

AN ASSESSMENT OF BATTERY SYSTEMS SUITABLE FOR USE IN PHOTOVOLTAIC SYSTEMS

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The objective of this study is to compile an up-to-date comprehensive data base for research, design, and development of photovoltaic systems, primarily in the areas of applications and battery technology, and secondarily in the area of power conditioning technology. The study will compile and organize systematically the available data on existing and potential terrestrial photovoltaic applications, with particular emphasis on those for which battery storage is appropriate for remote, residential, commercial/institutional, industrial/utility, agricultural and military applications. For each end-use area a scenario will be developed in which the most cost-competitive battery system will be selected and the R&D needed for these systems will be determined.

These objectives will be accomplished by the following tasks:

Development of a data base on batteries; development of a data base on power conditioning equipment; development of a data base on solar arrays; development of end-use characteristics; interfacing of battery systems, array and power conditioning equipment; cost analysis of battery systems; analysis of cost competitiveness of battery systems; identification of R&D needs and selection of battery systems; preparation of the final report; project management.

The completion of the above ten tasks is planned for November 1980.

Accomplishments/status - June 1979

The first four tasks together with the project management have already been started. Literature search has almost been completed. Battery, array and power conditioning equipment manufacturers have been contacted to obtain published brochures and other pertinent data. Specifics of the end-use areas have also been determined.

BATTERIES FOR SPECIFIC SOLAR APPLICATIONS

Sandia Laboratories, Albuquerque, NM 87185 (U.S.A.)

This program consists of a multitask effort to: (1) conduct detailed system analyses to define battery requirements for photovoltaic system applications; (2) conduct laboratory and photovoltaic systems tests to verify

battery requirements analysis; (3) survey current secondary battery state-of-art; (4) identify significant differences between battery requirements and existing technology; (5) support the necessary research and development required to rectify these differences; (6) develop the resulting technology so that cost effective photovoltaic systems incorporating battery energy storage are viable.

(1) A generalized Sandia Computer Code, SOLSTOR, has been used to simulate various residential system studies to determine the optimum array, battery storage and auxiliaries under various assumptions. Work is directed towards bounding the scope of initial study areas by comparing the economics of a PV residential system to a utility fed residential system.

(2) The "reasonableness" of the simulation studies has been checked by using input assumptions of two recent DOE funded studies. The results were compatible.

(3) Studies to date have indicated that various factors such as tax rates, tax credits, and escalation rates of alternative energy affect the timing of the economic viability. Other factors such as component cost and performance affect the sizing. Important parameters that affect the system viability are the sell back ratio and time-of-day rate schedule of the utility. Increasing the sell back decreases the storage feasibility; while increasing the time-of-day ratio increases the feasibility.

(4) A linear programming effort is in the debugging stages. An exact solution of the system configuration will be possible, and the best operating strategy to use to minimize the overall energy costs will be determined.

(5) Preliminary designs for a battery test laboratory have been completed. Portions of the data acquisition system have been ordered.

(6) A full state-of-art lead-acid battery has been sized for system studies at the Photovoltaic System Definition Project Facility. This facility will be used in a cooperative manner to test arrays, balance of system components, and batteries.

(7) Contact has been established with NASA/Lewis, MIT/LL and MERADCOM regarding PV application experiments that can serve as inputs to load profiling and battery technology requirements.

HANDBOOK FOR BATTERY ENERGY STORAGE IN PHOTOVOLTAIC POWER SYSTEMS

Bechtel National, Inc., San Francisco, CA 94119 (U.S.A.)

The objective of this contract is to provide a concise source of information on batteries, both existing and developmental, that can be used by designers of photovoltaic systems. The emphasis is to be on that information required successfully to interface the battery with the power system. The