ACCELERATED BATTERY TESTING STUDY

Battelle, Columbus, 505 King Avenue, Columbus, OH 43201 (U.S.A.)

The objective is to develop testing procedures to accelerate aging of electrochemical cells intended for solar applications, so that cycle life data can be acquired in less time. The cells of interest initially for base line information are lead–acid, both vented and sealed, and for both shallow and deep discharge applications.

There is a need to develop testing procedures to accelerate aging of electrochemical cells so that cycle life data can be acquired in less time than real time testing. The initial emphasis has been on lead–acid-type batteries. A literature review and manufacturers survey was conducted to identify the status of accelerated testing and published information pertinent to battery life.

The principles of accelerated testing are reviewed in the final report with reference to lead–acid batteries. Preliminary experimental designs for accelerated testing of batteries for solar applications are discussed with reference to current laboratory tests at SNL covering minimal factorial design, the team approach to generally accepted accelerated test designs, and a suggested new approach to accelerated testing with minimal failures.

This contract was completed in December 1981.

Recent publications

1 J. E. Clifford and R. E. Thomas, Study of battery accelerated testing techniques, *SAND82-7049*, Battelle Columbus Laboratories, April 1982.

SYSTEM PERFORMANCE AND ECONOMIC ANALYSIS OF WIND POWERED GENERATORS WITH BATTERY STORAGE (PHASE I)

Hawaii Natural Energy Institute (HNEI), a research institute of the University of Hawaii

The objective is to complete the Phase I preliminary battery/wind turbine system feasibility study. This study will attempt to determine the value of batteries to a small utility network that may have a high penetration of its generating capacity supplied by wind turbines.

A 60-ft tower was erected and instrumented for wind data collection in October 1981 and has been in operation since then. This tower is located on Molokai, in one of the candidate wind turbine locations. Also, turbine, battery, and utility interface equipment data and specifications have been obtained in order to make preliminary selections and for use in a computer model. A simulation code has been developed and is being used to evaluate the value of batteries in various system configurations. Initial results indicate that large batteries (greater than 1000 kW h) do not provide sufficient benefit to justify their cost, but a small battery may be very useful to maintain utility network stability and to reduce peak generating requirements.

Phase II, a 1-yr project, will begin in September 1982 and involves a final system evaluation using the computer model developed in Phase I. A utility-oriented battery system will be evaluated, rather than a site-specific battery/turbine system. Using the optimum system configuration from the modeling work, a blueprint design with complete component specifications will be done by an engineering design subcontractor. A go/no-go decision will be made near the end of Phase II regarding the feasibility of Phase III, system construction and operation.

ROCKY FLATS STAND-ALONE WIND/BATTERY EXPERIMENT

Rockwell International, Rocky Flats Plant

The objective is to set up and operate a small turbine with a conventional lead–acid battery in a stand-alone mode. The experiment is expected to permit battery performance and life evaluation in a controlled and instrumented environment. Data from the experiment may permit battery optimization for this application.

A 26-kW h Exide lead–acid battery was purchased after competitive bidding and delivered to SNL prior to being shipped to Rocky Flats. The battery was damaged in shipment, and several months were required to complete the repairs. The battery was shipped to Rocky Flats in late June 1982. It will be instrumented and wired to the test equipment during the summer. A north wind 2-kW d.c. wind turbine is in place and available for use in the experiment. Test startup is planned for September 1982.

The experiment will be operated for 1 yr following startup. Data will be collected and evaluated continuously. Experiment parameters will be adjusted to optimize battery use. If conditions warrant, a second battery (possibly a sealed lead–acid type) will be purchased and readied for use in the experiment starting in early 1984.