

**Results of competition:**

**Localised energy systems - a cross-sector approach - collaborative R&D**

**Total available funding for this competition was £11.5m from the Engineering and Physical Sciences Research Council and Innovate UK.**

**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
<p><b>Building Research Establishment Limited (lead)</b> Ove Arup and Partners (Arup) Peel Utilities Holdings Limited (PU) University of Liverpool</p>	<p>Combined Heat and Photo-Voltaics (CHPV)</p>	<p>£635,887</p>	<p>£408,944</p>
<p><b>Project description - provided by applicants</b></p>			
<p>The combined Heat and Photovoltaics (CHPV) Project will develop a validated system design tool for CHP+PV powered localised energy system for clusters of commercial buildings, combining low carbon CHP heat and electricity with renewable PV generation, thermal system and electrical energy storage and an optimising control system.</p> <p>The project will build on published knowledge and previous developments to create an accurate and calibrated modelling environment for clusters of commercial buildings. This tool will be used to develop sophisticated autonomous controls to optimise asset resource use and add value to integrated systems. Simulated application of the tool and control to three case study sites, including MediaCityUK in Salford, will provide data in support of commercialisation. Exploitation and dissemination of the tool and control method is expected to result in significant business opportunity for consortium members and the industry.</p> <p>The Project will bring together leading construction sector players (Arup and BRE), the biggest UK utilities company (Peel Utilities), and top research organisation (University of Liverpool) to deliver the project.</p>			

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<b>CENEX (lead)</b> Cardiff University Energy Saving Trust Enterprises Limited KAM Futures Manchester Science Parks Limited Moixa Technology Limited Potenza Technology Limited University of Warwick	Ebbs and Flows of Energy Systems (EFES)	£1,753,475	£1,245,836
<b>Project description - provided by applicants</b>			
<p>The Ebbs and Flows of Energy Systems (EFES) project looks to develop a grid balancing platform to provide electrical support to the national grid during peak energy demand times, such as evenings. The project will achieve this through development of a virtual power plant (VPP), a cloud based 'power plant', capable of utilising disparate electricity storage assets through a software package and controlled by utility providers.</p> <p>Supporting technology will also be developed through this project, including; a building energy management system (BEMS) for domestic and commercial building control functionality to support the VPP, domestic battery storage (BS) to store electricity during low tariff times for re-distribution during peak demand and vehicle-to-grid (V2G) electric vehicle (EV) charging capability to enable EVs to act as a battery store. The VPP will use current and historical consumer data to calculate the available battery provision to the national grid.</p> <p>The result of this support is a reduced requirement for rapid response services in the way of fossil fuel power plants, generating both an economic and environmental savings.</p>			

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<b>COFELY DISTRICT ENERGY (lead)</b> Aston University CENEX Open Energi Limited	Intelligent control agents for multi-functional bio-based local energy systems	£1,050,828	£755,172
<b>Project description - provided by applicants</b>			
<p>This project integrates a suite of new to market technologies and business models for decentralised energy systems. The project extends the functionality of an existing advanced bioenergy trigeneration facility to include options for the sale of low carbon heat, charging of vehicles and the use of EV's as differable loads and new technologies for frequency control. Live data on the status, configuration and revenue being generated by the multi-function local energy system can be viewed online or by appointment at the EBRI site.</p> <p>The project aims to show how new technologies and market drivers can unlock the potential for more efficient local energy generation.</p>			

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<b>EDF Energy R&amp;D UK Centre Limited (lead)</b> Future Transport Systems Limited Routemonkey	Managing the value of flexible energy through local battery storage and algorithm based control	£1,132,553	£646,667
<b>Project description - provided by applicants</b>			
<p>By anticipating local energy consumption and introducing micro-generation and storage systems, including stationary battery storage and electric vehicles, this project seeks to create a fully integrated local energy system of individual and aggregated sites.</p> <p>The project will use smart algorithms to optimise local energy sources and energy demand, through appropriately sizing the assets then managing them effectively. Sizing of the stationary battery systems to manage the critical factors for each local grid will ensure a maximised ROI to the system and optimise the use of low carbon energy supply, whether that be within the local system or available through the wider grid network. By optimising energy storage the project will also quantify carbon savings associated with load shifting/demand response.</p> <p>Initially aimed at commercial customers, the project will explore the impact and benefits of new technologies including Plug in Vehicles and the electrification of heat. The consortium members will contribute significant prior knowledge and when combined in our project, the enhanced solution will be commercially viable and available for our target B2B customers in 2015.</p>			

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<b>Energy Local Limited (lead)</b> DeMontfort University Energise Sussex Coast Exergy Devices Limited Moixa Technology Limited Oxford University (Dept. Engineering Science) Pactrol Controls WeSET	Community Energy Generation, Aggregation and Demand Aggregation Shaping (CEGADS)	£337,718	£220,586
<b>Project description - provided by applicants</b>			
<p>Energy Local offers a business new model to enable communities to bring local generation into half-hourly settlement and interact with suppliers. It harness smart meters and automatic control of electric heating, hot water and appliances to allow communities to use and pool their own generation locally and benefit from time of use tariffs.</p> <p>It will help communities gain a greater return on investment for local generation and share the benefit, engage in energy efficiency and reduce fuel poverty. This will also be attractive to social landlords and local authorities. Demand shift will also help avoid times of when power has high carbon intensity and smooth the demand curve. It will enable smart technology to be deployed and mutual benefits to be gained by customers and suppliers from smart meters. It provides a new market model for suppliers to provide Time of Use Tariffs to domestic customers in a cost effective manner and reduce the exposure to imbalance and improve forecasting. It provides the opportunity to offer new supplier offerings, expand and bring in new players into the energy market.</p>			

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<p><b>Exception EMS (lead)</b> Anvil Semiconductors Limited Aston University Schneider Electric Limited Turbo Power Systems Ltd Western Power Distribution LLP</p>	<p>A Low Cost, High Capacity, Smart Residential Distribution Network Enabled By SiC Power Electronics</p>	<p>£1,175,567</p>	<p>£793,676</p>
<p><b>Project description - provided by applicants</b></p>			
<p>A key challenge facing the UK Distribution Network Operators (DNOs) today is the increasing demand for power being placed on residential networks e.g. by the proliferation of electrical vehicles (EVs) and the move to electro-heat. Also, the increase in distributed generation (DG) is now resulting in unacceptable local voltage rises.</p> <p>This project follows on from an Innovate UK Feasibility Study which showed that a cost effective solution to these problems can be achieved on the existing infrastructure by increasing the local network phase voltage to 400 V (existing cable is rated at 600V). To step the voltage back down to 230 V at each house, DNO-owned, low-cost, 99% efficient power electronic converters (PECs) will need to be installed in the meter-box. Our previous study showed that the 99% efficiency was essential to avoid over-heating in the meter-box and hence new, low-cost 3C SiC devices were mandatory.</p> <p>This system will not only increase network capacity, but also provide optimised connections for emerging EV charging, DG and energy storage - the “smart-grid”. The project will develop a PEC prototype which will be deployed by Western Power Distribution in a small-scale demonstration of the project.</p>			

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<b>Graham Oakes Limited (lead)</b> Sharp Laboratories of Europe Limited Siemens Public Limited Company Tempus Energy Limited Tripod Software Limited University of Manchester	Upside	£829,488	£472,388
<b>Project description - provided by applicants</b>			
<p>Upside aims to build an ICT service that aggregates energy storage capacity in thousands of small devices and coordinates the charge/discharge cycles of these devices to create a coherent energy store that can be used to manage demand on the grid.</p> <p>By working with a wide range of devices (e.g. Uninterruptible Power Supplies, Electric Vehicles, battery storage systems for domestic solar arrays, heat pumps), we can build a significant energy store with very flexible operating characteristics. Our initial target is to build a 30MWh store from "spare" capacity in small (&lt;50kW) UPS currently installed in the UK. Such a store can be made financially viable by offering it to National Grid's Fast Reserve scheme. By shifting demand from peak periods to times of higher renewable generation, such a store can also significantly reduce CO2 emissions associated with electricity generation. An initial prototype for Upside is being developed for the finals of the Nesta Dynamic Demand Challenge.</p> <p>This project will help us build a pilot-scale service with a novel, "pluggable" ICT architecture, develop new algorithms for coordinating additional classes of device, and explore emerging business models.</p>			

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<b>ITM Power (Trading) Limited (lead)</b> Cardiff City Council	HELES: Hydrogen Enabled Local Energy Systems	£1,684,613	£1,086,848
<b>Project description - provided by applicants</b>			
<p>The project will integrate local energy, the built environment and transport systems by demonstrating a system that will help balance local energy demand and supply at the district level. It brings together two disparate energy sources and an energy carrier on the supply side, which will be designed to respond to local demand for electrical energy, gas and transport fuels in an integrated way. In practice this means an integration of solar PV and landfill gas with the production of hydrogen by rapid response electrolysis. This will demonstrate the use of hydrogen produced from an intermittent renewable energy source as a supply/load optimising intermediary fuel with the potential for use as a transport fuel and as a renewable low-carbon contribution to local gas supplies.</p> <p>The project will be the first joint deployment of rapid response electrolysis with solar PV and landfill gas in the UK, and the first to combine these technologies with the equipment necessary to create and store hydrogen for conversion to electricity and for other uses including zero emission fuel and for injection to demonstrate Power-to-Gas energy storage.</p>			

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<b>Kiwi Power Limited (lead)</b> Swanbarton Limited University of Southampton	Intelligent SME energy management and trading with ancillary services	£1,579,685	£1,000,342
<b>Project description - provided by applicants</b>			
<p>This project will deliver a novel low cost intelligent building energy control system integrated with a peer-to-peer energy market that will enable small to medium enterprises to control and automate energy production and consumption while participating in a localised energy market.</p> <p>This project will also facilitate new sectors of the economy to participate in demand response and time of use electricity pricing programmes.</p> <p>The project aims to create a pilot programme for 1 year where successful operation will optimise energy system efficiency and ensure that clients are paid for what they generate, only pay for what they use, reduce energy bills and are offered a new way to earn money by taking an active part in managing supply and demand.</p>			

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<b>Moixa Technology Limited (lead)</b> Bioregional Development Group British Gas Solar Oxford Brookes Enterprises Limited ReEnergise Limited Sustainable Chale Southern Electric Power Distribution	Community controlled energy through virtual private energy networks	£1,238,462	£812,303
<b>Project description - provided by applicants</b>			
<p>This project will demonstrate how distributed storage in a community can be managed to reduce average peak grid load by 65% and increase self-consumption of local PV energy across the community by 2x.</p> <p>The project team is led by Moixa Technology, who will develop the software technology platform to deliver these services. SSE PD &amp; British Gas provides commercial direction &amp; energy industry expertise. BioRegional will manage recruiting &amp; engagement in the community (residents, landlords &amp; councils). Oxford Brookes Institute for Sustainable Development will provide academic assessment. The planned community location is the village of Chale (Isle of Wight), we have the backing of the local council, Southern Housing Group. Sustainable Chale &amp; ReEnergise are local partners. Chale has a high penetration of existing PV systems, making it an excellent test bed.</p> <p>We have also engaged with the council &amp; community at Rose Hill in Oxford as an alternate location, and secured support. Combining local generation (PV) and 2kWh energy storage / home, in a cluster of 100, to create a significant community energy demonstrator.</p>			

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<b>Müller UK &amp; ireland Group LLP (lead)</b> Atlantic Water Company Limited Edinburgh Napier University Mackies Limited SRUC WHL Ltd	Enerwater	£1,295,176	£906,099
<b>Project description - provided by applicants</b>			
<p>This project will develop new methods to reclaim waste energy from different forms of refrigeration plants, and in parallel, use this energy to also assist in conditioning waste water to potable standard water. In both cases waste heat will be recycled to be used again in other localised manufacturing processes and water will be re-cycled.</p> <p>This will reduce costs in the food processing sector (including perishables). It will do this by reducing energy and water use costs as well as reducing the environmental footprint of the commodities produced. These novel technologies will have application in various processes in a diverse range of UK and international industries</p>			

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<b>Oswald Consultancy Ltd (lead)</b> JarmaCoe Solutions Ltd Open Energi Limited Northern Powergrid Holdings Company PassivSystems Serious Games International Limited	Developing "The GenGame" domestic smart grid platform to endure and thrive over the long term	£1,123,668	£650,210
<b>Project description - provided by applicants</b>			
<p>If the UK is to achieve its carbon reduction targets then radical changes are needed to the electricity markets to accommodate the forecast increase in electrical load due to the electrification of heat and transport and the intermittency of supply caused by the closure of traditional power stations and the increase in renewable generation such as wind and solar.</p> <p>One possible solutions to address the issues that this may cause this is to utilise any flexibility that customers have in how they use electricity.</p> <p>This 3 year project will explore the long term opportunity for domestic householders to trade appliance load curtailments in an online game. It will trial gaming options with 2000 customers to test ease of recruitment, the size of load response available and whether this can be reliably sustained to be of use to distribution network operators and other potential users of demand-side reduction services.</p>			

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<b>SEaB Energy Ltd (lead)</b> Hoare Lea Limited Moixa Technology Limited Mosscliffe	Shoppapower - Maximizing local waste/water/energy generation & re-use in retail environments.	£1,010,929	£596,390
<b>Project description - provided by applicants</b>			
<p>This project will incorporate SEaB Energy's patented MUCKBUSTER® (MB) containerised micro Anaerobic Digester (AD) system to generate energy from food and septic waste disposal into a shopping centre environment, together with Moixa's MASLOW localised energy storage DC systems (both at demonstrator level) to facility the electricity generated from the MB system with integrated Cygnus Atratus fuel cell and Kensa Group ground source heat pump from the centre's food wastes 24/7 to be used in the shopping centre at peak power to reduce the need to take energy from the grid; with distributed energy storage battery capability within the Moixa MASLOW system.</p> <p>Hoare Lea will be providing additional generation by incorporating SPV systems onto the centres rooftops to additionally provide energy during peak time to reduce grid demand.</p> <p>The shopping centre will consider using MB generated energy to power EV charging points.</p>			

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<b>Siemens (lead)</b> Science and Technology Facilities Council University of Cardiff University of Strathclyde	Decoupled Green Energy Supply	£1,903,021	£1,064,337
<b>Project description - provided by applicants</b>			
<p>The project is focussed on the use of ammonia as a carbon-free fuel, to fully decouple the supply and demand of electricity from fluctuating renewable energy sources.</p> <p>A small scale demonstrator will be designed and assembled, to evaluate the performance and scalability of a system that accepts intermittent energy and delivers reliable matched base load electricity to meet demand. The key components of this local configuration are an “agile synthesis unit” which produces ammonia, a generator and internal combustion engine, suitable to use the stored ammonia to generate electricity on demand.</p>			

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<p><b>Telemetry Associates Limited (lead)</b> CRITICAL SOFTWARE TECHNOLOGIES LIMITED Secure Controls Limited Smart Homes &amp; Buildings Association Limited Trusted Renewables Limited University of Bristol</p>	<p>IODiCUS - Interoperable Open Digital Control Unit System</p>	<p>£570,364</p>	<p>£386,182</p>
<p><b>Project description - provided by applicants</b></p>			
<p>The Interoperable Open Digital Control Unit System Project (IODiCUS) seeks to demonstrate the technical viability and future market for a connected energy network, in buildings with microgeneration and local energy storage and optimised interaction with the electricity grid.</p> <p>The project builds on the "Interoperability of energy harvesting, storage and use" feasibility study funded under the Innovate UK Buildings Better Connected Call and will utilise algorithms executing dynamic decision making of the use of microgenerated electricity locally to the building, options for local storage, or for selling to, or buying back from, the electricity grid.</p> <p>It will use a representative set of buildings, residences and dwellings in and around the University of Bristol to demonstrate the efficacy of a Localised Energy System. It will develop Open Digital Control Units and Secure Communication Devices for measuring each energy input, store or output and develop algorithms that aim to delivering stable loads despite intermittency. IODiCUS will evaluate the technical and commercial merits, along with the future needs and constraints of the residential or business customer.</p>			