Technology Strategy Board
Driving Innovation

Results of competition: Power electronics - Feasibility studies

Total available funding for this competition was £2m 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
Zagres Limited (lead)	Feasibility assessment of a new ultra-high voltage silicon carbide thyristor technology for multi-megawatt wind turbines' power electronics converters	£152,743	£114,557

Project description (provided by applicants)

Zagres has developed new design and fabrication techniques for Ultra-High Voltage Silicon Carbide (UHV SiC) Thyristor technology which enables substantial reduction in manufacturing costs, as much as 40%, and operation at voltage and frequency ratings which have never been utilised before in the industry. The technology, proven on laboratory prototypes, promises applications in several high-power systems, such as renewable energy generation, High Voltage DC (HVDC) systems and Flexible AC Transmission Systems (FACTS). The key benefits include reduction in cost of energy, and enhancement in efficiency and reliability.

The aim of this project is to assess the feasibility of the UHV SiC Thyristor technology for wind turbine applications and quantify their benefits with respect to cost of energy, reliability and efficiency. A prototype 20 kW converter will be built and then tested on a real wind turbine for a three-month period. In addition, models will be developed to evaluate the advantages of UHV SiC Thyristor converters for multi-MW wind turbines.

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NAREC Development Services Limited (lead)	Next generation HVDC network for the offshore renewable energy industry	£156,001	£109,445

Project description (provided by applicants)

Currently, HVDC technologies are being developed for the purposes of connecting an offshore wind farm to both the grid network and other wind farms. This is particularly important when considering the long transmission distances that need to be overcome for the planned UK Round 3 offshore wind farms and also longer term projects such as the European Supergrid. However, the technologies do not consider the use of HVDC technology beyond the substation of the offshore wind farm. This project concerns the development of a HVDC concept for power collection, transmission and distribution within an offshore wind farm.

The project aims to investigate the feasibility of such a concept and focus on some of the components and sub-systems that would be present in the tower and/or nacelle of each wind turbine. This includes the early development of a hybrid HVDC transformer. The concept addressed by the project offers great potential in terms of adding flexibility and redundancy into an offshore wind farm. This is particularly important for offshore wind farms where access for maintenance operations will be limited. However, perhaps the most notable advantage of this concept is its potential to reduce or even eliminate the need for an offshore substation which is one of the most expensive components in an offshore wind farm system.

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Moixa Technology Ltd (lead) Pulse Power and Measurement Ltd BSF Electronics - Protea Enterprises Limited	Efficient bi-directional DC PSU/inverters for low power distributed energy systems and DC load/supplies	£174,612	£130,750
Project description (provided by applicants)			
The project will develop and prototype an innovative and highly efficient low power (<1kW) hybrid DC power supply (battery charger)/inverter for deployment in distributed energy systems. This technology is needed in order to radically improve the economics and scalability of distributed edge of grid energy storage systems. The technology will extend use PPM's (Tim Crocker) established high frequency power MOSFET expertise that is now being applied to bi-directional AC-DC converters, and Moixa's expertise in system integration and design. Such low power, energy efficient power supply/inverters help enable new markets of small scale mass distributed energy storage systems to be efficient and act as source and sink. It is an enabling technology for DC microgrid, including small scale microgeneration, to interact with the grid scale energy system, as an aggregated resource. Traditionally inverter/battery chargers are high cost and designed for much higher power levels. This project will address both technical innovations in power conversion architecture, and aggressive cost targets for the final design, to develop a small size, low cost, high efficiency inverter/battery charger at the 500W and 1kW scales. Moixa plan to deploy in commercial pilots as a first customer integrated into their MASLOW system.			

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Amantys Limited (lead)	Data mining for power electronics health monitoring	£174,008	£113,000
Project description (provided by applicants)			
The project will use innovative data mining techniques from the pharmaceutical, energy and aerospace industries in collaboration with an embedded data collection system to test the feasibility of detecting long-term changes in the health of operational power electronics systems that are used in high availability applications such as wind turbines, electric locomotives, high voltage transmission and large motor drives. The aim is to improve the availability of these systems to increase the return on the assets at the same time as reducing maintenance and operational costs.			