

Innovate UK

Results of Competition: Innovation in Vehicle-To-Grid (V2G) Systems: Real-World Demonstrators

Competition Code: 1705_CRD_TRANS_V2G_DEMO

Total available funding is £25,037,480m from BEIS and OLEV

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
OCTOPUS ENERGY LIMITED	PowerLoop: Domestic V2G Demonstrator Project	£158,425	£55,449
CHARGEPOINT SERVICES LIMITED		£26,534	£11,941
ENERGY SAVING TRUST ENTERPRISES LIMITED		£53,013	£53,013
NAVIGANT CONSULTING (EUROPE) LIMITED		£109,560	£38,346
OCTOPUS ELECTRIC VEHICLES LIMITED		£6,342,718	£2,854,223
OPEN ENERGI LIMITED		£254,483	£114,517
UK POWER NETWORKS HOLDINGS LIMITED		£48,400	£0

Project description - provided by applicants

Electric vehicle batteries unlock a new benefit that drivers have never experienced - the battery can help power their home, their street and the whole of the UK. In turn, this enables an innovative management of electricity demands on the grid, minimises network reinforcement costs, and supports the further roll-out of intermittent renewable energy generation. Octopus Energy are leading a consortium to unlock this value with six other key players - Octopus Electric Vehicles, Chargepoint Services, UK Power Networks, Open Energi, Navigant Consulting and the Energy Saving Trust. This unique group will enable customers to discover electric vehicles, take them for a test drive and access a special Vehicle to Grid (V2G) bundle. A two-way charger will enable the driver to charge their vehicle intelligently, use the power in the battery in the home when prices are high, or sell it back to the grid - creating value for the driver. The availability of the domestic electric vehicle (EV) batteries to help balance the system makes the grid flexible and responsive, allowing greater use of variable generation like renewable energy, and reduces the cost of EV ownership by rewarding owners for taking part. As the first project of its kind, Beating Home provides critical insight into how effective EVs are as a grid balancing mechanism, how drivers would like to interact with their EV charging system, and the technology to make it all possible. With this data, the UK can simultaneously encourage greater uptake of EVs while smoothly integrating them into the grid, aligning with UK decarbonisation goals. The consortium includes the market leading charge point platform provider (CPS), an innovative aggregator (Open Energi) and the DNO in the area where EV penetration is highest (UKPN). The unique combination of participants in the consortium enables an unparalleled opportunity to validate domestic V2G at scale in regional clusters.

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NISSAN MOTOR (GB) LIMITED	e4Future	£4,879,299	£2,439,649
Imperial College London		£921,643	£921,643
NATIONAL GRID PLC		£168,585	£84,293
Newcastle University		£894,671	£894,671
NORTHERN POWERGRID (YORKSHIRE) PLC		£140,000	£39,200
NUVVE LTD		£2,255,103	£1,578,572
UK POWER NETWORKS HOLDINGS LIMITED		£605,000	£42,350

Project description - provided by applicants

This proposal is for a large-scale V2G demonstrator, deployed in groups and controlled by an innovative aggregator platform stacking multiple services that supports a more efficient electricity system and decreases ownership costs to vehicle users. The project Consortium is composed by participants from typically disconnected sectors including car companies, infrastructure providers, energy services, and the public sector. The demonstrator includes private communal, commercial/delivery and public service vehicles, using V2G-ready models. The project will evaluate the response of distinct consumer groups (which together are highly representative of the target market) to commercial V2G offers. Data collected will be used to test and refine different business cases and reward mechanisms for providing V2G services, generating insights on receptiveness and acceptance of V2G operation. The demonstrator will determine the technical and commercial potential of V2G to support the GB electricity system. The innovative V2G platform will stack multiple services to the System Operator and Distribution Network Operators participating in the project. Distribution, transmission and whole-electricity system models will be used to assess system-wide impacts, benefits and potential revenues from V2G. The project will identify key barriers in the policy and regulatory framework, market barriers and cybersecurity issues, and propose solutions so that V2G can contribute to much needed system flexibility. Learning outcomes will be exportable to electricity systems worldwide. Widespread sharing of project findings, through industry events and publications, will build confidence in and help grow the V2G sector. Learning outcomes will be used by the consortium and the wider UK industry to rapidly deploy V2G business models and encourage significant take-up of ULEVs over the next 5-10 years, optimizing their potential as a resource and improving flexibility and efficiency of the electricity network.

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FLEXISOLAR LIMITED	SMARTHUBS Demonstrator	£646,414	£452,490
EMSC (UK) LIMITED		£542,276	£325,366
FLEXITRICITY LIMITED		£233,697	£116,848
TURBO POWER SYSTEMS LIMITED		£818,828	£491,297
Project description - provided by applicants			
<p>The demonstrator will target early adopters of V2G mostly in the commercial area comprising six sites and 150 V2G enabled EVs. The demonstrator will seek to answer the following research questions: 1.What are the accessible service revenues for V2G systems in real life applications? 2.How can static and dynamic storage be integrated in a single site to optimise service revenues? 3.What is the optimum power rating and cost for a V2G bi-directional inverter when considering lifetime system cost verse lifetime service revenues?</p>			

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EDF ENERGY R&D UK CENTRE LIMITED	V2GO	£562,716	£281,358
ARRIVAL LIMITED		£547,244	£273,622
FLEET INNOVATIONS LIMITED		£255,195	£178,637
JUUCE LIMITED		£877,459	£614,221
Oxfordshire County Council		£414,004	£414,004
University of Oxford		£825,852	£825,852
UPSIDE ENERGY LTD		£655,844	£459,091

Project description - provided by applicants

V2GO (Vehicle-To-Grid Oxford) will develop, trial and evaluate potential business models, on- and off-vehicle hardware and products and services by engaging with UK fleet operators. Fleet vehicles account for 56% of new registrations and are quickly (i.e., ~3 years) turned over into the private market. A better understanding of fleet operators' attitudes and valuations of different V2G technologies, products and services could create additional pathways for increasing the uptake of Ultra Low Emission Vehicles (ULEVs). The energy storage capacity of electric vehicles (EVs), present new opportunities and value propositions for V2G power system services (e.g., potentially alleviate the need for generation and transmission investments; increasing network efficiency and energy security. Given the size and use patterns of fleets, they could generate economies of scale that will help realise V2G opportunities and maximise their values. V2GO brings together an interdisciplinary consortium of 8 partners from industry and research with expertise in energy and power markets and systems, fleet operation value chains and electric mobility. The project will address three objectives: 1\.. To build confidence in and demonstrate the value of V2G to fleet operators; 2\.. To engage with and understand ULEV owner's attitudes to V2G services and technologies; 3\.. To demonstrate the technical and commercial potential for ULEVs through the power grid and vehicle-to-building to directly and indirectly support the electricity system. These objectives will be met through a real-world demonstrator trial (WP3), a portfolio of research (WP4; WP5), development of V2G business models, products and services (WP2, WP4) and exploitation and dissemination (WP6, WP7). The trial will run for 20 months and involve at least 100 EVs from different sized fleets including Royal Mail, UPS, DPD, DL, EDF Energy, Oxford County Council, University of Oxford and Addisson Lee. Two novel tools will be developed to facilitate the provision of V2G products and services and maximise their value: 1) a flexibility assessment toolkit, allowing fleet managers and V2G aggregators to work together to quantify the potential benefits of fleet electrification, and the added value of providing V2G products and services; and 2) a real-time coordination platform which will assess: a) based on the size and operation of an EV fleet the combination of V2G services that could maximize overall value (e.g., short term operating reserve, firm frequency response, enhanced reactive power services); and b) how fleet operation could potentially be modified to improve value, considering power system and mobility value chains.

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SSE SERVICES PLC	Bus2Grid	£1,720,917	£516,275
BYD (U.K.) CO., LTD.		£539,686	£134,922
UK POWER NETWORKS HOLDINGS LIMITED		£48,400	£0
University of Leeds		£122,832	£122,832

Project description - provided by applicants

The project is a first of a kind large scale, multi-megawatt, demonstration of Vehicle to Grid (V2G) technology in electric bus depots in London. Over 30 e-buses will be enabled to provide bi-directional charging connected to an aggregation platform that enables the e-bus batteries to interact with the energy system. The project will explore the commercial value and social benefits to the energy and passenger transportation systems developing services to National Grid, local DNOs, bus operators and transport authorities accompanied by the consumer engagement approaches necessary for its implementation. Overall, the project will provide confidence to encourage the growth of the V2G market through the creation of business models and their enabling frameworks, and a clear V2G mass roll-out strategy in the e-bus market space. The project will be delivered by a consortium led by SSE, the UKs second largest electricity generator, bringing knowledge of wholesale electricity markets and delivering an aggregation capability as well as leading on design advice and installation of charging infrastructure and comprises BYD, global leader in e-bus manufacturing providing V2G enabled electric buses, charging infrastructure and charging management systems; UKPN, providing DNO use cases and local network modelling intelligence; and Leeds University, leading on business model design and barriers to market analysis.

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OVO ENERGY LTD	Sciurus	£372,299	£186,149
CENEX (CENTRE OF EXCELLENCE FOR LOW CARBON AND FUEL CELL TECHNOLOGIES)		£213,764	£213,764
INDRA RENEWABLE TECHNOLOGIES LIMITED		£3,220,257	£2,254,180
NISSAN MOTOR (GB) LIMITED		£340,690	£170,345
OVO TECHNOLOGY LTD		£628,782	£314,391

Project description - provided by applicants

The ****Sciurus**** project will develop and deploy a large number of V2G chargers units with participants who own/lease a Nissan Leaf EV. It will also include the development of a grid balancing platform to provide electrical support to grid operators during peak energy demand times. Furthermore, it will explore and test commercial propositions to identify a viable long-term business model. Finally, consumer behaviour and receptiveness will be measured to provide insights into EV owners' attitudes and their response to V2G products and services. The project seeks to: demonstrate that V2G technology works at a residential level; prove the business case of residential customers participating and benefiting from V2G service provision; and demonstrate the value of V2G to vehicle manufacturers. This project brings together a unique consortium, highly skilled in their respective sectors, to deliver a first-of-a-kind large-scale demo of a truly innovative V2G proposition, with national and global exploitation potential. The partners will develop and build technologies in the UK, establish a UK supply chain and secure the position of the UK in this rapidly growing market. The market for aggregated V2G chargers providing flexibility services is currently immature, but evolution is rapid and demand is strong, a highly competitive market is expected to develop.

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CISCO INTERNATIONAL LIMITED	E-FLEX - Real-world Energy Flexibility through Electric Vehicle Energy Trading	£1,994,249	£997,125
CENEX (CENTRE OF EXCELLENCE FOR LOW CARBON AND FUEL CELL TECHNOLOGIES)		£250,388	£250,388
E-CAR CLUB LTD		£360,666	£180,333
Greater London Authority		£384,651	£384,651
Imperial College London		£419,960	£419,960
NUVVE LTD		£1,496,045	£1,047,231
Transport for London		£385,000	£385,000

Project description - provided by applicants

The promise of flexible mobile energy storage & supply through V2G is no less than to turn each vehicle into a net carbon reducer. The challenge is to create a market mechanism that allows these benefits to be realised with business cases for EV operators and grid/energy users. E-FLEX will create a scale demonstration of a functioning V2G market. It will combine a number of fleets with variable duty cycles, a mixed hardware ecology, and diverse energy users (grid plus facilities) with a market design that captures as much value as possible as private benefit. E-FLEX will involve a mix of urban (London) fleets (parcel delivery, car sharing, police and health service vehicles), totalling 200 EVs. The first phase will be oriented at fixed scheduling against known end user demand. The second phase will demonstrate a dynamic (near-real time) market operation. Vehicle use and V2G cycles will be fully monitored for analysis of market operation, including adoption, use, cost of operation, value captured, and battery and vehicle performance.

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A.T.KEARNEY LIMITED	EV-elocity	£957,321	£478,660
CENEX (CENTRE OF EXCELLENCE FOR LOW CARBON AND FUEL CELL TECHNOLOGIES)		£649,071	£649,071
E-CAR CLUB LTD		£554,766	£277,383
HONDA MOTOR EUROPE LIMITED		£794,843	£397,422
Leeds City Council		£197,825	£197,825
Nottingham City Council		£193,497	£193,497
SLAMJAM LTD		£1,152,027	£806,419
TOTO ENERGY LTD.		£559,494	£335,696
University of Nottingham		£312,205	£312,205
University of Warwick		£251,106	£251,106

Project description - provided by applicants

This project and our consortium of partners will focus on the business models which will enable the sharing of the value V2G can bring to the grid, local and regional businesses and of course the consumer. Ultimately we are looking to define and test scaleable business models which will link our technology (existing and new) to a range of new service models. Our partners are ATKearney, Cenex, e-Carclub, Warick University, University of Nottingham, Honda, Slamjam, Nottingham City Council, Leeds City Council, Toto Energy and a mix of local SME's. We will take an airport such as (Liverpool John Lennon Airport or Gatwick) as our primary demonstrator for 100 EV's connected and parked at the Airport and enable them through our technology to be used as an aggregated battery storage. The consumers of the vehicles will be able to monetise through the trading to the grid and our App will allow them full control of these parameters of trading. The output of the project is to help the current and future EV consumers monetise their investment while accelerating the take up of EV's in UK through this trading monetisation. Our V2G solution will be EV car maker agnostic and will inform the necessary scale from the 100 demonstrator to large scale deployment across the country and Internationally.

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