Department of Energy & Climate Change

CLT CARBON LIMITING TECHNOLOGIES

DECC Energy Entrepreneurs Fund Phase 4 Supported Companies

Company	Location	Company and Project Summary
Carbon Clean Solutions	Reading	Carbon Clean Solutions Ltd have developed a range of solvents to remove carbon dioxide from flue gases from fossil fuel fired power stations and industrial processes. These new solvents require less energy and have improved environmental performance than the industry bench mark. This project aims to compare different solvents (MEA vs the new solvent from Carbon Capture Solutions Ltd) inside an intensified absorber. Experimental study, modelling and process analysis will be used to compare performance. This is to quantify the potential in reduction of capital cost and operating cost for capturing CO_2. The project will be led by CCS Ltd and in collaboration with Newcastle University and University of Hull.
C-Capture	Leeds	C-Capture Ltd (C-CL) was spun out from Leeds University to commercialise an innovative family of amine-free PCC solvents that can already match the steam requirements of the best 2G amine solvents but also have significantly reduced toxicity, environmental impact and corrosion characteristics. In this project, variants of C-CL's amine-free chemistry will be screened for suitability in the laboratory and scaled-up on the company's dedicated pre-pilot test rig in order to identify optimum candidates. These will then be tested on PCC simulation rigs to confirm their superiority to 2G amine solvents. The results will be used in licensing negotiations with manufacturers of CCS plant and chemicals.
Celtic Renewables Ltd	Edinburgh	Celtic Renewables is commercialising an innovative patented process technology, based on proven ABE fermentation, which converts sugars into biofuels (butanol and ethanol), and three other high value commodities: acetone, animal feed and hydrogen. Butanol has recently been recognised as an advanced biofuel with significant advantages over ethanol both as a fuel and as a blending component. Initially the company is focusing on converting problematic by-products of the whisky industry, which present significant disposal and environmental issues, due to annual production of millions of tonnes of these residues. The purpose of the project is to complete the industrial-scale process blueprint for the innovative fermentation technology so that it is commercially and technically robust, and to develop the strategic partnerships in order to establish the first industrial production plant by 2015.
CRESS	Reading	CRESS aims to apply its flywheel energy storage system to utilise regenerative energy in container handling cranes at shipping ports. Cranes currently waste the braking energy when a container is lowered but this can be recovered and used in raising the next container. The energy saved would reduce both the diesel used to power the cranes and lower carbon emissions. There are around 10,000 container port cranes worldwide. Market feedback shows that existing energy recovery systems do not meet port operators' requirements. In order to capture this opportunity CRESS will develop and test a pre-production prototype in both the laboratory and on a crane operated by its strategic partner Port of Felixstowe. These tests aim to prove that the CRESS system can reliably deliver attractive fuel savings and payback.

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Energy Transitions Limited	Montgomery	This project will research and develop a novel renewable heating technology based on the integration of innovative low-emissivity transpired solar collectors (Low-E TSCs) with 1) ventilation systems and 2) air source heat pumps (ASHPs). Within the project model Low-E TSCs will be developed and tested; they will also develop model systems in which Low-E TSCs are integrated with 1) ventilation systems and 2) ASHPs and they will undertake testing and monitoring of the performance of these model systems. ETL aim to demonstrate that Low-E TSCs will deliver pre-heated air to ventilation systems at higher efficiencies than any other solar air heating technology and that by pre-heating the air supply to ASHPs they can improve ASHP efficiency by 25 to 50%.
EWIPRO Limited ewipro	Margam, Port Talbot	The proposed project is based around the final development steps of a product that addresses the challenges and risks associated with the application of external wall insulation to existing buildings at critical junctions. The product provides an integrated kit of parts solution to almost all the conceivable eaves and verge challenges that are faced when installing external wall insulation to existing buildings. It can be used in conjunction with any external wall insulation material or system, and has been designed to suit the thickness of most installations (between 90-110mm thick). If there was an impetus within the EWI industry to increase this thickness our product could easily be adapted.
Fault Current FAULT CURRENT LTD	Cardiff	FaultCurrent Ltd are developing a series of magnetic fault current limiter (mFCL) protection products for installation within electricity distribution networks to facilitate the connection of more distributed and renewable generation on existing network assets. The innovation is a unique mFCL based on intellectual property developed over a number of years within the specialist Wolfson Centre for Magnetics at Cardiff University in the UK. This technology results in a completely passive low cost ferrite permanent magnet device. The primary advantages are: there is no requirement for a back-feed scheme (there will be a short interruption in power only whilst the mFCL is connected); saving between £250k and £500k per installation and potentially avoiding network upgrade costs in some situations; the cost of a mFCL, installation and commissioning can be treated as a capital expense; there are negligible maintenance costs (it is a 'Fit & Forget' system); and the technology does not require a power source so no running costs are incurred.
FET Engineering Ltd FET GROUP FUTURE ENVIROMENTAL TECHNOLOGIES	Bristol	Research estimates that, whilst first generation 'amine' technologies are likely to be the most cost effective methods of capturing industrial CO_2 emissions, these technologies will not be in a position to be implemented until 2025. Project PureStream offers significant advantages over the other Carbon Capture technologies identified in research, as the core technology behind PureStream is a proven electro-chemical process. It is anticipated that PureStream will be available for commercial deployment from 2017 across a range of carbon and other greenhouse gas emitters, both small & large in scale. PureStream, which can be retro-fitted into existing infrastructures, is a lower cost and more environmentally friendly solution to carbon capture than the current CCS technologies under development.

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Future Blends Ltd	Didcot	Future Blends is creating a relatively low cost, locally produced advanced (2G) biofuel "drop in" emulsion that could replace up to 40% of the UK's demand for light fuel oil (LFO), resulting in a commensurate reduction in CO_2e and SOx emissions, and at a price point of c. 20% below the cost of LFO. The immediate application would be for the shipping industry (i.e. marine engines), with later development in rail and heat and power generation. The Project aims to demonstrate the viability of using an emulsion of biomass-derived pyrolysis oil and LFO as a blended "drop-in" fuel for use in large diesel engines. The Project will seek to scale the existing bench-scale emulsion research to a pilot production facility (c. 5-10 litre/h) and produce sufficient quantities to undertake and complete engine trials. The Project is expected to achieve at least a 25/75 mix of pyrolysis oil in LFO, and ultimately 40/60.
Highview Power	London	Highview Enterprises Limited, trading as Highview Power Storage, is a developer of energy storage technology using liquid air as the energy storage medium. Liquid Air Energy Storage (LAES) technology combines proven components from the industrial gas and power generation sectors in an innovative way, and produces no harmful emissions. A first small-scale prototype HGCS was developed as part of Highview's world-first LAES pilot plant partly funded by the DECC Smart Grid Capital Grants programme. This demonstrated the effect of cold recycle on the efficiency of the overall LAES process and provided useful learning regarding the design of a HGCS.The objective of the proposed project is to consolidate Highview's understanding of the physics of the HGCS by testing a single full-scale HGCS cell, thus reducing the risk involved in the deployment of a fully-integrated LAES plant at commercial scale.
Naked Energy Limited	Guildford	Naked Energy has developed an innovative hybrid solar technology providing combined heat and power. Virtu integrates standard photovoltaic cells into an evacuated tube solar thermal collector with novel heat transfer mechanism. For any given area, more of the sun's energy is converted into heat and electricity than existing products, enabling higher sunlight conversion per square meter of roof space in a "single visit" installation. In laboratory testing 90% of the sun's 1000W/m^2 has been captured and converted into heat and power. The versatile, modular design provides distributed energy generation for commercial and domestic applications regardless of climatic or geographic conditions. The key innovation is a highly efficient heat transfer mechanism that has been extensively tested and validated by Imperial College London and has wider applications beyond solar. This project will develop the next generation of trial and test prototypes for on-going environmental tests being conducted with the UK's largest utility company prior to an integrated pilot with a leading supermarket group.

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NVP Energy	Westmeath	NVP Energy (NVPE) is a clean-tech company that has developed a novel energy-positive and carbon-neutral technology that sustainably treats Waste Water (WW) while recovering valuable biogas. Lt-AD is a Secondary Stage treatment step offering a valuable solution to users in the target markets of Food & Drink industrial WW sectors and Municipal WW. The technology is post pilot-scale with > 2 years of successful on-site trials completed at globally recognised industries. This EEF project will allow NVPE to deliver the first full-scale demonstration reactor on a UK food & Drinks site (ABP Foods , £1 billion revenue); demonstrate the successful full scale deployment of Lt-AD; and create a flagship reference site to support sales and profitable growth in the UK and globally.
Q-BOT	London,	Effective under-floor insulation of existing buildings is one of the great unresolved challenges, and can account for as much as 25% of the total heat loss of older properties. Current methods are disruptive, labour intensive, have significant technical limitations, and are cost prohibitive, severely limiting adoption. In comparison to existing methodologies Q-Bot can retrofit insulation quickly, cheaply and with minimal disruption. Because of the small and compact size of the robots, in many cases the installation can be completed without even entering the property. The robot can be inserted through an external air vent, deploy within the void and apply insulation to the floor boards in situ. The Proof of Concept level, complete with initial monitored trials has already been achieved with the help of previous DECC EEF grant. With the help of this DECC EEF 4 project we intend to develop the technology so that third party installers can use it, secure the necessary certification, and optimise the robot and spray routines to ensure the application across the widest possible range of homes, so the service can be delivered at scale. Once commercialised Q-Bot will have 2x the performance, be 70% cheaper, 9x faster and 100% less disruptive than any other floor insulation method. On average Q-Bot will save 4,000-6,000kWh of heating energy and 800-1300kg of CO2 per home annually. This will lead to much reduced energy use to heat homes, directly reducing emissions such as CO2, NOx and Particulate Matter.
Upside Energy	Cheshire	Upside Energy is building a cloud service that enables households & SMEs to earn extra income from batteries & other energy stores. In many cases, our service makes it economically viable for people to buy batteries they wouldn't otherwise own (e.g. to store energy from solar PV arrays). We do this by coordinating the energy stored in uninterruptible power supplies (UPS), PV arrays, electric vehicles, heating systems, to create a "virtual energy store" (VES). We will use this VES to deliver balancing services to the grid, distributing 75% of their revenue back to the original equipment owners. We aim to significantly increase the UK's capacity for demand response where small energy users consume over half our electricity.