



### BEIS Energy Storage Cost Reduction Competition – Summary Project Details

- Technology improvement projects;
- 7 projects;
- Total value of grants awarded: £5.2m

Lead Company	Consortium Partners (if applicable)	Project Title	Brief Project Description	Grant Award
Power Migration Partners (trading as StorTera: <a href="http://www.stortera.com">www.stortera.com</a> )	N/A	Thin film flow battery for low cost energy storage	<p>StorTera (Power Migration Partners), was established in 2013 to develop a novel flow battery technology that is low-cost, long-lasting and easily scalable. The result is a polysulfide redox Single Liquid Flow Battery (SLIQ).</p> <p>With the aim of reducing the manufacturing costs of the SLIQ, StorTera has devised three potential routes to cost reduction which, in combination, have the potential to make a significant cost reduction to both the capital and levelized cost of energy storage. In addition to low cost, the SLIQ has high energy density, millisecond response time and +20 year lifetime. The power and energy are independently scalable giving complete flexibility and high efficiency (92%) has been demonstrated by the first demonstrator installed at Inverie on the Knoydart peninsula.</p> <p>StorTera has tested proof of concept models of these elements and are now planning to further develop and demonstrate these novel manufacturing processes in this project. The project team will design, assemble and test the novel components prior to designing a roll to roll manufacturing technique that will be implemented for large scale manufacture of the SLIQ. A modular SLIQ will be assembled and tested to verify the manufacturing process for the new low cost flow battery.</p>	£526,575
ITM Power (Trading) Ltd	N/A	Next generation Electrolysis for Power-to-Gas Energy Storage	<p>Power-to-gas systems using rapid response Polymer Electrolyte Membrane (PEM) electrolysis have the potential to operate at a range of scales, from kW to hundreds of MW size systems. However, whilst PEM electrolysis can enable increased deployment of intermittent renewable generation</p>	£579,046



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			technologies, realising the full benefits will require a significant reduction in capital costs together with increases in performance (hydrogen production rate and pressure) and scale, whilst ensuring high efficiency and safe operation. This project aims to address these cost reduction and performance improvement challenges, by making a step-change in PEM electrolyser technology at the materials, stack and system level, to triple hydrogen production pressure to up to 100 bar, and to double current density to 4 A/cm <sup>2</sup> at base load relative to the current state of the art, whilst maintaining nominal energy consumption below 50kWh/kg hydrogen.	
NiTech Solutions Ltd	University of South Wales;  BPE Design and Support Ltd	Biological Integration of Electricity and Gas Grids for Low Cost Energy Storage (BioGrid)	The interoperability between electricity and gas networks facilitates energy storage on a daily and seasonal basis and storage of electricity via H <sub>2</sub> converted to synthetic methane can deliver this task. Methane can be stored at low cost and can be injected to the gas grid without regulatory restrictions. The proposed project will move a novel biomethanation sub-system capable of converting grid relevant amounts of renewable electricity to carboxylic acids and methane for energy storage, from its existing Technology Readiness Level of 3 (Laboratory Proof of Concept) to at least TRL6 (Verified Prototype System).	£726,680
redT Energy	N/A	Generation 3 Stack Commercialisation	This project will enable redT to accelerate its materials cost reduction programme for its patented vanadium flow machines. Flow machines do not degrade like conventional lead or lithium 'batteries', which contain both power and energy elements together within a cell. Furthermore, redT's technology is fully reusable and therefore does not require expensive end-of-life disposal procedures like	£750,000



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			<p>conventional 'batteries'. The specific project objectives are:</p> <p>(i) To secure significant cost reduction in the redT vanadium flow machine technology; the target cost reduction - including improvements in the stack and electrolyte - is up to 32%.</p> <p>(ii) To identify methods to increase the overall performance with associated increases in the power output and electrolyte density of the machine to further reduce cost per kWh figures as well as its footprint.</p>	
SynchroStor Ltd	University of Edinburgh	Two Phase Pumped Heat Energy Storage with Integrated Generation	<p>Two Phase Pumped Heat Storage (PHS) stores electricity at times when there is over supply of wind or solar at a project cost an order of magnitude cheaper than batteries. PHS differs from previous pumped heat approaches in using unpressurised heat stores, and a two-phase closed-cycle Joule-Brayton machine as the interface between electricity and heat. Compared with previous PHS, this system works at much higher pressures, which significantly improves power density whilst reducing cost. The volume of storage can be chosen independently of the power rating, and PHS stores degrade slowly, meeting diurnal or week-long storage needs. The PHS project will:</p> <p>(i) demonstrate and optimize all aspects of the functionality of the PHS in its first 15 months;</p> <p>(ii) build an 80kW prototype unit validating the overall system in the second half of the project.</p>	£995,241
Cumulus Energy Storage Ltd	N/A	Copper/Zinc Energy Storage Cost Reduction	Cumulus Energy Storage is enabling more renewable electricity to be generated, transmitted across the electricity infrastructure and used by electricity intensive industries.	£704,153



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			This is achieved through designing and manufacturing lowest-cost, grid-scale energy storage batteries using rechargeable Copper/Zinc technology. The aim of this project is to enable further development of several component parts of the Cumulus lowest-cost energy storage system, together with improved battery management, and to accelerate our ability to commercialise this global opportunity more quickly.	
Nissan Motor Manufacturing (UK) Ltd	Inter-national Automotive Research Centre, WMG;  Ametek GB;  Element Energy Ltd	UK Energy Storage Lab	The mission of this project is to reduce the cost of stationary energy storage by opening the UK's first facility for grading and sorting end of life Electric Vehicle (EV) batteries. These modules will then be supplied to manufacturers of stationary storage products. By creating this pilot facility, the expected benefits are a significant reduction of the costs of modules to be used in stationary storage, which could be passed on to the customers creating a more cost-effective solution. A key output of this project will be to create 1MWh worth of energy storage which can be used in stationary storage, with modules taken from the facility, to be combined with solar PV panels. This will serve as a proof of concept which can be scaled to match the needs of small to large enterprises and residential customers with renewable energy solutions.	£907,216