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UK motorway to charge electric cars on the move

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An electric bus in Germany uses an inductive fast charging system

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The Highways Agency intends to equip an English motorway to test wireless charging of moving electric cars.

A spokesperson has confirmed an off-the-cuff reference, by an official at an ITS(UK) EV working group meeting, to plan for the UK's first on-road trial of dynamic as opposed to static car charging.

This will mark a step change in EV charging activity that has focused mainly on electric buses until now. A newcomer in this sector is Transport Scotland, which, working with Scottish Enterprise and bus manufacturer Alexander Dennis, plans to trial a 'semi-dynamic' system using a hybrid-electric vehicle in Glasgow this summer.

Claimed benefits of on-the-road charging – using electromagnetic fields generated by subsurface modules – include extended range and smaller batteries. US research at North Carolina State University (NCSU) suggests that car ranges could increase from around 100km to nearly 500km.

The HA says its initiative is supporting the government's low-carbon policy by "promoting the advantages of ultra-low-emission vehicles". At the same time, UK transport consultancy TRL has won a tranche of the €9m European Commission (EC) co-funded FABRIC programme set up to assess technological aspects of dynamic charging.

The Highways Agency (HA) has yet to give details of the trial site or dates. But it has issued criteria for system adoption, including a lifecycle comparable to that of asphalt (typically around 16 years), cost-effective maintenance, resistance to vibration and weather, and efficient charge collection at high speeds.

UK static inductive charging experience to date involves test cars parking at existing plug-in stations in London and an electric bus service launched in January 2014 in Milton Keynes, where vehicles top up their overnight charge during drivers' rest breaks. Managing this five-year demonstration is the eFleet Integrated Service joint venture between Mitsui Europe and consulting engineers Arup.

Arup helped create a wireless power transfer system branded HALO in Auckland, New Zealand in 2010. US wireless technology developer Qualcomm, which bought HALO in 2011, is running the London static car trial and planning a dynamic test track in Auckland.

For operational experience, the HA can look to Asia, where the Korea Advanced Institute of Science and Technology (KAIST) is running two online electric vehicle (OLEV) buses on a 12km continuous charging route in the city of Gumi. It claims 85 per cent maximum efficiency in power transfer.

The HA will also be monitoring the semi-dynamic charging trial highlighted by Transport Scotland chief executive David Middleton at a Chartered Institute of Highways & Transportation conference in March 2014. A halfway house between static and dynamic technologies, it will enable a hybrid bus to pick up charge from a series of modules installed under the road surface at strategic points along the route so it can run for long periods in fully electric mode.

A Transport Scotland spokesman explains that the approach "is likely to cause less disruption than, for example, installing dynamic charging along the length of a road".

More recently, TRL announced that it is taking part in another European project, ZeEUS, to investigate zero emission urban bus systems using different technologies as part of regular services in eight cities, including London and Glasgow. The electric buses deployed at both these UK demonstrator sites will use wireless 'opportunistic' charging, which will allow them to complete routes that would otherwise be too demanding for regular electric buses.

A similar technique is being used in Braunschweig, Germany, where a bus fitted with Bombardier Primove fast-charge technology went into passenger service on 27 March.

Transport authorities can also learn from the 2010-2013 Continuous Electric Drive (CED) project, run by the Flanders DRIVE automotive research centre. This segregated a 500m stretch of the Belgian N769 highway as a temporary test track with both asphalt and concrete surfaces. It concludes that dynamic charging is "very feasible" in terms of both road construction and system design – the latter performing comparably with static charging. It also declares the system electrically safe.

A central issue for road operators is the extent of the road surface impacted by dynamic on-road charging – 10 per cent according to NCSU's modelling, 5-15 per cent in KAIST's experience. An alternative concept triallled by UK start-up Ampium envisages replacing trenching by less intrusive saw cutting to accommodate charging units powered from off-road sources.