Technology Strategy Board
Driving Innovation

Results of competition: Power Electronics - Collaborative research and development

Total available funding for this competition was £3.9m from the Technology Strategy Board.

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
Babcock International plc (lead) TWI Limited Cornelius Specialities Ltd Teal & Mackrill Limited	The development of a durable easy to apply 'polyhedral oligomeric silsesquioxanes' based anti-icing coating for aluminium composite core conductor lines to enable their implementation in the overhead line energy market	£683,580	£454,317

Project description (provided by applicants)

The wholesale adoption of ACCC conductors in the energy supply market, which offer twice the power supply capacity of existing conductors, has been prevented due to concerns regarding their long-term performance under ice-loading. Effective durable anti-ice accretion solutions do not exist. To address the current and pressing need to increase grid capacity using existing support infrastructure, we propose the development of an effective and durable anti-icing coating using cutting-edge super hydrophobic technology. The application of this technology on ACCC conductors will facilitate their safe adoption in the market and deliver the following benefits:

1. Increase two-fold the current carrying capacity of conductor lines, without upgrade of existing infrastructure;

2. Substantially reduce maintenance and associated costs (£900million savings) up to the year 2020

3. Reduced environmental impact as access to towers for foundation upgrades would not be required

4. Based on supply of energy to all UK homes (117,000 GWh per year), replacing 10% of existing ACSR lines with ACCC conductors will reduce line losses by 2,925GWh (£175million) and prevent 1.23million tonnes CO2.

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CISCO Systems Limited (lead) University of Strathclyde AMBX UK Limited PureVLC Limited	Light as a System (LaaS)	£1,148,910	£628,397
Project description (provided by applicants)			
Convergence between data and power networks will completely change power networks within 5 years enabled by a) public policy imperatives b) emergence of new power transfer and management protocols and c) the roll out of smart meters and grids requiring “smart loads”. Light is one of the highest fixed power needs in public buildings and industry. The advent of light powered, connected, and controlled by digital networks opens a new spectrum of innovation and capability to manage smart loads and reduce costs. LaaS will be used in this project as a test bed to demonstrate the Internet-of-Things in power networks and the evolution to a smart grid and network load. It brings together existing technologies, emerging standards and policy obligations to create a new power service. LaaS will develop and integrate protocols, test them in hardware devices, demonstrate the solution in-situ and enable a “smart load” to exploit smart grids. The new protocols will address current constrictions on digital power by addressing kw capacity, distance limitations, lumens rendered, big data interfaces and load analytics. LaaS will be self-aware and open to new back-end devices and front-end consumers.			

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Dynex Semiconductor Limited (lead) Eltek Semiconductors Ltd Alstom Grid UK Limited University of Warwick Turbo Power Systems Ltd	SiC Power Electronics- The Route to a Resilient Energy System (SiCER)	£951,059	£643,302
Project description (provided by applicants)			
The improvement of the UK's energy infrastructure is critical moving into a low carbon economy. A paradigm shift in technology will be required in order to cope effectively with an ever increasing amount of renewable energy being brought online. The UK has committed to connecting 32,000 MW of offshore wind power by the year 2030 in an effort to meet ambitious (low) carbon emissions targets. It is envisaged that other forms of renewable energy e.g. tidal, solar could also play a role alongside traditional coal-fired power stations and nuclear energy generation. Revolutionary changes to large (multi-gigawatt) scale power conversion is indispensable if these carbon emissions targets are to be met. The objective is to enable a step change in power conversion, transmission and distribution through silicon carbide (SiC) power electronics. This will be achieved by bringing together world-leading companies and academics in the fields of high-voltage power electronics, semiconductor technology and power generation, transmission and distribution. The consortium will build upon existing materials knowledge, attained through academic research to deliver the project.			

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Dynex Semiconductor Limited (lead) GE Oil & Gas Amantys Limited Newcastle University	Direct State of Health Measurement for power devices (DiSoHM)	£976,231	£641,879
Project description (provided by applicants)			
Direct State of Health Measurement for Power Devices (DiSoHM) is a project which brings together academia and industry with the objective of developing an in-situ health-monitoring device that is able to detect and quantify the health of a power electronics module. DiSoHM will dramatically increase the availability of power electronics systems embedded in harsh environments such as off-shore facilities and sub-sea equipment. Electronics applications used in such challenging environments incur extremely high maintenance costs due to their remote and difficult to access locations. A technology such as that which will be developed in this project will help to reduce the cost of breakdown maintenance by providing a failure prediction capability which can be used to schedule effective preventative maintenance. It is expected that this technology will find applications in other areas where high availability is important, such as HVDC transmission, high-speed electric trains and aerospace.			

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
IXYS UK Westcode Ltd (lead) University of Sheffield Alstom Grid UK Limited	Next generation very large press-pack IGBT	£1,034,266	£599,935
Project description (provided by applicants)			
Power electronics is the extension of solid-state electronics away from handling communications and data and into the business of handling electric power up to gigawatts with reduced losses of energy; it is an enabling technology for the low-carbon economy. This project brings together a university, a manufacturer of high-power semiconductors and an electric grid end-user, who are world-leading in their fields and all based in the UK, to develop the next generation of higher power rated electronic devices to enable this to happen. This is a major opportunity for the UK in securing our own grid and helping implement our commitment to renewable energy, particularly connecting offshore wind turbines to the grid, and is also a major export opportunity, particularly to the developing economies that do not have this indigenous technology. It will secure and potentially increase employment in the UK, in what is a major opportunity and growing market and will increase skills in an area of business where there is a shortage of skills that is hampering business ability to grow to the benefit of the economy and society in general.			

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ITM Power (Trading) Limited (lead) National Grid PLC SSE PLC AEG Power Solutions Ltd Cressal Resistors Limited	Power electronics for dynamic electrolyser response for grid balancing	£770,437	£436,889
Project description (provided by applicants)			
This project relates to the development of a front-end power electronics module which will allow a dynamic energy storage/hydrogen production system for frequency control on the electricity network. The module will allow a distributed solution for managing both sudden increases and decreases in system frequency by offering very rapid response times.			

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Plant Integrity Limited (lead) Applied Inspection Limited Brunel University	MOSAIC (Monitoring, Scanning and Active Inspection of Cables)	£750,509	£510,259
Project description (provided by applicants)			
There are 29,000km of high voltage overhead transmission cables in the UK, operating in severe conditions of heat and cold, moisture, voltage stress, wind induced vibration, overloads and structural fatigue, all of which can cause catastrophic failure. The MOSAIC project aims to prototype a novel method of combined monitoring and enhancement of the structural health of these cables, more technically effective, cost effective and safer than existing passive monitoring techniques i.e. infra-red and visual imaging using helicopters and human inspectors. In the MOSAIC technology one sensor module, in a fixed location on a cable and self-powered by inductive harvesting of energy from the cable, will permanently and in real time monitor a cable to: (1) Measure vibrations, which are a major cause of cable fatigue, and actively cancel them through automatic electromechanical means. (2) Actively detect early signs of cable fatigue and track its growth using long range guided ultrasound, which can access cable areas impossible with infrared and visual sensing. (3) Wirelessly transmit essential data, including cable location to a base station, for instant maintenance decision making.			