Smoothing the way to a renewable future

Australian National University / Development of devices for energy conversion and storage based on novel functional materials

Teaser / Summary –

Finding ways to ensure a smooth power output is critical to unlocking the door to renewable energy.

"This sort of technology is crucial to the transition to renewables." ~ Prof Yun Liu.

*One of the big challenges with renewable energy sources is intermittent supply, when we need our energy to be constant. Image: **David Clarke***

What is the technology?

This technology is an energy storage device based on recently invented dielectric materials that have a fast response of less than a second, and can be used at high voltage, up to several thousand volts, and in a very broad temperature range.

They can be integrated into devices such as power filters and inverters to manage power output and electricity distribution which helps deliver high quality power control and a smooth power output when sourcing renewable power.

"This is particularly critical given the growing contribution, but intermittent nature of renewable energy sources," says research team leader, Professor Yun Liu

Achieving the desired smooth, controlled output requires a storage and conversion device that has high power density and high energy storage density, quick charging times and long-term discharging

capability, a high operating voltage and good temperature stability. Current products do not meet all these criteria.

This technology is helping to develop new energy storage and conversion devices to deliver some of the fundamental requirements of renewable energy generation, storage and delivery.

Who is the project team?

This project team comes out of the Australian National University and consists of Professor Yun Liu, Prof Ray Withers, Mr. Teng Lu and another PhD candidate, along with industry partners; Guangdong Fenghua Advanced Technology, China.

What challenge is this research helping to solve?

This technology will lock in power network stability and reliability when drawing energy from sources that are naturally unreliable.

Australia's energy systems were built on a constant stream of energy, and energy stability is what modern day energy consumers expect. Getting energy from the sun or wind is desirable because it is a clean and sustainable energy source, but the power generation capability of these popular renewables varies from nothing to extreme.

"Developing technology that keeps up with this variability and is able to store energy and then deliver it in a smooth, constant output is a critical technical challenge," says Professor Liu.

This project will deliver a device that has high power storage capability, to convert energy from renewable sources and deliver it smoothly, quickly, safely and at a broad temperature range.

The shift to more sustainable energy sources means developing appropriate controls to maintain reliability. Image: Sander Van Dijk

What is the benefit of this technology?

"This sort of technology is crucial to the transition to renewables" says Prof Liu.

It can be used to smooth electricity generation and deliver it for multiple applications in a home, to support new transport technologies and across smart grids.

This technology can be used in a range of scenarios, including as a temporary bridge between abrupt, renewable energy generation and long term energy storage devices to maximise energy availability and reliability.

The introduction of electric powered vehicles brings many benefits, but there are also substantial challenges in powering a vehicle, particularly up a steep route. If this this device is installed on a vehicle, it can ignite the engine and provide a burst of energy – in less than a second - to produce the power needed to propel the car or bus up a hill.

For more information

Visit http://energy.anu.edu.au/

Or contact Igor Skryabin

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