

Innovate UK

Results of Competition: Energy Catalyst - Early Stage Feasibility - Round 3

Competition Code: 1504_FS_EGS_ENCATES3

Total available funding for this competition was £10M from Innovate UK and EPSRC (over all strands)

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
Thermaflex Systems Ltd	Exploitation of waste energy in refrigeration	£198,862	£139,203
Project description - provided by applicants			
<p>Thermaflex Systems has conceived of a thermally driven fluid pump that when integrated into a refrigeration cycle has the potential to increase efficiency and convert waste energy into electricity. A patent has been filed and an independent assessment has been carried out by a UK university that supports our estimations of 30-40% energy savings on a compressor load. A major UK refrigeration system design business has also expressed interest in the technology and will work with us on the feasibility study. Whilst we have proven in a test rig that the Thermaflex pump can use waste energy to generate shaft work, its implementation in a refrigeration cycle to exploit the waste energy has not been tested. The design of the components that comprise the Thermaflex technology in a refrigeration cycle and any resulting thermodynamic phenomenon will be determined in the feasibility study.</p>			

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Tidal Harness Ltd Cranfield University Offshore Renewable Energy Catapult	Platforms for tidal energy convertors	£123,830	£99,290
Project description - provided by applicants			
<p>The generation of reliable and sustainable clean electricity using the ocean tides is known as tidal energy. Many types of platforms exist to support the array of tidal turbines that have been developed to produce tidal energy. The overall cost of any supporting platforms is not just the cost of manufacturing itself but inevitably includes the cost of deployment, installation, retrieval and maintenance. This project proposes and assesses the technical feasibility of a floating platform that has a: dramatic increase in reliability with a simplified design; greatly reduced purchase, maintenance and running costs; and potential to be adapted for different types of tidal energy convertors and offshore electrical equipment. At the moment the less reliable source of sustainable clean electricity from wind energy generation outcompetes that of tidal energy. The improvements that we propose to the tidal energy platform, that will accommodate an already developed and experimentally tested tidal turbine, will ensure tidal energy is substantially more reliable and affordable than wind energy.</p>			

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University College London (UCL) Sharp Laboratories of Europe Ltd	Low cost high energy density anode for stationary energy storage	£199,927	£149,935
Project description - provided by applicants			
Sharp Laboratories of Europe Ltd and University College London are working together to develop a new low-cost high-energy density anode material for sodium-ion batteries. The new material will be an important step in the development of this very young technology. This project will play an important part in providing energy storage in the UK and tackling the energy trilemma. The devices will lower the cost of domestic energy storage making it financially viable for consumers, increasing the uptake of renewables and contributing to a reduction in the UK's reliance on fossil fuels.			

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Stopford Projects Ltd Liverpool John Moores University Unilever Central Resources Ltd	Upgrading woody biomass to biocoal using a novel microwave induced plasma technology	£199,909	£145,929
Project description - provided by applicants			
There is a real need to de-carbonise energy production in order that Governments meet their obligations to reduce fossil fuel derived carbon emissions and to meet renewable energy generation targets. Using sustainable sources of wood as a fuel is one such method of reducing the CO2 emissions associated with energy production; however, wood has a high moisture content, low energy density, has variable combustion properties and there are considerable costs incurred in modifying existing power plants for co-firing. Consequently, power producers are looking increasingly to torrefaction as a method of upgrading woody biomass to produce energy dense and renewable "biocoal", but technology development has been hampered by engineering problems and economic issues. The main aim of this proposal is two-fold: to enhance and assess the techno-economics of using novel microwave induced plasma (MIP) technology to make biocoal; and to use a systems approach to identify the optimum position and scale of the MIP technology within the biomass supply chain so that the benefits of biocoal can be realised.			

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Telemetry Associates Ltd Eco Design Consultants Ltd University of Hertfordshire Flint Engineering Ltd	TUPROOFS - Thermal under PV roofing SIP	£199,996	£169,996
Project description - provided by applicants			
The TUPROOFS project investigates novel methods of utilising PV and Solar Thermal technologies on roofs for new build residential and commercial and for refurbishment at Passivhaus levels of energy performance and grid parity. It also looks at the use of the technology for on-site deployment, for export as IPR and as a way of delivering energy for rural areas in developing countries with the promise of enabling local industry, employment, light and communication and thus delay migration to cities and developed countries. It is expected the partners will create a JV at the end of the project to exploit the technology and knowledge developed.			

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Glass Technology Services Ltd Sheffield Hallam University	Lower-energy routes to commercial soda-lime-silica glass manufacture through changes in the raw materials balance	£186,639	£156,645
Project description - provided by applicants			
This project is a collaboration between Glass Technology Services Ltd and Sheffield Hallam University that will undertake a feasibility study to develop lower-energy routes to produce commercial soda-lime-silica glass. We propose to make changes in raw materials composition and balance, including the partial replacement of batching ingredients in a glass melting furnace to reduce melting temperatures and melting times, and consequently reduce energy consumption, costs and emissions by 5-10% across the UK glass manufacturing industry. An innovative and critical aspect of this research will be to apply chemistry techniques to waste products from other industries (e.g. rice husk, banana waste, sea shells) to develop raw materials that can be introduced into glass melting processes to either reduce the high temperature viscosity or provide lower energy input for fusion. If successful this project will lead on to a second stage programme of applied research targeted at developing scalable technology that can be introduced into the UK's 18 glass manufacturing sites.			

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Wind Technologies Ltd	Reducing the 'levelised cost of energy' in offshore wind through a disruptive fault diagnosis technology, ReliaWind	£198,413	£138,889
Project description - provided by applicants			
Reliability is vital in the growth of wind power, especially offshore installations, currently generating 4.7% of UK electricity. Preventive maintenance, enabled by condition monitoring systems, increases reliability and availability of wind farms as well as reducing maintenance costs, leading to a lower 'Levelised Cost of Energy' (LCOE). Wind Technologies has developed ReliaWind, a unique condition monitoring technology which utilises electrical measurements to detect and diagnose mechanical and electrical faults in the wind turbine drivetrain. This project aims to assess ReliaWind's technical and commercial feasibility through testing in a pilot wind turbine and study of the economics with respect to net reduction in the LCOE.			

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Zagres Ltd	Feasibility assessment of a low-cost ultra-efficient 5 kW Gallium Nitride inverter for grid-connected domestic energy storage applications	£199,596	£139,717
Project description - provided by applicants			
This project aims to prove the technical feasibility and quantify the economics of a new Gallium Nitride (GaN) inverter technology through design, build and testing of a prototype GaN inverter for grid-connected domestic energystorage applications.			

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Vertogen Ltd	Variable Pitch Vertical Axis Wind Turbine	£136,294	£95,406
Project description - provided by applicants			
<p>Small scale horizontal axis wind turbines and vertical axis wind turbines are unable to handle high winds or turbulent conditions. At very high speeds wind turbines shut down. Existing designs focus on external mechanical and electrical systems to reduce the output rather than exploit the attributes of low and high wind conditions. Turbines with static blades cannot effectively capture the direct wind energy for all the blades. Existing designs rely on a small proportion of the total blade area and typically feature a symmetrical profile (equal profile each side). Existing vertical axis machines have an inherent inefficiency because while one blade is working well, other blades are effectively pulling in the wrong direction- causing them to behave as a brake. Vertogen has identified a gap in the market for a variable pitch VAWT.</p>			

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Geo Green Power Ltd D'Ascanio Research Ltd University of Nottingham	A Revolutionary Rotary Ericsson Heat Pump/Engine	£198,700	£168,453
Project description - provided by applicants			
<p>The aim of the project is to develop a mechanical heat pump utilizing the Ericsson thermodynamic cycle. This rotary Ericsson system was designed from the outset to match as closely as possible the ideal Carnot cycle. The system can be used both as an engine and cooler (and air conditioners and refrigerators), depending on the thermodynamic cycle direction. By use of the rotary system, almost all of the pitfalls of earlier designs have been overcome. This system consists of two pairs of rotors each of whose rotation is controlled by a motor-generator. The proposed Ericsson heat pump system will use the environmentally friendly working fluid, e.g, helium or hydrogen, and would be highly efficient. It would replace the conventional vapor compression cycle using CFC's that is harmful for the environment. It would make a breakthrough in many areas, e.g, refrigeration systems, industrial coolers , and solar/geothermal/industrial heat electricity generation, etc, to reduce energy consumption and carbon emission. The proposed project will involve the computer simulation, design and optimisation, construction and lab testing a first-of-its-kind small scale prototype system.</p>			

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MTG Research Ltd Valpak Ltd University of Oxford	Portable solar powered Electricity Supplies Using Recovered Batteries (PESURB)	£196,329	£155,942
Project description - provided by applicants			
Millions of functional rechargeable lithium ion batteries are disposed of each year. Some of these are recycled to recover the materials they are made of, but this is expensive and the recovered value is low. A better, and more sustainable approach, is to identify those batteries that have remaining functional lifetimes and to use them in new applications. This project is developing a process whereby these end of life batteries can be recovered, rapidly tested, and integrated into portable, low cost, lightweight, solar cell rechargeable power supply units that can be used to charge mobile phones and to power low energy lighting. There are around 600 million people globally with mobile phones that have no access to electricity at home. To charge them, they often have to walk for many hours to charging stations to connect their phones to car battery-based chargers; a privilege for which there are high charges. The power supply units developed in this project will provide low cost energy for phone charging and low energy lighting applications, using a circular economic approach to the reuse of lithium ion batteries.			

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Wideblue Ltd Offshore Renewable Energy Catapult	Wind Turbine Blade Optical Health Monitoring (BOHEM)	£173,643	£144,928
Project description - provided by applicants			
This project will develop a novel wind turbine blade structural health monitoring system based on digital cameras and image processing using an array of optical markers installed inside the blade. An optical system will be designed, and a digital image correlation technique will be used to track the markers which will characterise the dynamics of the blade during operation for both onshore and offshore wind turbines. The output data will be used to characterise the blade structural condition by monitoring changes in properties in real time in all weather and all operational conditions. For the feasibility study the layout of camera, illumination and markers will be optimised for a real blade using the design geometry and structural properties and proven in a state-of-the-art 7MW wind turbine			

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Wright Brothers Industrial Services Ltd Sheffield Hallam University	Briquetting of recycled glass fines for energy and CO2 reduction in the glass industry	£195,049	£155,301
Project description - provided by applicants			
<p>The glass industry is synonymous with inefficient energy consumption, resulting in high energy costs and carbon emissions. The global glass manufacturing sector uses 140 - 220 TWh of energy and emits 50-60 MT of CO2 p/a, which is set to escalate YoY, with a forecast market growth rate p/a of 7.2%. Glass melting processes account for 75% of the industry's energy consumption, with the average melting furnace operating at only 55% efficiency. In the UK alone the energy costs for the glass industry equate to circa £72.5m p/a, and inefficient, sub-optimal melting processes result in unnecessary CO2 emissions of 150,000T. A key contributor to the problem is the availability of the supply of cullet - recycled glass, which, when re-introduced into the melting process, can significantly reduce the melting energy of glass making raw materials. This project will test the feasibility of a new briquetting technology that will secure the long term supply of cullet by converting waste cullet fines (20% of the total supply) into valuable raw material that can be introduced into the glass melting process, and subsequently reduce energy consumption, costs and CO2 emissions by 4-8%.</p>			

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Big Solar Ltd Loughborough University	Development of Power Roll, ultra-low cost and ultra-lightweight PV	£198,037	£154,525
Project description - provided by applicants			
<p>The market for photovoltaic (PV) modules has expanded dramatically from 7GW in 2009 to 49GW in 2014 and is poised for explosive growth, up to 100GW pa. by 2018. Big Solar Limited is developing Power Roll, an ultra-lightweight and ultra-low cost solar PV product. This unique technology allows users to generate renewable energy at a cost cheaper than carbon based technologies and significantly less expensive than current PV technologies. Power Roll will have a thickness of less than 0.25 mm and be 98 times lighter than current PV, allowing for a wider range of applications than is possible with current PV technologies. Big Solar is delighted to have been successful in being awarded an Energy Catalyst Early Stage Grant and it will help enable potential investment of up to £10m in renewable technology in the North East of England.</p> <p>The market for photovoltaic (PV) modules has expanded dramatically from 7GW in 2009 to 49GW in 2014 and is poised for explosive growth, up to 100GW pa. by 2018. Big Solar Limited is developing Power Roll, an ultra-lightweight and ultra-low cost solar PV product. This unique technology allows users to generate renewable energy at a cost cheaper than carbon based technologies and significantly less expensive than current PV technologies. Power Roll will have a thickness of less than 0.25 mm and be 98 times lighter than current PV, allowing for a wider range of applications than is possible with current PV technologies. Big Solar is delighted to have been successful in being awarded an Energy Catalyst Early Stage Grant and it will help enable potential investment of up to £10m in renewable technology in the North East of England.</p>			

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Computational Modelling Cambridge Ltd University of Glasgow	Bio-GaTe - Advanced Biomass Gasification Technologies	£199,865	£169,881
Project description - provided by applicants			
An alternative and sustainable way of producing energy with low emissions and meeting the total energy demand globally is crucial for providing the security of future energy supplies long after the conventional fossil fuels run out. Biomass gasification can potentially ensure this due to its sustainability and inherent carbon neutrality, but the key constraint to the wider spread of biomass gasification technology is primarily not having processes efficient enough to deal with feedstock varieties, leading to poor gasifier performance. The aim of this project is to implement physics-based virtual engineering strategies to enable cost-effective technical development of advanced biomass gasification technologies (Bio-GaTe) capable of converting biomass feedstocks and wastes efficiently to alternative energy and high purity synthesis gas. The UK has legal obligation to produce 15% of total energy from renewable sources by 2020. The project also closely ties with the government current policies to deliver a low carbon future economy by decarbonising energy generation through renewables and sustainable routes, while safeguarding energy security.			

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University of Strathclyde Romax Technology Ltd Airts Consulting Ltd ScottishPower Renewables (UK) Ltd Datalytics Technology Limited	Optimisation of Wind Energy O&M Decision Making Under Uncertainty	£162,108	£126,930
Project description - provided by applicants			
<p>Wind energy will play a full part in decarbonisation of the future energy mix - if the costs can be reduced. This project develops a technological concept that helps achieve that cost reduction, by utilising data in a way which directly supports quick and reliable decision making in the everyday operation of a wind farm, either on- or offshore. The volume of data available from wind turbine assets is staggering - from component temperature traces, to weather forecasts, to sea conditions. But ultimately that data needs to be used by a control room engineer to change a decision in order to be useful. This innovative project develops a decision-making system that combines advanced visualisation methods and component health systems developed by UK SMEs with decision-theory from academia, and brings this together in a way that a wind farm operator can utilise to drive down the cost of operating a wind farm.</p>			

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ProPlanEn Ltd	WakeBlaster - faster than real-time wind farm flow simulation for optimised operational control	£197,150	£138,005
Project description - provided by applicants			
Almost all offshore and most onshore wind turbines are sited in wind farms where curtailments and wakelosses can be quite substantial. This feasibility project explores the creation of a technology base that enables operators to increase the joint operational efficiency of wind turbines sited in wind farms. The envisaged WakeBlaster technology delivers cost effective, faster than real-time, yet accurate modelling of even very large wind farms. Control strategies based on WakeBlaster will lead to more efficient wind farms, reducing both social cost and levelised cost of electricity.			

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Clean Energy Ltd University of Plymouth Mott MacDonald Ltd	Wave energy converter for small communities	£199,084	£164,294
Project description - provided by applicants			
This project involves development of a novel Wave Energy Converter (WEC) with a floating point absorber and further made from waste materials. Pressurised seawater is pumped to the shore for a variety of end uses including desalination and electricity generation. The concept behind the WEC is that it can be manufactured, deployed, maintained and used by small coastal communities, primarily in Less Developed Countries. The work proposed in this project builds on existing modelling and engineering work already carried out by the academic partner on behalf of the lead partner, and will extend both these aspects to prove feasibility of the device. The multinational engineering partner will draw upon their expertise to define the most effective way to use the supplied flow of pressurised seawater. The project is a collaboration between Clean Energy Ltd, the University of Plymouth, and Mott MacDonald.			

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Energy Transitions Ltd London South Bank University	Development of a new generation of high efficiency heat pumps using pre-heated air supply	£160,754	£130,756
Project description - provided by applicants			
The project's objectives are to assess the technical feasibility of developing a new range of high efficiency AirSource Heat Pumps (ASHPs) that achieve a significant improvement in performance compared to conventional ASHPs by virtue of the air supply to the ASHPs being pre-heated either by solar air collectors or, where appropriate, by use of exhaust air flows. We will consider the feasibility of the concept for both new build and retrofit to existing buildings within both the residential and commercial sectors. The application of the new range of high efficiency ASHPs will be for the supply of renewable heating and cooling (where used in conjunction with thermally driven cooling systems) in buildings. The project's activities will include appraisal of system design options, development of a detailed thermodynamic system design model and demand-side model, formulation of control and modulation strategies, investigation into optimisation of system components (with particular attention to working fluids, fluid flow rates, evaporator, condenser and controller), calculation of theoretical system performance in different climates and undertaking of cost benefit analysis.			

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Gravitricity Ltd	Gravitricity Ltd, Development of Hybrid Mechanical and Compressed Air Energy Storage System	£184,650	£129,255
Project description - provided by applicants			
<p>This is a proposal to develop a novel technology based on a combination of using gravity and compressed air for grid-connected electrical energy storage at a scale from 100kW to 50MW peak power and from 250kWh to 10MWh energy per cycle. This will fill a technology gap between small-scale relatively short-life storage devices like flywheels and batteries, and inherently large scale systems like pumped storage. It also has major advantages including rapid response (<2s to full power) and high energy efficiency (>90% round-trip efficiency) with no cyclic deterioration (performance is not affected by number of storage cycles or by part-loading). The project will include engineering work to develop all aspects of the technology (including a methodology to vertically drill holes up to a km deep and 5m in diameter) alongside parallel commercial work to ensure the technical offering will suit the emerging demand for energy storage on power grids. The project will output fully costed plans for a proof-of-concept prototype deployment to be deployed within 3-5 years.</p>			

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Tayhope Enterprises Ltd Senegy Development Solutions Ltd	Electricity generation using geo-engines powered by HP fluids	£195,612	£136,929
Project description - provided by applicants			
An exploration into the potential to extract energy from high pressure gas reservoirs and using this energy to drive electricity generators. The study will quantify the electricity generation potential of new geo-engines and explore the materials required to work with acidic HPHT fluids			

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Results of Competition: Energy Catalyst - Early Stage Feasibility - Round 3

Competition Code: 1504_FS_EGS_ENCATES3

Total available funding for this competition was £10M from Innovate UK and EPSRC (over all strands)

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
Dycotec Materials Ltd TWI Ltd	INTREPID: INnovative smarT coatings for incREased Performance of Thin Film PV Solar Cells.	£195,000	£164,992
Project description - provided by applicants			
<p>Solar PV systems represent a large and rapidly growing global market with large growth rates traditionally met by low-cost c-Si systems imported from the Far-East. Recently markets for thin-film technologies based on CdTe and CIGS have started to grow rapidly giving European manufacturers greater market share. However thin film systems are limited to efficiencies of 15%. Smart coating technologies based on functional nano-materials offer a tremendous opportunity to increase thin-film cell efficiency with relatively low investment. This approach is commercially attractive and offers technical and commercial advantages for solar PV systems, directly addressing the energy trilemma. However, outstanding issues relating to degradation and efficacy have to be overcome to achieve commercial acceptance. INTREPID will develop coating technologies for smart coating systems based on organic / inorganic coatings that can achieve 1% increase in cell efficiency for lifetimes 20 years for in-process and in-field application.</p>			

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Adelan Ltd Conrad Anderson (Midlands) Ltd University of Birmingham	Development of novel and reliable microSOFCs for use in APUs & other applications	£199,932	£145,958
Project description - provided by applicants			
This project examines the feasibility of a new SOFC device in the field of fuel cells, an invention which could lead to more economic portable power in stationary vehicles such as campervans and police vans. Up to now, the fuel cell has been too expensive to apply in such applications. Even after long development, a small fuel cell system for power/heat costs almost £13,000. These high costs are coming down as production increases (about 50,000 units were installed in Japan in 2014) but in the UK less than 100 systems are installed now. By utilizing a new design, Adelan plans to jump onto a lower learning curve to accelerate the penetration of this technology. Adelan published the first description of a UK microtubular SOFC in 1994 and has been making steady progress in cost reduction and in commercialisation strategy. The project partner Conrad Anderson has manufacturing skills which will show how the product can be made economically. The third partner University of Birmingham is an expert organisation in fuel cells, in this case developing sealant and metal interconnect materials. The commercial objective is to manufacture the new design in large numbers by 2020.			

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DZP Technologies Ltd NPL Management Ltd	Two-Dimensional graphene-related Transition metal dichalcogenides for ultracapacitor Energy storage Devices (2D TREND)	£199,978	£119,858
Project description - provided by applicants			
<p>The discovery of graphene inspired exciting new research in to other two-dimensional (2D) materials, most notably the 2D transition metal dichalcogenides (TMDs) which similarly to graphene can be exfoliated into atomically thin nano-sheets with unusual electronic and optical properties. To date, most research on TMDs has remained in the laboratory, in contrast to graphene which is already applied in new commercial products. This project, entitled 'Two-Dimensional Transition metal dichalcogenides for ultra-capacitor Energy storage Devices' (2D TREND), aims to establish the feasibility of 2D-TMD materials for scale up and use in ultra-capacitor energy storage for the smart grid. The project will develop methods to exfoliate 2D-TMD materials to nano-sheets and integrate them into supercapacitor electrodes. This will be complemented by advanced structural and chemical characterisation to develop understanding of the material properties. The project will demonstrate electrochemical cells which will enable the evaluation of the 2D-TMD materials for real-life energy storage.</p>			

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
SENSE Offshore Ltd Industrial Systems and Control Ltd	SENSE - Self Erecting Nacelle and Service System (for a large offshore wind turbine)	£198,884	£139,218
Project description - provided by applicants			
Awaiting Public Project Summary			

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
De Montfort University Printed Electronics Ltd Victrex Manufacturing Ltd	Creating electricity by reducing cost, payback time and Carbon foot print - An exploitation of a novel method into manufacturing Crystalline Silicon Photovoltaic solar Cells	£69,950	£57,857
Project description - provided by applicants			
Photovoltaic solar cells are renewable energy devices which convert light energy into electric energy. The cost of PV devices is still very high. We have developed silicon structures for application in PV with benefits of low temperature processes, thus less power consumption and a reduction in heat dissipation to the environment - reduces carbon footprint. Si structures can be deposited onto cheap/flexible plastic substrates, process is fully scalable, compatible with an already existing industrial process (PECVD), reduces manufacture cost and precursor to manufacturing industry. The project is aim to exploit the aforementioned benefits into photovoltaic solar cells.			

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Ocean Array Systems Ltd Offshore Renewable Energy Catapult	Simulations tools to enable Asset Life Extension (SALE)	£173,784	£126,336
Project description - provided by applicants			
The wind energy industry needs more accurate and efficient tools to calculate unsteady loads. These tools (for-in-service use) will inform yield and asset life decisions. They will be used to reduce O&M costs and hence LCoE. Ocean Array Systems and the Offshore Renewable Energy Catapult have won support from Innovate UK for their Simulation to enable Asset Life Extension project. This will (1) validate a simulation tool for wind turbines /arrays and (2) investigate the feasibility of a control systems module to aid farm-level management of turbulent effects. Using (velocity and loads) data sets from wind turbine locations, OAS' simulations enable site-specific predictions of turbine performance, accounting for turbulence, providing owners with a tool to enable asset-life-extension.			

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Marine Power Systems Ltd University of Bath	The Multi-float WaveSub Wave Energy Converter (WEC)	£199,946	£155,006
Project description - provided by applicants			
This project is a 12 month collaboration between Marine Power Systems (MPS) and University of Bath (UoB) to model, design, build, test and validate a 1:30th scale multi-float version of the 'WaveSub' Wave Energy Converter (WEC). The multi-float version will unlock WaveSub's long-term Levelised Cost of Energy (LCOE) wave-to-wire efficiencies, to allow WaveSub to compete with 'conventional' energy generation without subsidies, at <£60/MWh when fully commercialised. The WaveSub WEC is a game-changing device that tackle the energy trilemma head on, being capable of providing sustainable & cost-effective renewable energy generation to the UK grid - every day, 1TWh of wave energy enters UK waters; an amount equal to the UK's daily electricity consumption. The patented WaveSub stands out from the crowd, with its unique innovations that include sub-surface orbiting power take-off floats and a variable depth reactor operation, allowing it to survive storms and capture energy from the motion of waves, in almost all sea states.			

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AES Ltd Heriot-Watt University Soltropy Ltd	Reducing the Cost of Solar Thermal: Integrating a Novel Freeze Tolerance Approach with Flat Plate Solar Thermal Panels	£199,155	£169,178
Project description - provided by applicants			
<p>The aim of the project is to integrate Soltropy's patented freeze tolerance solution, developed for vacuum tubesolar thermal collectors, with AES Ltd's (AES Solar) flat plate solar thermal collectors. This will help to significantly reduce the installed cost of their solar thermal systems. Most solar thermal systems in the UK do not run water directly through the collector panels as it can cause freeze damage. Instead they run an antifreeze fluid through the collector which means that when a new solar thermal system is installed a perfectly good tank is replaced by a new hot water tank with a heat exchanger. This can double the price of the installed system due to the new tank and additional labour costs. A new tank is not required with Soltropy's solution which allows water to be used directly in the system. It works by using a compressible tube inside the copper piping which takes up the expanded volume of the water if/when it freezes. The cost savings made from not needing a new hot water cylinder and from the reduced installation time will lead to a steep reduction in the installed cost of solar thermal systems</p>			

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Water Powered Technologies Ltd University of Strathclyde	Zero Energy Distributed Micro Pumped Hydro	£195,402	£157,494
Project description - provided by applicants			
There are frequent times when the UK's national grid needs extra help to cope with demand when all the kettles across the UK go on at the same time and there is no wind for all the wind turbines. Using Water Powered Technologies Ltd range of patented water pumps, networks of lakes, ponds and reservoirs can be filled in times of flood or excess rain and then automatically discharge water into turbines to generate totally zero carbon electricity as and when required. These distributed micro pumped hydro networks can help provide refuge for wildlife and extra water for farmers in time of drought offering wide benefits beyond being the fastest provider of electricity to your home and a dependable as well as totally renewable store of energy for the entire UK.			

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Nortech Management Ltd	SinePost for a Low Carbon Future	£146,316	£87,790
Project description - provided by applicants			
<p>Nortech is a small-to-medium enterprise (SME), focused on the design, manufacture, supply and support of monitoring and communications products for use by electricity distribution network operators (DNOs). In this feasibility study, part-funded by InnovateUK, we aim to develop a directional current sensor (SinePost) for electricity network control and fault detection systems. Various techniques will be investigated to establish a method for reliably measuring voltage on high voltage (HV) overhead line systems. This will overcome technical limitations with existing products on the market. When combined with electrical current sensing, the direction of power flows in electricity distribution systems can be determined. This is particularly important when new generators connect to the network (as they can reverse power flows and cause thermal overloads) and will allow DNOs to detect and respond to faults more effectively (restoring electricity supplies to customers more quickly). "SinePost for a Low Carbon Future" will help the UK move towards a low-cost, low-carbon network, with secure electricity supplies for our current and future needs.</p>			

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Fraunhofer UK Research Ltd SgurrEnergy Ltd	Wake Anemometry for Yaw control: laboratory Demonstration, Ruggedisation and Field Testing	£199,992	£149,992
Project description - provided by applicants			
Wind energy is becoming a key ingredient in the UK's energy mix. However, the cost of offshore wind in particular remains relatively high and can begin to hold back uptake of this low carbon option and with the installation of new onshore turbines reducing there needs to be greater efficiencies and performance shown from the many thousands of installed wind turbines globally. An important part of the energy costs comes from maintenance and servicing. Reducing wear and downtime and improving turbine efficiency is an important goal for the designers of the next generation of wind turbines. Behind every wind turbine there is generated a wake pattern that can give us vital information about the alignment of a turbine. A control system based on such measurements requires a low cost laser based wind measurement system to be viable. This project will construct such a wake monitoring system and then after ruggedisation take it to the field to test it alongside much more expensive and bulky commercial laser based measurement systems. The expected outcome from the project will be a field demonstrator that is able to show the feasibility and benefits of wake anemometry			

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Pyro Yield Ltd Heriot-Watt University	Biomass Gasification with High Temperature CO2 Capture (GHTC)	£199,771	£160,855
Project description - provided by applicants			
<p>This project aims to develop and prove the technical feasibility of an integrated Bio-CCS system that has the capability to convert biomass waste into syngas that can be used to replace natural gas and in the same time capture the CO2 emitted. Also, the proposed technology can produce added value activated carbon (used for environmental applications or gas purification) and sodium carbonate (3rd largest manufactured chemical). By 2020, the UK could have access to about 1,8 EJ of bioenergy supply; this is equivalent to 20% of current primary energy demand in the UK, but the logistics of supplying large scale projects are difficult. The development of small delocalised systems able to convert biomass to heat/energy saving CO2 emissions is key to meet the ambitious biofuels and GHG directives and introduce the technology. Since the centralised capture of CO2 from small enterprise is not economically possible, emissions reduction and renewable energy recovery from waste/by-products is the most viable option.</p>			

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GSS Avionics Ltd University of Oxford	Transmission heAlth Monitoring (TAM)	£199,948	£169,953
Project description - provided by applicants			
The TAM project is aimed at providing the Wind Energy Sector and the British Gear Association Partners with aHealth Monitoring System that will reduce through-life costs and improve the supply, efficiency and reliability of UK wind Energy. High costs arise from the frequent, unpredictable failure of high-value transmission components (e.g. gearboxes), which could be prevented if fault development could be reliably detected. To this end, this industry led collaborative project will investigate novel eddy current sensor and electronic technologies that have the potential to provide a step change on existing sensing technologies by drawing on research at the University of Oxford and combining it with technology transfer from development partners in the Aerospace and Defence sectors along with experience from the Wind Turbine manufacturing industry .			

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Helios Advanced Energy Systems Ltd	Helios Thermal Energy Storage System	£192,334	£134,634
Project description - provided by applicants			
<p>Energy storage to meet increasing demand is vital to developing a low-carbon energy system, and can provide more flexibility and balancing to the grid, as well as providing a means of coping with increasing use of intermittent renewable energy. Locally, it has the potential to drastically reduce energy costs for businesses and homes. Current commercial-scale storage solutions are too early in their development & storage costs outweigh energy savings so commercial mkt uptake has been very limited. To be cost competitive, cost per kWh must be lower than off-peak electricity prices (£0.07/kWh). Helios Limited, a micro SME, are seeking to test the feasibility of developing a combined heat & power energy storage system (TESS). The device will be smart-enabled, and will utilise off-peak electricity to store heat energy at ~£0.02/kWh in a high density medium. The device will use a Sterling motor to generate electricity at peak hours, and heat losses will be used to heat a water matrix for heating or hot water. The device will also have the ability to feed energy back into the grid if needed, and store energy from renewable energy sources such as solar PV.</p>			

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Tidal Harness Ltd The Natural Environment Research Council	Electrical Generator for Tidal Turbines	£67,990	£48,391
Project description - provided by applicants			
<p>The generation of sustainable clean electricity by harnessing the potential power of the ocean tides is known as tidal energy. Many permutations of tidal turbines exist but the majority have similarities with wind turbines and are still plagued by poor reliability of equipment and high cost. A primary reason for poor reliability is the presence of too many moving components. This project proposes and assesses the technical feasibility of an electrical generator which simplifies the drive train of the turbine, yielding only one moving component namely, the rotor itself. This disruptive simplification will result in an effective tidal turbine which reduces the capital and operating expenditures and ensures tidal energy is substantially more reliable and affordable than wind energy. The electrical generator can potentially be adapted for other applications such as river turbines, hydroelectric and wave power applications.</p>			

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Exergy Ltd Cranfield University	Modular system for production of heating, cooling and electricity using ejector-boosted absorption (TRIGEN)	£194,315	£155,644
Project description - provided by applicants			
<p>The TRIGEN project (Modular system for production of heating, cooling and electricity using ejector-boosted absorption) project will confirm the technical feasibility of a tri-generation system, based on an integrated system of solar linear collector and a hybrid absorption heat pump, in the range of 50-100 kW for decentralized applications of energy production. The system is targeted at residential and service sectors although it can be applied across all scales including industrial premises. The advantage of TRIGEN is its low capital cost, it can be mass produced and there is no cost and emissions associated with its energy input (i.e. solar - free and clean source of energy). All of these benefits contribute to the energy 'trilemma' by reducing emissions, reducing cost of generation and by increasing security of supply through the increased uptake of decentralised generation systems. If successful, TRIGEN will bring solar energy closer to the user by developing a solution that makes it attractive and competitive for industries & households.</p>			

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Energy SRS Ltd UK Power Reserve Ltd University of Bristol PR Marriott Drilling Ltd Alfred Cheyne Engineering Ltd D Bayliss Consulting Ltd	GENSSIS (Gravitational Energy Storage & Synchronous Inertial Stability)	£188,473	£133,132
Project description - provided by applicants			
<p>The application of existing technologies through a focused consortium of industry expertise is central to the impact of this project. Six UK companies will be involved in a detailed coordinated study into the feasibility of developing a technology based on a gravitational potential energy concept and its potential to provide zero emission ancillary grid balancing services to National Grid Electricity Transmission plc. There has never been a more appropriate time to search for viable technologies that can provide cost effective, reliable, solutions to the critically important problem of reducing carbon emissions. The project has merged many existing, proven technologies into the design to function in a completely new area of operation. For example, heavy lifting and borehole technology from the offshore oil and gas industry, and new age products such as synthetic rope, provide cutting-edge solutions when integrated within this innovative scenario. The project is also commercially innovative in that it has identified a commercial utility application for its ability to re-produce electrical energy without involving carbon emissions or toxic chemicals.</p>			

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Subsea Asset Location Technologies Ltd Precision Acoustics Ltd University of Birmingham	ATTACH – Acoustic Tagging Technologies Applied to Cables and subsea Hardware	£241,511	£198,222
Project description - provided by applicants			
The ATTACH (Acoustic Tagging Technologies Applied to Cables and subsea Hardware) project is a three-way collaboration between Subsea Asset Location Technologies (SALT) Ltd., Precision Acoustics Ltd. and the University of Birmingham to carry out a feasibility study to identify remote-sensing, acoustical methods of labelling high-value subsea energy assets, such as cables and pipelines. It is not generally appreciated that finding an asset might take a significant amount of time and money as the cable, or pipeline, might have been buried or moved as a result of ocean currents, the asset may then become invisible to a sonar system. Thus any method of tracking the asset without having to excavate it would dramatically reduce costs. The aim of this project is to design synthetic sonar targets that float above the asset and are significantly easier to detect using a sonar system than the asset itself. One can imagine that being able to see a string of such targets over a range of a few hundreds of metres (likened to cat's-eyes whilst driving at night) would dramatically increase the detectability of such assets.			

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Protean Wave Technology Ltd Cranfield University	Reusing existing ship structures for large capacity wave energy conversion (RESWEC)	£114,729	£94,612
Project description - provided by applicants			
The aim of this project is to assess the feasibility of Re-using Existing Ship structures for large-capacity WaveEnergy Conversion (RESWEC) to support a novel configuration of an oscillating water column array. The project will demonstrate the technical feasibility of creating the WaveShip, a zero-emissions mobile renewable energy platform, by showing that a near end-of-life ship can be repurposed whilst retaining satisfactory structural and stability characteristics to meet the environmental conditions encountered on the open oceans. This project will prove the naval architectural principles underpinning the WaveShip concept are sound, supported by a physical model testing campaign to validate analytical results. Vendor-supplied information will be used to show how existing turbine and generator technologies can be brought together to create a wave energy harvesting system, that will then be employed in the clean and sustainable production of hydrogen, which will be compressed and stored onboard in readiness for offloading. Successful completion of Project RESWEC will pave the way to ensuring the world's first 'Renewable Energy FPSO' becomes a viable and credible reality.			

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Jee Ltd	Excalibur - A novel subsea infrastructure solution for the deployment of tidal arrays	£124,543	£74,726
Project description - provided by applicants			
<p>The tidal energy sector is currently seeking ways to exploit the advancements made in tidal turbine technology in the UK. These devices have already undergone open water testing and were shown to be technically and commercially viable. The key challenge now is to find a cost-effective way to deploy these devices at a large scale to help unlock this energy source which has the potential to meet 20% of current electricity demands in the UK. This is particularly challenging in the harsh metocean conditions expected at the locations where these devices are required to operate. Excalibur is a novel subsea infrastructure system which will help overcome these challenges. It includes a standardised foundation system that is device neutral enabling different suppliers to "plug and play" their technologies into the system. The installation and maintenance of these devices is also simplified by using Excalibur which in turn reduces the cost of tidal energy.</p>			

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Total available funding for this competition was £10M from Innovate UK and EPSRC (over all strands)

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
OXIS Energy Ltd University of Southampton	Microgrid Energy Storage using Lithium-Sulfur Batteries	£194,167	£155,223
Project description - provided by applicants			
<p>This project will develop and demonstrate active remote gas sensing platforms capable of wide scene observation at considerable stand-off distances. This technology has multiple, high-value commercial applications in growing markets. Specifically this project will develop 2um pump laser sources optimised for optical parametric amplification (OPA) of chirped Quantum Cascade (QC) Lasers for sensing and imaging applications. Within the 24 months project duration it is anticipated that this marriage of technologies will lead to the development of active remote gas sensing platforms capable of wide scene observation at considerable stand-off distances. Such capability will address multiple commercial applications for the control of industrial processes, environmental monitoring, traditional petrochemical, hydraulic fracturing and security markets.</p>			

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OpenGoSim Ltd TotalSim Ltd Heriot-Watt University NERC British Geological Survey	CO2CloudSim: CO ₂ storage and CO ₂ -enhanced oil recovery subsurface simulations, using open-source software in the Cloud	£199,994	£166,976
Project description - provided by applicants			
<p>CO2CloudSim will be the only web application supporting open-source software to simulate CO₂ storage and CO₂-enhanced oil recovery (CO₂ - EOR) subsurface processes, combining parallel computing and Cloud technologies. Due to its inherently ad hoc development process, open-source software brings continuous innovation from experts worldwide, but is difficult to use. Parallel computing dramatically reduces the time needed to perform a simulation by using multiple computer processors, but the computer hardware required is expensive to buy and maintain. CO2CloudSim will make open-source software easier to use by providing a web-user interface, live support and affordable parallel hardware through the use of Cloud technology and a pay-as-you-go service. Making open-source software more accessible to industry users, CO2CloudSim will enable software customisations needed to accelerate the continued development of CCS and CO₂-EOR. During this feasibility study we will develop a prototype of CO2CloudSim to enable early customer tests, and introduce significant improvements to the open-source simulator engine by innovative numerical methods.</p>			

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Carbon Compost Company Ltd HiETA Technologies Ltd Base Structures Ltd Helec Ltd TWI Ltd	ENTRANCE - Energy from Transportable Bio-Char Equipment	£199,398	£168,292
Project description - provided by applicants			
ENTRANCE will develop , at feasibility level, an integrated transportable system to obtain combined electrical power and heat, and valuable co-products from wood and other biomass fuel. The co-products are high value charcoal, biochar for soil improvement and a means of long term carbon sequestration, and preservatives for building products. Centralised biomass CHP systems cannot address this market. A transportable system is needed to operate at the biomass source and remove the transport costs of bulky wood and agri-waste. ENTRANCE will modify a biochar retort to supply its hot and calorific exhaust gas to an external combustion (Stirling) engine powered CHP generator, modified for wood pyro-gas. The gas will be stored in a portable buffer gas store to allow continuous electrical output from the biochar batch operation. Innovative compact heat exchangers will be used to cool and densify the hot gas for storage and feed to the Stirling combustor, whilst recyclable filters will be developed to clean the gas and extract valuable compounds. Electricity is for use in agricultural buildings or grid supply, the heat from the exchangers is used for biomass or crop drying.			

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KYMIRA Ltd	Energy Harvesting e-Textile Platform	£199,800	£139,860
Project description - provided by applicants			
<p>This project seeks to validate the early stage energy harvesting technology being developed at KYMIRA Ltd. The intended outcomes are to take our ideas or concepts and over 12 months, develop these into initial working prototypes. To do this we will be experimenting with and refining a number of prominent energy harvesting methods and redeveloping them to suit our needs. Through experimentation we intend to identify the most efficient methods and optimal utilisation areas. The project is focused on developing the concept of a wearable energy harvesting solution with resulting outcomes being used for consumer applications such as sportswear and also medical, military and space exploration use cases. KYMIRA Ltd. currently trades in the performance sportswear market having co-developed a passive wearable technology that we utilise within our products to enhance performance and accelerate recovery. With customers on every continent around the world and multiple awards to our name we are well renowned for our technically innovative approach and desire to disrupt the technology markets of tomorrow.</p>			

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Eco3 Design Ltd University of Sheffield S2S Electronics Ltd	Low Cost Power Supplies for Developing Countries - Repurposing Computer Power Supplies (RECOMPS)	£149,772	£116,490
Project description - provided by applicants			
<p>This project is developing a simple, low cost, renewable energy power supply for use by people that have no access to grid electricity. Millions of tonnes of electrical and electronic equipment are disposed of each year across Europe. In many cases the products are still fully functional, yet they are consigned to rudimentary melting operations to recover their metals. A far more beneficial approach is to refurbish and repurpose products for use in new applications where higher value can be maintained and a product's useful life extended. This project is studying the feasibility of removing power supply units from end of life computers so that they can be modified to work with solar cells to provide portable energy sources for use in third world countries. In sub-Saharan Africa, for example, less than 25% of the population has access to a domestic electricity supply, but they still need power for charging mobile phones and providing basic lighting. The project is adopting a sustainable approach to the energy trilemma and aims to convert a waste product into a valuable, low cost unit that can provide electricity where it is currently not available.</p>			

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PJH Partnership Ltd	Enhanced electricity generation through waste heat utilisation and thermodynamics of supercritical CO2	£133,793	£93,655
Project description - provided by applicants			
<p>PJH Partnership has identified an innovative process that can both cycle CO2 and efficiently convert waste heat to power using a highly efficient working fluid. The system manipulates multiple phase changes of CO2 to maximise the thermodynamic potential of a fluid that is both highly stable, readily available and inert. Due to its high density in the supercritical phase, power generation technology powered by this fluid requires a notably smaller footprint, a tenth less turbine size and significantly less operational costs. Benefits include enhanced electricity generated from fossil fuel sources currently averaging 45%, up to 60%. Potential CO2 avoidance totals 142.3mT per year, with increased security through better utilisation of national energy assets. This 12-month project aims to assess the technical feasibility of generating supercritical CO2 using the process methodology and evaluate its efficacy in power generation using turbine technology. The modular retrofit system targets fossil fuel generators and renewable operators with future commercial deployment anticipated end-2018.</p>			

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Soltropy Ltd Heriot-Watt University	Reducing the Cost of Solar Thermal: Integration of Thermal Storage with Solar Collector Design	£199,893	£169,907
Project description - provided by applicants			
This project will combine a Soltropy freeze tolerant solar thermal system with heat storage capability. This will make the overall system more effective and expand the use of solar thermal by making it more cost effective. The project's main focus is to -1. Reduce the cost of the system for installations where space heating is required. 2. Reduce the cost of the system for installations where there is no existing hot water tank. 3. Increase the performance of the system.			

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Adrok Ltd IGas Energy PLC	Feasibility study for innovative remote sensing to increase onshore UK gas production	£190,000	£115,000
Project description - provided by applicants			
<p>This project will determine the feasibility of using innovative remote sensing techniques to improve the rate of success in hydrocarbon exploration and development of onshore UK gas fields. The project will be lead by Adrok Ltd, a company which has been researching atomic dielectric resonance (ADR) as a method of determining elements in the subsurface and the depths of subsurface layers. There have been successful applications of this technology for mineral and hydrocarbon exploration in other countries but to date there has been almost no use of this technology in the UK. Adrok's partner for this project will be IGas Group plc. IGas has more onshore UK fields on production than any other company and is also one of the leading companies for UK shale exploration. In addition, IGas has strong geological expertise and a large database of UK onshore seismic data. In 2016-17 IGas plans to acquire surface geochemistry data and to drill various exploration wells. The objective of the feasibility study will be to investigate how ADR results can be integrated with geological, geophysical and geochemical data to find and develop new onshore UK gas fields more efficiently.</p>			

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Glen Farrow UK Ltd Brunel University	Power Generation and Heat Recovery from Biomass with Advanced CO2 Thermodynamic Power Cycles	£199,798	£169,828
Project description - provided by applicants			
<p>In this project, one test rig of a small-scale and high-efficiency CHP exhaust (biomass combustion) power generation (5kWe) and heat recovery system will be established and measured. The energy conversion system is based on an advanced thermodynamic power cycle and uses CO2 as a working fluid. Special designs and controls will be applied to the proposed system so as to achieve a high thermal efficiency and obtain production of heating where necessary. Simultaneously, a detailed mathematical model for the proposed biomass power generation system and components will be developed and validated with measurements. The model will then evaluate, compare and analyse different system and component designs, heat recovery productions, control optimisations and power cycle configurations; this will eventually lead to the optimal design and construction of the proposed system. The validated model will then be further scaled up to explore the actual application and development of biomass-CO2 power systems.</p>			

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