Innovate UK

Results of Competition: Wireless Electric Vehicle Charging for Commercial Users: Feasibility Studies
Competition Code: 1807_FS_OLEV_WC_DEMO_ST1

Total available funding is £644,181

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
ELMTRONICS LTD	Feasibility study of Wireless charging equipment in existing electric vehicle service fleets to monitor productivity for commercial manufacture.	£71,020	£49,714
North Somerset council		£0	£0
READYPAY LIMITED		£0	£0
Teesside University		£16,477	£16,477

Note: you can see all Innovate UK-funded projects here https://www.gov.uk/government/publications/innovate-uk-funded-projects
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Funders Panel Date: 28/09/2018

Project description - provided by applicants
Elmtronics are undertaking atrial of Wireless EV charging products with existing UK electric vehicle fleets. With the assistance of Teeside University, Elmtronics are testing the technology to gain real world understanding of how this product can work in the UK market. The advantages of Wireless EV charging are thought to be- * More efficient than conventional wired charging * Shorter and more frequent charges * Safer with no trailing cables * An enriched user experience The aim of this trial is to confirm the anticipated advantages of the use of wireless EV charging for both commercial and domestic use thus being able to confidently establish a market in the UK for the technology. Using trial data from one public sector participant & one private sector participant that both currently run EV service fleets we aim to- * Monitor the usage patterns of the participants using the equipment Measure the efficiency of the technologyGain feedback on the user experience to establish potential improvements Develop a product suitable for the UK market

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URBAN ELECTRIC NETWORKS LTD	Wireless EV "Charge on the Go"	£31,989	£22,392
ALBRIGHT PRODUCT DESIGN LIMITED		£14,941	£10,459
EDF ENERGY R&D UK CENTRE LIMITED		£10,391	£5,196
HEVO POWER EUROPE LTD		£25,862	£18,103
URBAN FORESIGHT LIMITED		£30,900	£21,630

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Project description - provided by applicants
The UK government has banned the sale of internal combustion engine (ICE) vehicles from 2040, and is targeting up to 40% of new van sales to be zero emission by 2030, yet with 4M vans on UK roads, and total van mileage increasing due to internet shopping, currently only 0.3% of new van sales are electric. With cities and towns also looking to address air quality through the introduction of low, zero emission and clean air zones and stricter emission standards (WLTP), **commercial fleets are under pressure to introduce low emission vehicles, such as electric vehicles (EVs), to minimise the impact on their business**. **However many commercial fleet operators remain wedded to diesel or are hesitant to adopt EVs at scale**, as a result of conflicting government, industry and media reports, waiting for price reductions, and range, residual value and public charging infrastructure improvements. **The purpose of this feasibility study and subsequent phase 2 demonstrator is to showcase an innovative and viable, wireless EV charging solution, the UEtwo, with real word benefits for commercial fleets**. By minimising the business disruption EVs can pose, we aim to give commercial fleet managers the confidence to accelerate the move to EVs than would otherwise be the case.

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CENEX (CENTRE OF EXCELLENCE FOR LOW CARBON AND FUEL CELL TECHNOLOGIES)	Wireless Charging for Electric Taxis - WiCET	£30,378	£21,265
IHI EUROPE LTD		£19,218	£9,609
Nottingham City Council		£8,970	£8,970
PARKING ENERGY LTD		£24,962	£17,473
Transport for London		£9,788	£9,788

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University of Warwick		£12,474	£12,474

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Project description - provided by applicants
The purpose of the WiCET project is to investigate the commercial and technical viability of wireless charging for full electric and plug-in hybrid vehicles, with particular focus on taxis (Hackney Carriages) and private hire fleets. Given the typical duty cycles of taxis and the required recharging times during a shift, or for vehicles that are double-shifted, wireless charging for opportunity charging is considered to be an enabling technology in moving towards electrified taxi operations. Indeed, installation of wireless chargers at taxi ranks for frequent charging boosts, known as Choko-Choko charging in Japan, offers the opportunity for minimising recharging times and limiting the capacity of on-board batteries. This reduces 'range-anxiety' and helps control vehicle price. These are current barriers to increasing use of EVs. This study will explore the potential to install wireless chargers in taxi ranks and examine the technical, commercial and operational implications. Secondary use-cases will also be explored including the use of wireless charging for emergency vehicles when they are on duty waiting for a call out. This feasibility study brings together all aspects of the wireless charging value chain and will clarify the route to market for both a retrofit and "factory option" product. It will prepare the ground for a world leading large-scale commercial demonstrator of EV wireless charging technology in London and Nottingham delivering significant inward investment from IHI (Japan) and ParkingEnergy (Finland) in the UK. The final report will be published and Cenex will also organise a workshop using the successful OLEV Go Ultra Low Nottingham supported LEVEL (Low Emission Vehicle Enterprise and Learning) programme to disseminate the findings.

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UK POWER NETWORKS SERVICES (COMMERCIAL) LIMITED	Wireless Electric Fleets	£39,751	£19,876
HIGH SPEED ONE (HS1) LIMITED		£6,638	£3,319
University of Warwick		£20,434	£20,434
UPS LIMITED		£9,575	£4,788

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Project description - provided by applicants
The Wireless Electric Fleets project will look to investigate the feasibility of wireless charging at logistics depots, utility sites and taxi-ranks. Both commercial and technical analysis will input into the development of business case. Based on this business case the feasibility of real-world demonstrators of the technology will be determined.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
A.T.KEARNEY LIMITED	AMiCc (Semi-dynamic infrastructure charging for commercial applications)	£35,556	£17,778
4TH DIMENSION TECHNOLOGY LIMITED		£25,345	£17,742
BRIXWORTH TECHNOLOGY LIMITED		£21,872	£15,310
University of Nottingham		£14,983	£14,983
University of Warwick		£15,966	£15,966

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Project description - provided by applicants
This feasibility study and it's consortium partners are looking to evaluate the opportunities of bespoke semi-dynamic and static wireless charging in order to; * Increase EV uptake for vehicles will low dwell times and high utilisation, such as taxi's and buses. * Identify the primary motivation and use cases for wireless charging. * Identify how standardised wireless charging protocols could increase the uptake of smart charging and vehicle-to-grid applications. * Impact of battery preservation - what influence will wireless charging have on the relationship OEMs and users currently have with the vehicle battery? With a diverse consortium of large multi-nationals to SME's, spanning the energy, transport and built environment sectors, the partners are well placed to lead on the uptake of wireless charging for commercial applications. Partners are A.T. Kearney (lead), 4th Dimesion Technology, Brixworth Technology, University of Warwick and University of Nottingham. The consortium is also working with a leading midlands based vehicle OEM, who will review the opportunity of becoming a partner at demonstration phase to identify the application of technology back to the vehicle. The project also has a number of other organisations on it's advisory board, who wish to become full partners at application stage; Transport Systems Catapult, Cenex, Peel Group, DG cars, a leading DNO, a leading multi-national O&G, Nottingham City Council and Isle of Wight Council. The consortium will use the feasibility stage of AMiCc to develop a robust business case for the integration of wireless charging into their portfolio for asset management and aggregation with V1G and V2G applications. Three case studies will be explored initially; taxi's, city buses and security vehicles, where dwell times are short and infrastructure opportunities are often limited due to space constraints.

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FLEXIBLE POWER SYSTEMS LTD	Wireless Charging in Micro-Fulfilment Centres for Last Mile Delivery	£55,609	£38,926
Heriot-Watt University		£20,216	£20,216

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Project description - provided by applicants
Light Goods Vehicles (LGVs) account for 15% of UK GHG emissions from road transport and 33% of NOx emissions, while making up just 10% of vehicles. In commercial fleets LGVs are heavily utilised to meet businesses' and household consumers' demands for increasing service quality and extended delivery windows, and LGVs often operate at high load factors for maximum productivity. Several electric vehicle (EV) options have been brought to market by OEMs in this segment but uptake remains low because of limited range and overall higher total costs of ownership. Focusing on home delivery operations within the retail and parcel delivery sectors, the project will explore i) the benefits of wireless charging for van fleets; ii) a novel micro-fulfilment logistics model that is more compatible with EVs and evolving market needs and iii) the benefits of combining micro-fulfilment and wireless charging infrastructure to create revenue opportunities from infrastructure sharing. The wireless charging benefits to be quantified during the project include: i) increased compatibility between vehicles and chargers (no need for multiple connector types on the vehicle or charger side, simple handling for future autonomous vehicles); ii) vehicle charging while handling payload and manoeuvring to maximise utilisation and increase flexibility; iii) reduced space and vehicle parking constraints and maintenance costs; iv) increased flexibility and convenience to click and collect customers who own EVs. The feasibility study will analyse vehicle movement data from up to 4 users to assess the share of activity that could already be met with available EVs and quantify the productivity and range benefits of replacing plug-in chargers with wireless chargers. We will then evaluate charger placement -- both in existing user facilities such as depots and stores as well as in newly developed micro-fulfilment centres (MFCs) -- to simultaneously maximise EV penetration, financial and environmental benefits. MFCs are small-footprint consolidation centres located close to consumers to maximise freight efficiency and collaboration and reduce LGV distance travelled. Revenue and business models for infrastructure installation, utilisation and ownership will be proposed and tested with customers, and a follow-on real-world demonstration plan will be developed. Flexible Power Systems (FPS) are an SME energy company who work with customers to optimise their energy usage across transport and stationary systems via technology deployment and asset management. Heriot-Watt University (HWU) are one of the UK's leading research institutions with academics who specialise in logistics and co-lead the Centre for Sustainable Road Freight (SRF).

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Electric Fleet Integrated Services	Wireless Charging Infrastructure for Milton Keynes	£54,000	£27,000
CHAR.GY LIMITED		£29,760	£20,832
Milton Keynes Borough Council		£3,981	£3,981
Open University		£25,002	£25,002
University of Warwick		£6,822	£6,822

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Project description - provided by applicants
This Feasibility Study will explore the use of wireless charging technology to support the introduction of electric public service vehicles in Milton Keynes. It will examine the culture of organisations which operate in the public service sectors, and the technical options which exist. Based on the findings, the study will develop application-specific business cases to support the roll-out of a city-wide wireless charging infrastructure. These applications will focus particularly on taxi/private-hire and on-demand bus services, although other applications such as light freight, grocery deliveries, healthcare, and waste collection services will also be considered. A distinctive feature of the study will be an in-depth socio-technical examination of the cultures and business practices of the organisations which operate in the chosen areas of application. This will respond to the fact that the take-up of electric vehicles by the targetted service providers, to date, has been low and changing this situation will require a deep understanding of culture and business practice in addition to an understanding of the available technology. The programme will embrace two key areas of technical innovation. First, the adoption of a novel wireless charging device will be explored. This device is currently being developed at the University of Warwick using the latest power electronics technologies to deliver very compact, high power, units which are ideal for small and medium-size vehicles. The second area of innovation will explore the potential for coupling wireless chargers to existing on-street cable-chargers. If successful, this approach will allow many more chargers to be installed across the city without requiring an equal number of new connections from the local electricity network operator.

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ALGRET INNOVATIONS LTD	Wireless Semi-Dynamic Charging for Electric Taxis (WS-CET)	£25,176	£17,623
EB CHARGING LTD		£51,376	£35,963
Southend on Sea Borough Council		£13,092	£13,092
University of Birmingham		£19,397	£19,397

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Project description - provided by applicants
The WS-CET feasibility project will provide evidence to taxi drivers that switching to electric cars has a positive impact on their business and that it will bring to them a lower cost per mile, thanks to the introduction of a disruptive cable-less charging technology with low infrastructure and capital costs. The proposed technology allows the drivers of electric taxis to conveniently charge their batteries during the downtime while they are queuing in a rank waiting for customers, hence obtaining a significant extended zero emissions range throughout the working day without any impact on business. The system will also be beneficial to local authorities in terms of supporting taxis in the transition to low emission vehicles and the subsequent reduction in emissions, carbon and air quality problems. The innovative charging technology has an estimated cost approximately 75% lower than the alternative wireless technologies, whilst being capable of supporting charging rates of an estimated 4 times while taxis are at taxi ranks. This combination will create a practicable business model from several potential charging methods which will be verified in the feasibility. Within the feasibility, the consortium will quantify the activity of taxis in respect to using EVs but will also measure the time and locations where taxis will gain the maximum charging benefit. This will be reflected in the different charging mechanisms and pricing strategies to be reviewed and matched against the costs to achieve a price per mile lower than that of a conventional car, which would make switching to electric cars also economically convenient for taxi drivers.

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LESLA LIMITED	Cost-effective electric vehicle charging for public spaces by novel coreless wireless charger technology	£69,217	£48,452
DIGITAL CITY LIMITED		£18,756	£13,129

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Project description - provided by applicants
Shortage of public charging places is slowing down EV adoption. All owners of electric vehicles have to charge their EVs and current wired charging methods greatly limits the potential users of electric vehicles only to those who are living in private homes and have opportunity to install home charging equipment. Many people living in multi-story apartment buildings are discouraged to use EVs for the lack of available charging places close to their homes. Wireless charger providing automatic operation as soon as the car is parked, would greatly simplify EV use. There are a few wireless charging technologies attempting to address these issues, however majority of them are based on inductive power transfer principles developed more than a hundred years ago. Existing products have several shortcomings, two most obvious being _charger price and the necessity for extremely precise parking (coil alignment)_ . Current wireless charging systems run into thousands of pounds, thus making wireless charging a nice feature for the few luxury car owners, but seriously impeding the use of these systems for ordinary people. The innovation is the new coreless WPT technology developed by Lesla is up to 10 times cheaper compared to current wireless charging products. This has been achieved by using novel coil frequency and phase synchronization approach, which does not require use of very expensive high frequency rectifiers for each coil. Hence, this technology also ensures that the installation of the coils is much simpler, not involving replacing whole or part of road surface. The wireless charging coils can be inlaid in small 1" trenches, which are covered straight away, thus minimizing traffic disruptions. By using Lesla technology whole parking areas can be electrified for the price of a single charger, which brings following benefits: the reduced charger costs per vehicle, thus making the technology more economically feasible; increased ease of operation: the vehicles do not have to be parked with extreme accuracy, also increased use of the space: the parking spots do not have to be reserved for electric cars only, as all spots in a car park can serve as charging spots. The project is aimed to evaluate the benefits of widespread wireless charging infrastructure and to develop business model for public wireless charging operators based on example of a city selected in this project.

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