US companies lead charge to unleash the potential of the battery for grid energy storage

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Hurricane Sandy's recent demonstration of our reliance on steady and reliable power production to run almost every aspect of our lives has brought into sharp focus our urgent need to find back-up solutions.

Step forward the humble battery which, in new and fascinating guises, is beginning to find its place as the backroom back-up that will keep our power flowing.

The current edition of Energy Quarterly, published as a special section of the November 2012 *MRS Bulletin*, takes a long hard look at the battery, detailing both its potentials and its problems, in particular for energy storage in the electrical grid.

With more than 99 per cent of energy storage on the US national grid requiring huge sites where water can be pumped into elevated reservoirs and then flowed through electricity-generating turbines, batteries – portable, modular and easy to install – are increasingly attractive for grid storage.

Batteries are ideal for injecting short bursts of power into the grid that smooth variations in alternating current frequency. Batteries are good for such applications because they can quickly release energy and cycle hundreds of times daily with low energy loss.

Battery storage can quickly inject the precise amount of power the grid needs, absorb excess energy on the grid, provide reserves without a minimum generation requirement, and be sited anywhere. They have no emissions and use little water.

The Electric Power Research Institute (EPRI) is trying to develop industry standards for grid battery storage, which should make it easier for utilities to install battery systems in the future. The race is now on to develop new and innovative battery chemistries:

- Boston-based Pellion is working on magnesium-ion batteries
- General Electric has opened a factory to make a new battery based on two-decades-old nickel-sodium-chloride chemistry
- Pittsburgh-based Aquion Energy is close to starting large-scale manufacture of sodium-ion batteries
- Axion Power from Delaware is combining lead-acid battery chemistry with electrochemical capacitors to create hybrid devices that quickly absorb and release charge
- Even flow batteries, a decades-old technology, are seeing a comeback

As to the drawbacks of batteries, cost and lack of experience are the biggest hurdles to widespread use of battery storage. However, technologies are improving as newer chemistries become available, bringing down costs. And battery technology is expected to follow the path of wind and solar energy, with costs going down and confidence in usage increasing with experience.

It all adds up to a bright future for the battery and for power use in the American home.

Energy Quarterly (EQ) is a special section published in the Materials

Research Society's *MRS Bulletin*. EQ is dedicated to the challenges facing materials scientists in the quest for sustainable solutions to the world's energy problems and is aimed at both experienced researchers and the general reader.

The current edition also contains an interview with Ellen Williams, the new Chief Scientist for BP, as well as articles on the supercapacitor.

More information: EQ is available free to all online at the MRS Bulletin website. Read the full article on battery power at: www.mrs.org/energy-quarterly

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