

PROJECT FACTS

UNIVERSITY OF KENTUCKY CENTER FOR APPLIED ENERGY RESEARCH

ELECTROCHEMICAL POWER SOURCES

Redox Flow Batteries for Grid Energy Storage

Redox flow batteries are a class of energy storage devices suitable for stationary energy storage applications. Advantages of flow batteries include rapid response times, moderate cost, modularity, low maintenance, and flexible operation. One important feature of flow batteries is the ability to independently maximize the capacity or power capability of the system. The system capacity is dictated by ion concentration and electrolyte volume, while system power is controlled by electrode size and number of cell stacks. The all vanadium redox flow battery (VRB) is the most highly developed and characterized flow battery system currently in use, and several demonstration units are currently installed worldwide. The primary disadvantages of VRB technology are related to toxicity and cost of various cell components. Flow battery research efforts at UK-CAER are developing lower-cost, less toxic redox chemistries based on aqueous manganese or iron redox couples with suitable energy and power densities for grid energy storage. New, highly conductive carbon electrode materials are also under development, using carbon nanospheres synthesized by hydrothermal synthesis from carbohydrate precursors.

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