



Project update

Advanced storage to unlock power of renewables

Project details			
Project title	A Facile Method for Storing and Rapid Release of Renewable Energy to an Electrical Grid	Key aims	<ul style="list-style-type: none"> • Develop technologies for storing higher volumes of renewable energy • Tackle the intermittency of renewable energy • Create a new generation of high performance supercapacitors.
Participant	Center for Applied Energy Research, University of Kentucky, USA		
Start date	2007		
Project summary			
<p>A breakthrough in storing renewables energy on high voltage networks is the aim of a project being funded by E.ON's International Research Initiative.</p> <p>Finding a solution would help overcome the intermittent nature of renewables energy, so that off peak generation can be stored and released rapidly to cover demand at peak times.</p> <p>The project was submitted by Dr Stephen Lipka, Principal Investigator in the Center for Applied Energy Research at the University of Kentucky.</p>		<p>It is investigating ways in which one type of a group of storage devices known as 'supercapacitors' could be developed to hold more energy, and charge and discharge faster than the technologies allow at the moment.</p> <p>The electrochemical double-layer capacitor (EDLC) is capable of storing and returning energy at higher rates than most batteries and could exceed the performance of the electrochemical capacitors that are in use at present.</p>	
		<p>The University of Kentucky has been researching and developing EDLC technology for some years. Under the IRI funding it is investigating how two types of carbon material - porous and graphite - could be further developed for electrochemical capacitors.</p> <p>Graphite carbons are being assessed as electrode materials for a new type of electrochemical cell based on lithium-ion. These could achieve an energy density that is three times as high as the electrochemical capacitors now being used.</p>	

Progress report - 1

Activity is under way in all areas of this project with the main focus on the preparation of two types of carbon which are needed to develop the new EDLC supercapacitors.

The project team obtained samples of base materials - known as 'precursors' - to enable the use of porous and graphitic carbon for manufacturing electrodes.

These materials include rayon fiber, coconut shell and graphitic carbon such as anthracite. They were assessed for cost, availability and their likely yields of activated carbon after thermal processing.

Progress made in the research program included the assembly of the furnace and gas flow equipment which will be used to process the rayon fiber precursors. These will be converted later

in the project into activated carbon.

The physical characteristics of this carbonized precursor, and the graphitic carbon, were studied, particularly the size and distribution of carbon particles which is critical to the development of the electrode.

Another furnace was also fabricated for experiments in activating the carbon, with the initial work concentrated on porous carbons. This involved processing the rayon precursor carbon fiber using steam and CO₂.

A key aim of this work was to set guidelines for obtaining the optimized surface area and pore size distribution.

A further aspect of the work covers the selection of electrolytes. A range of commercial products were sourced to test the performance of porous and graphitic carbon and some have been

modified to enhance their charge storage capabilities and electronic conductivity.

The project team also purchased a processing line to fabricate electrodes from porous and graphitic carbon and assemble single and multi-cell supercapacitors. Progress includes identifying which composition of materials appears to work best in the electrodes and fabricating test cells.

Electrochemical screening and testing also began with trials of activated carbon in laboratory-scale cells. A suite of tests is being developed to demonstrate an acceptable level of performance.

➔ www.eon.com/research_initiative