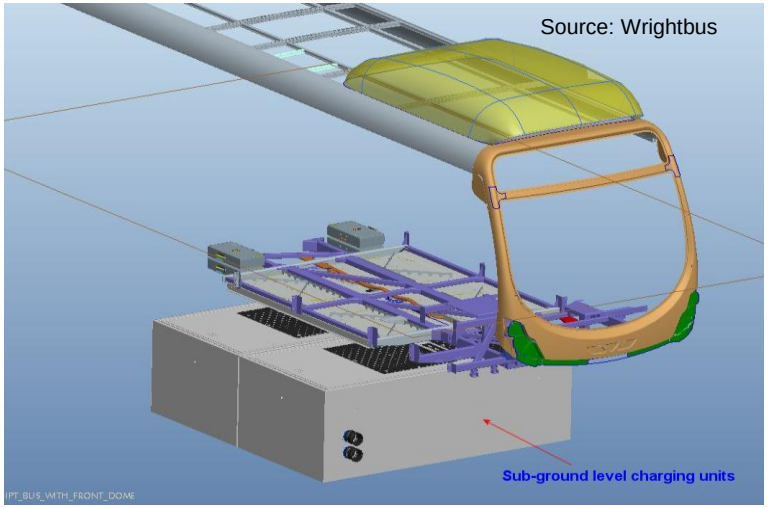


Milton Keynes – A City of 230,000 people

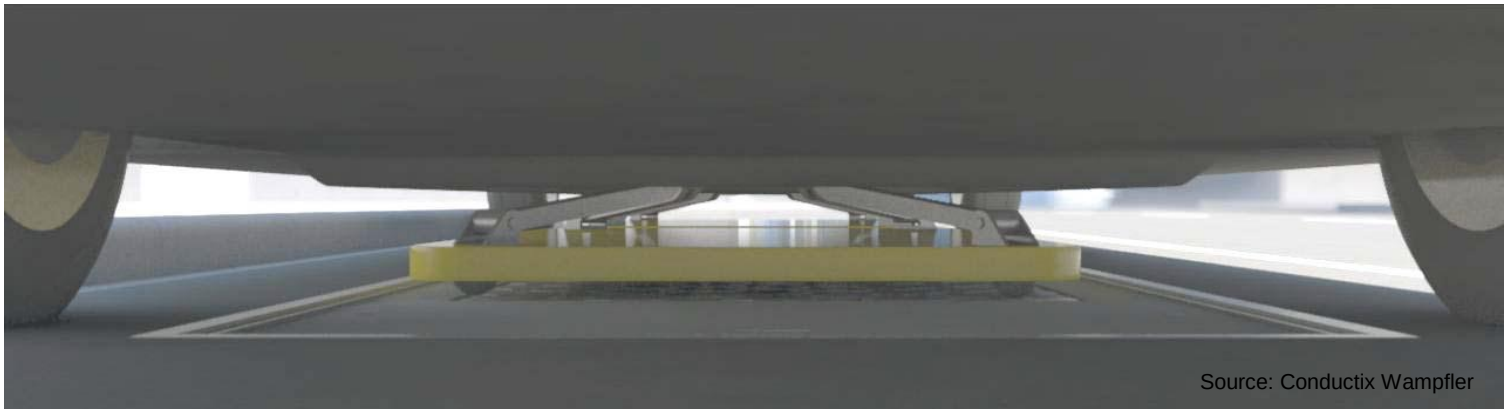
Progress

- Fully Electric Bus – Wrightbus
- Inductive Chargers – Conductix Wampfler

Source: Wrightbus



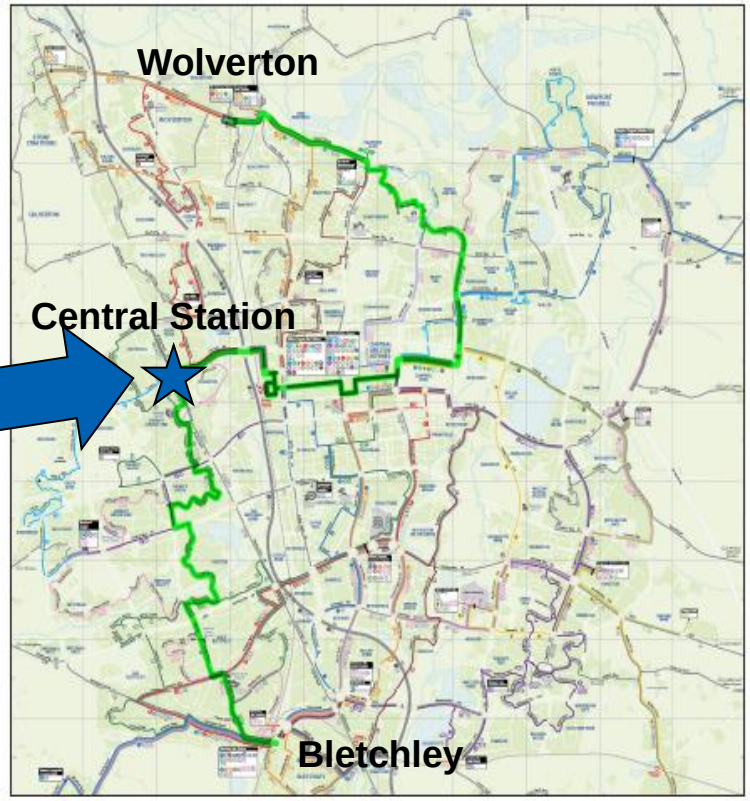
Source: Wrightbus


Source: Conductix Wampfler

Progress

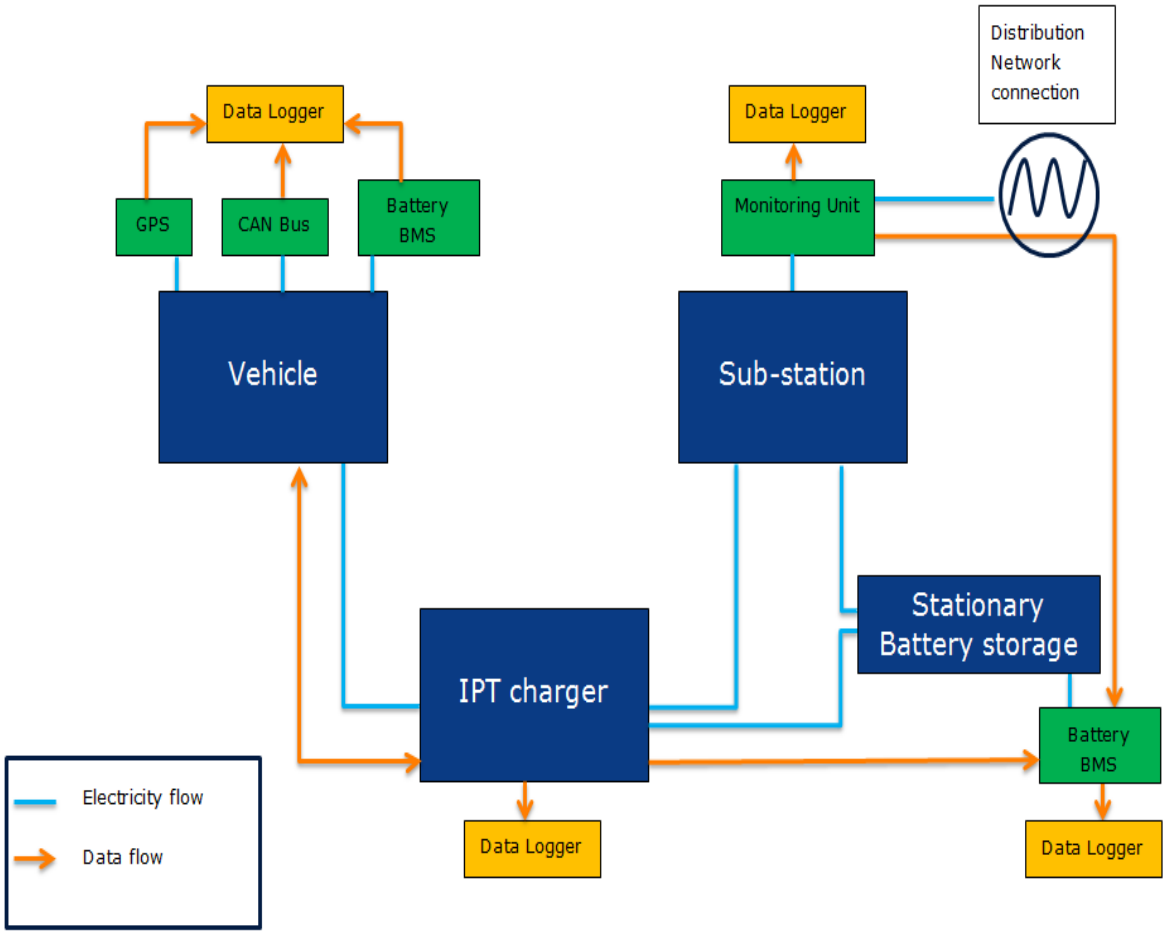
- 8 buses on a single route
- 2 chargers at either end of the route – necessary to complete the route
- 1 charger at mid-point – allows for flexibility to study demand

WPD-owned inductive charger that will be flexibly used based on Bus battery SOC. Data will be compared with impacts on the network and the network condition.



Progress

- Currently defining interfaces for data capture and storage in order to analyse impacts
- First set of analysis is due to be completed by end of September 2013



Thank you

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