

August 05, 2016 | By Liezel Labios

UC San Diego Part of New DOE Consortium to Revolutionize Electric Car Battery Performance

Researchers at the University of California San Diego are part of the new Battery500 consortium led by Pacific Northwest National Laboratory (PNNL) aiming to almost triple the energy packed in electric car batteries and make them smaller, lighter and less expensive. This would allow manufacturers to make more affordable electric vehicles that can travel two to three times farther.

The consortium will receive up to \$10 million a year over five years from the Department of Energy's Office of Energy and Renewable Energy, the [White House recently announced](#).

"Our goal is to extract every available drop of energy from battery materials, while also producing a high-performance battery that is reliable, safe and less expensive," said consortium director and PNNL materials scientist Jun Liu. "Through our multi-institutional partnership, which includes some of the world's most innovative energy storage leaders, the Battery500 consortium will examine the best options to create the most powerful next-generation lithium batteries for electric cars."

"We are excited to partner with some of the leaders in the battery research community to develop the next generation of battery technologies," said nanoengineering professor Ping Liu, the principal investigator of the UC San Diego team, which is comprised of researchers from the university's [Sustainable Power and Energy Center](#) (SPEC). "We'll be taking advantage of our different areas of expertise to try to reach this project's aggressive goal and timeline."

The Battery500 consortium's goal is to develop lithium batteries with almost triple the "specific energy"—the amount of energy packed into a battery based on its weight—of batteries that power today's electric vehicles. Because electric vehicles need to be lightweight to drive farther on the same charge, batteries with high specific energies are essential.

Specifically, the consortium aims to build a battery cell with a specific energy of 500 watt-hours per kilogram, compared to the 170-200 watt-hours per kilogram in today's typical electric vehicle battery, at a cost of less than \$100 per kilowatt-hour.

The team will design new electrode and cell architectures, pairing lithium metal as the negative electrode with two different materials for the battery's positive electrode. Researchers will redesign batteries to prevent undesired side reactions that weaken a battery's performance.

Researchers at the UC San Diego Sustainable Power and Energy Center will focus on two different, yet complementary efforts. Liu will lead efforts to engineer new battery electrodes that contain less of what he calls "inactive components"—materials that, while necessary for the battery to work, add to the battery's mass and don't help the battery store more energy.

The other effort, led by nanoengineering professor and SPEC director Shirley Meng, will focus on developing materials for the battery's positive electrode that can store more energy. Meng's team at the Laboratory for Energy Storage and Conversion will utilize a fundamental materials science approach to understand the mechanisms of battery materials at the level of single atoms and molecules, and at the interfaces.

UC San Diego is currently budgeted to receive \$3 million over five years.

SPEC is comprised of multiple faculty members with research interests in battery technologies ranging from fundamental science, materials development, device integration, to testing and evaluation. The Center's focus of leveraging scientific advancement to develop technological innovations resonates well with the mission of the consortium.

A key focus of the consortium is to ensure that the technological solutions it develops meet the needs of car and battery manufacturers. During the project's timeline, consortium members will work with industrial partners to implement innovations.

Consortium partners include the following:

- Pacific Northwest National Laboratory (research partner and advisory board member)
- Brookhaven National Laboratory
- Idaho National Laboratory
- SLAC National Accelerator Laboratory
- Binghamton University (State University of New York)
- Stanford University (research partner and advisory board member)
- University of California San Diego
- University of Texas at Austin
- University of Washington

- IBM (advisory board member)
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