Energy 'super store' aims for speed and power

Project details	
Project title	A New Supercapattery Based Energy Storage System with an Advanced Power Electronic Interface for Intelligent Power Grids
Participants	University of Nottingham, United Kingdom

An emerging electricity storage technology that may provide reserve energy 'on demand' is being accelerated and scaled up through E.ON's International Research Initiative (IRI).

The novel 'supercapattery' – the name is taken from supercapacitor and battery – is thought to have the potential to solve many of the technical challenges involved in storing energy.

This concept combines the fast response time of supercapacitors, and the energy storage capability of batteries, in a device aiming to revolutionize load leveling on power grids.

There may also be smaller-scale opportunities, such as managing the use of electric and hybrid vehicles and balancing the variations in output from renewables sources including wind and solar energy.

The University of Nottingham proposed this project which is led by Professor George Z. Chen of the Department of Chemical and Environmental Engineering, and Professor Greg Asher and Dr. Christian Klumpner of the School of Electrical and Electronic Engineering.

The project aims to demonstrate numerous supercapatteries operating together with a storage capacity of about 1.5kWh.

A second part of the project is to develop an advanced power electronic interface to join the supercapattery to the grid. This would use a power converter to link the supercapattery system, operating on direct current, to the alternating current of the grid.

Additionally, the electronic interface would handle the complexities of the different voltage and frequency levels on the two systems and the connections with the 'intelligent' distribution networks of the future.

In selecting the supercapattery as the storage option, the university has highlighted three key performance factors making it suitable for large-scale grid applications:

- Its potential efficiency is greater than 80 percent
- It can deliver recharge and discharge cycles measured in minutes
- It offers a high energy storage capacity.

The project is designing a scaleable version of the supercapattery for laboratory trials and testing a range of advanced composites, such as for the electricity storage material, and the best layout.

Work related to the electronic interface includes developing a laboratory prototype power converter able to operate with the supercapattery and meet the requirements of the grid system and power quality.

A successful demonstration of the supercapattery would provide a base-level storage cell whose technologies could then be developed at a commercial scale.

These units would be able to handle energy from intermittent and distributed generators, making a substantial contribution to load leveling, with a possible reduction in the reliance on fossil fuels.

In the longer term, the supercapattery could be used universally in stationary and mobile applications, even having a role in the domestic energy market.

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