Novel battery system could reduce buildings' electric bills

May 8 2012

The CUNY Energy Institute, which has been developing innovative low-cost batteries that are safe, non-toxic, and reliable with fast discharge rates and high energy densities, announced that it has built an operating prototype zinc anode battery system. The Institute said large-scale commercialization of the battery would start later this year.

Zinc anode batteries offer an environmentally friendlier and less costly alternative to nickel cadmium batteries. In the longer term, they also could replace lead-acid batteries at the lower cost end of the market. However, the challenge of dendrite formation associated with zinc had to be addressed. Dendrites are crystalline structures that cause batteries to short out.

To prevent dendrite build-up, CUNY researchers developed a flow-assisted zinc anode battery with a sophisticated advanced battery management system (BMS) that controls the charge/discharge protocol. To demonstrate the new technology and its applications, which range from peak electricity demand reduction to grid-scale energy storage, they have assembled a 36 kilowatt-hour rechargeable battery system.

The system, housed in the basement of Steinman Hall on The City College of New York campus, consists of 36 individual one kWh nickel-zinc flow-assisted cells strung together and operated by the BMS. In peak electricity demand reduction, batteries charge during low usage periods, i.e. overnight, and discharge during peak-demand periods when surcharges for power usage are very high.

"This is affordable, rechargeable electricity storage made from cheap, non-toxic materials that are inherently safe," said Dr. Sanjoy Banerjee, director of the CUNY Energy Institute and distinguished professor of engineering in CCNY's Grove School of Engineering. "The entire Energy Institute has worked on these batteries – stacking electrodes, mounting terminals, connecting to the inverters – and they are going to be a game changer for the electric grid."

The batteries are designed for more than 5,000 – 10,000 charge cycles and a useful life exceeding ten years. The demonstration system is being expanded currently to 100 kWh, with another 200 kWh to be installed later this year. At that point, it will be capable of meeting more than 30 percent of Steinman Hall's peak-demand power needs, yielding savings of $6,000 or more per month.

Professor Banerjee sees initial applications for the batteries in industrial facilities and large, commercial properties. The nickel-cadmium (Ni-Cd) batteries that would be initially replaced are used in applications that range from backup power for server farmers to very large starter motors. Other large-scale Ni-Cd applications include grid support, like a system in Alaska that deploys a 45 MW Ni-Cd battery array.

The CUNY Energy Institute's zinc anode battery system can be produced for a cost in the $300 - $500 per kWh range, which for many applications has a three to five-year payback period. The cost is being rapidly reduced and is expected to reach $200 kWh with a year.

To commercialize the batteries, researchers plan to have a company operational by fall 2012 with the goal of breaking even within two years, Professor Banerjee said. The company will probably set up its pilot manufacturing facility in close proximity to City College, he added.

More information: www.cuny.edu/site/energy.html

Provided by City College of New York