



CUNY ENERGY INSTITUTE

FLOW-ASSISTED ZINC ANODE BATTERIES FOR GRID-SCALE ELECTRICITY STORAGE



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MNO₂-ZN BATTERY COST ~\$100KWH

The CUNY EI is improving the cycle life of a proven chemistry through advanced materials characterization and novel control strategies

Rechargeable Alkaline Battery

Pasted Zn: control dendrites
Pasted MnO₂: make rechargeable

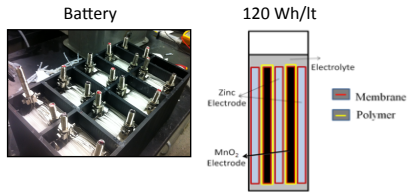
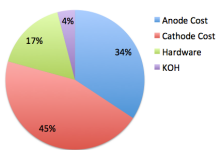
Advantages

Low-cost, Safe, non-toxic
Easy to fabricate and recycle
Modular

Innovations

Membrane
Polymer
Electrode composition
Operations

<\$100/kWh



ZN-MNO₂ BATTERY PERFORMANCE

Performances

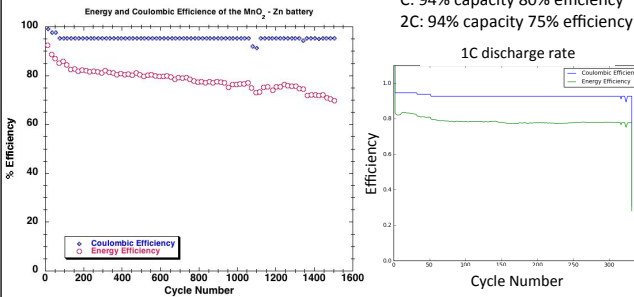
> 5 times the cycle life of a Pb-Acid battery
< 1/4 \$/kWh cost of a Pb-Acid battery
< 1/16 \$/kWh cost of a Pb-Acid battery

Progress

Sept 2011: 700 cycles
Feb 2012: 950 cycles
August 2012: 1500 cycles

C-Rating Performances

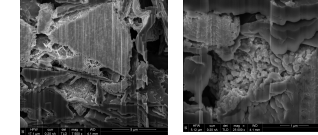
C: 94% capacity 80% efficiency
2C: 94% capacity 75% efficiency



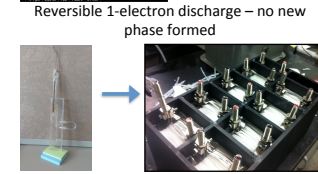
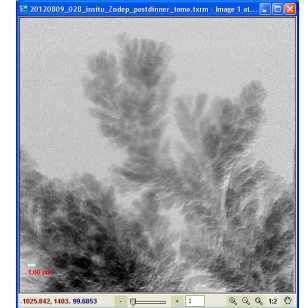
MNO₂-ZN CHARACTERIZATION

Operations and materials are improved through advanced in-situ characterization in collaboration with Brookhaven National Lab

Pasted MnO₂: Phase control, Material structure, binder



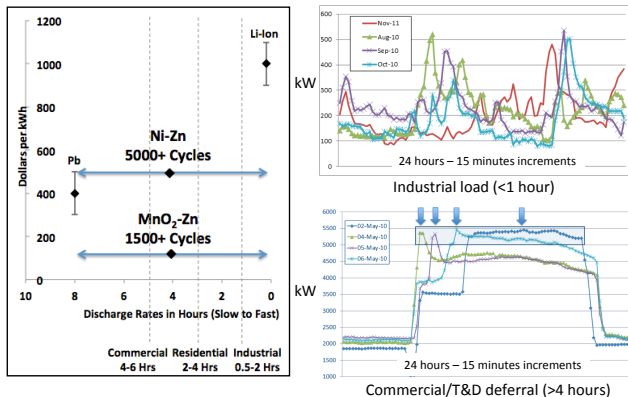
Pasted Zn: Dendrite Control, separator



In-Situ Full scale Zn-Metal deposition

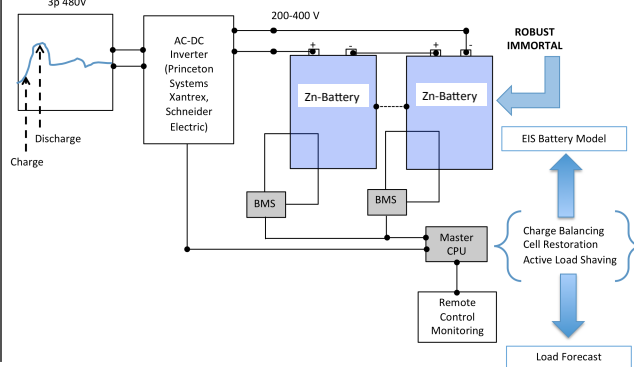
GRID APPLICATIONS (100KWH – 500MWH)

MnO₂-Zn technology meets the discharge requirements of grid-scale applications

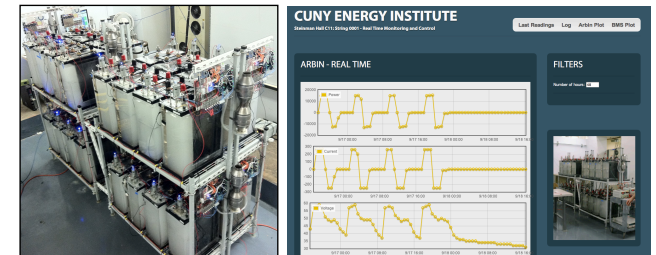


GRID-CONNECTED SYSTEM

The CUNY EI is developing and testing hardware/software systems for peak shaving applications in commercial and industrial buildings



30KWH DEMONSTRATION



30kWh Ni-Zn Battery System demonstrates urban demand charge reduction at a CUNY Energy Institute

100+ Cycles
> 90% Coulombic Efficiency
> 80% Energy Efficiency

Ni-Zn will be integrated with MnO₂-Zn in 2013

Commercialized by Urban Electric Power <http://string0001.uepinc.com>