Low-cost energy storage for the smart grid: 100kW facility in operation in New York City, scaled to 200kWh by July 2013

New battery technology developed by the City University of New York and exclusively commercialized by Urban Electric Power

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New York City – A new highly efficient, low-cost commercial battery technology for the smart power grid is currently being powered up as a 100kW sub-system on the campus of the City College of New York. This is the first stage of a 100kW/200kWh system to be completed by the end of July 2013. The technology was developed by the CUNY Energy Institute with support from the Department of Energy, NYSERDA, and Con Edison and has been exclusively licensed to Urban Electric Power (UEP) for electricity storage and management. For over a year, this technology has been in operation as a 30kWh lab demonstration for peak shaving.

Cost-competitive grid-scale energy storage (for peak shaving, renewables firming, and transmission and distribution deferral) requires batteries with much lower lifetime costs per kWh than has been previously available. For the past ten years, researchers have worked to develop new battery technologies that can compete in these markets. Urban Electric Power's zinc anode battery technology is the first of these to transfer from the lab to market. UEP's new GreenCat zinc-nickel oxide (Zn-NiO) rechargeable battery systems are able to meet these ambitious cost targets because they are capable of achieving many more cycles than previous generations of zinc anode batteries. Urban Electric Power's advanced zinc anode batteries provide performance similar to a lithium ion battery for the price of a conventional lead acid battery per delivered kWh. These novel zinc anode batteries are safe, non-toxic, and 100% recyclable and operate without capacity loss for many years. They do not require special handling or cooling equipment.

UEP is commercializing two low-cost, long life zinc anode battery technologies for multiple applications at both large and small scales

Urban Electric Power has exclusive rights to two novel zinc anode rechargeable battery technologies that were developed by the CUNY Energy Institute under the leadership of distinguished professor of chemical engineering, Sanjoy Banerjee, PhD, with support from the Department of Energy, NYSERDA, and Con Edison. Both battery types contain zinc anodes but have different cathodes (nickel oxide or manganese dioxide). Zinc anode batteries were invented over 100 years ago and are trusted for their safety, reliability, and high energy density. Previous generations of zinc anode batteries have been limited to 300-500 cycles, making them too expensive and inadequate for most important applications. The patent-pending innovations developed at the CUNY Energy Institute have enabled UEP's zinc anode batteries to attain significantly longer lives.

Flow-assisted battery technology

The GreenCat Power batteries operating in UEP's 100kW peak shaving system utilize zinc-nickel oxide flow-assisted technology. The addition of flowing electrolyte prevents the zinc dendrite growth and electrode deformation that have led to premature battery failure in the past. UEP's flow-assisted batteries with high-quality nickel oxide cathodes are able to recharge for over 5,000 deep cycles while retaining more than 80% of their capacity. These

Zn-NiO batteries are appropriate for peak shaving, peak shifting, power protection, forklift operations, and solar and wind firming.

Ultra low-cost zinc-manganese dioxide technology

UEP's next generation GreenCat battery product uses a much less expensive manganese dioxide cathode that lowers the battery price to under $100/kWh with stable performance for over 2000 cycles. The Department of Energy's Advanced Research Projects Agency-Energy (ARPA-E) supported the zinc-manganese dioxide (Zn-MnO2) research at the CUNY Energy Institute as part of the Grid-Scale Rampable Intermittent Dispatchable Storage (GRIDS) program. $100/kWh is DOE's cost target to unlock the market for grid-scale energy storage. At this price, UEP batteries can also compete with lead acid batteries for uninterruptible power supply (UPS) applications and automotive starting, lighting, and ignition—the largest existing rechargeable battery market. Urban Electric Power is currently looking for strategic partners to expand commercial adoption and licensing of both technologies.

Leveling out energy demand and reducing the cost of peak electricity

Urban Electric Power's battery technology delivers low-cost energy storage that reduces the delivered price of electricity for multiple markets, solving the problem that electricity supply and demand are not coupled in real time. Energy is often needed at times and places where it cannot be generated. Building the transmission and distribution infrastructure to deliver electricity is expensive and time-consuming, making reliable electricity very expensive in some areas.

For peak shaving customers in urban distribution areas, UEP's GreenCat Power battery systems are able to distribute electricity demand throughout the day to reduce demand charges, which can make up half of the cost of energy bills in congested areas. In peak shifting applications, UEP batteries are charged using lower cost off-peak electricity and set to release electricity when retail rates are higher. UEP batteries are able to back up intermittent renewable sources to smooth out generation throughout the day, preventing grid instability and voltage sags. As well, the technology can serve the large industrial uninterruptible power supply (UPS) market.

About Urban Electric Power

Urban Electric Power (UEP) is a Limited Liability Company operating in New York. The company ownership is held by the inventors of the technology at the City University of New York (CUNY), the company officers and employees, and selected private investors. UEP has exclusive rights to the rechargeable zinc anode electricity storage technology invented and demonstrated at the CUNY Energy Institute.

UEP's first product—the GreenCat Power batteries used in the 100kW system—is based on the zinc-nickel oxide (Zn-NiO) flow-assisted battery technology developed at the CUNY Energy Institute. These batteries offer a combination of extremely long cycle life (over 5,000 cycles) at high charge and discharge rates that can access the full battery capacity in less than an hour. At the 50-200kWh scale, Urban Electric Power battery systems are suitable for applications in peak demand charge reduction, peak shifting, and industrial UPS. The first generation power systems are being introduced commercially for delivery in January 2014.

The company's second GreenCat product is based on the ultra-low cost zinc-manganese dioxide rechargeable batteries developed by the CUNY Energy Institute with funding from DOE ARPA-E. For under $100/kWh and lifetimes of over 2,000 cycles, these batteries will be an environmentally friendly, lighter, lower cost, higher performance replacement for lead acid batteries in starting, lighting and ignition (SLI) motor vehicle applications as well as UPS and large scale energy storage applications.

GreenCat batteries are an exclusive product of Urban Electric Power.

More information is available at the UEP website: http://www.urbanelectricpower.com

About the CUNY Energy Institute

The CUNY Energy Institute was formed in 2008 to broaden the scope of the existing Clean Fuels Institute. Headquartered at the historic City College of New York, the CUNY Energy Institute benefits from the resources of all the City University of New York campuses. A multidisciplinary team of prestigious faculty from various scientific and engineering fields, as well as industry experts, the CUNY Energy Institute seeks to advance our fundamental understanding of energy. We attract a diverse body of undergraduate and graduate students, who are able to perform cutting edge energy research with world-class faculty. Our main areas of focus are energy storage, nuclear science, and oil and gas research. The CUNY Energy Institute employees over 30 researchers and engineers.

More information is available at: http://www.cuny.edu/site/energy.html

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