

# **Energy Storage Handbook For T&D Applications: A Standardized Approach**

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## **ABSTRACT**

EPRI is developing an Energy Storage Handbook for T&D Applications with co-sponsorship and participation from DOE. The initial edition of the Handbook will be issued by the end of 2003 and update/expansions will be issued periodically thereafter. The purpose of the Handbook is to provide a National perspective on the benefits of grid-interactive energy storage in general and an objective information resource on the major, near-term energy storage systems and their respective benefit-cost assessments for leading opportunity T&D applications. The Handbook will communicate the business case for electrical energy storage at the corporate and policy levels within industry and government, respectively, and will guide utilities for screening candidate storage systems for representative opportunity applications as well as provide a basis for formulating site-specific assessments to support related deployment decisions

The broad categories of such applications include: Grid Stabilization, Grid Operation Support, Distribution Power Quality and Load Shifting. Grid Stabilization includes Rotor Angle Stability, Voltage Stability and Frequency Excursion Suppression. Grid Operation Support includes Regulation Control and Spinning Reserves. Distribution Power Quality includes a short (seconds) duration and a long (hours) duration application. Likewise, Load Shifting includes a short (3 hours) and a long (10 hours) duration application. These individual applications are described with emphasis on the grid phenomena being addressed and the role of stored energy to support the grid, such as the mitigation of T&D congestion or the improved utilization of T&D resources. Characterizing parameters needed to evaluate the application and perform a quantitative benefit-cost assessments are presented. Also addressed are select storage applications where attractive economics depend on a combination of different benefits.

For this initial Handbook, the following energy storage systems are included: lead-acid, nickel-cadmium, and sodium-sulfur modular batteries; zinc-bromine, vanadium redox, and sodium polysulfide-sodium bromide flow batteries; superconducting magnetic energy storage; flywheels; ultracapacitors; and compressed air energy storage. A dedicated chapter for each system addresses the technology description and status, the applicability to the respective individual and combined applications plus the resultant benefit-cost assessments for the applications with promising economic potential. Key to the success and value of the Handbook is a standardized approach to application definition plus the benefits and costs estimation methodology.

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