

ZINC/BROMINE BATTERY DEVELOPMENT — PHASE II

Exxon Research and Engineering Company, Box 8, Linden, NJ 07036 (U.S.A.)

The objective of this project was to develop the core technology for a bipolar zinc/bromine flow battery that could eventually be adapted to various advanced battery applications. System scale-up to 20 kW h for 50 cycles was the demonstration target.

Exxon Research and Engineering has been developing bipolar zinc/bromine flow battery technology for several years on its own funds. This Phase II program was cost-shared with DOE and continues an earlier Phase I program. During Phase II, the system was scaled up to an 80-V, 20-kW h design and cycled to 70 plus cycles using 600-cm² electrodes. Life cycling on automatic parametric testing stations (500-W h, eight-cell bipolar stacks) extended demonstrated life from 150 deep cycles to over 400 deep cycles and 1400 shallow cycles. A simplified two-piece (co-extruded electrode and integral separator/flow frame) cell construction was demonstrated, which is capable of low cost mass manufacturing using existing commercial plastic fabrication techniques. High conductivity supported electrolytes that both improved efficiency for bulk energy storage and produce more power on electric vehicle cycle (J227aD) simulations were demonstrated. Finally, the next generation of components, 1200-cm² electrodes of the two-piece construction, were designed to use the high conductivity electrolytes and the recent concepts in 'tunnel shunt current protection'.

All Phase II tasks are complete. Future work will continue under Phase III.

ZINC/BROMINE BATTERY DEVELOPMENT — PHASE III

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The objective of this project is to develop the core technology for a bipolar zinc/bromine flow battery that could eventually be adapted to various advanced battery applications. A 20-kW h battery, designed for stationary domestic photovoltaic applications, is a deliverable.

This cost-shared contract will culminate previous development work in Phases I and II by optimizing the design concepts into a final 20-kW h deliverable demonstrator battery. The first 20-kW h battery from Phase II has been extended to over 135 cycles. Parametric studies (500-kW h, eight-