The report (186 pages) is mainly intended to provide those engaged in the solar-energy industry, as well as other users, with information and components that are encountered in the production of cost-effective solar-energy systems for heating and cooling, which involves to a great extent, components such as heat pumps, air-conditioner machines, controls, etc., that are used in conventional heating, ventilating and air-conditioning (HVAC) systems.

The report is divided into three parts: Plan, Paths and Tasks. Part 1 of the report (the Executive Summary and Sections I and II) gives the overall view of the program plan.

The second part is focussed on several approaches, called paths, (a path is simply the linking of a method of energy collection or rejection with a particular application), to the application of solar energy. This part of the report is divided into two sections: Section III for the solar energy heating and cooling buildings, and Section V for agricultural and industrial process applications. Section III describes ten such paths: (a) service hot water (2 paths); flat-plate liquid-heating collectors and flat-plate air-heating collectors; (b) space heating (4 paths), direct solar heating, solar-assisted heat pump, flat-plate air-heating collectors, and flat-plate liquid-heating collectors; and (c) space cooling (4 paths), evaporative cooling, night sky radiation, or cool night air without energy conditioning equipment; concentrating collectors with absorption or vapor compression chiller (operating at moderate temperatures); and flat-plate collectors with dessiccant machines for air-conditioning or dehumidification. These ten paths differ in character; some require an emphasis on materials development, some on system analysis and some on component development and testing. In Section IV, there is just a list and very brief discussion of eleven paths for agricultural and industrial process applications, but without describing them in detail.

The third part of the report (4 appendices) present detailed information on the specific tasks that should be undertaken to move along any of the paths, whether in series or in parallel. Appendix A gives flow diagrams for the heating and cooling tasks. Appendix B includes brief descriptions of these tasks and of the non-engineering tasks. Approximately 275 tasks are identified and divided into five categories: solar collectors, thermal storage and heat exchange, solar air-conditioning and heat pumps, systems and controls, and non-engineering aspects. The importance of each task to a given path is indicated by a number, and the tasks for each path are placed in functional categories and arranged in sequence, giving each path a logical development. Appendix C lists the importance number for all of the solar heating and cooling engineering, while Appendix D indicates the importance and priority of each non-engineering task to the overall R & D program. The report emphasizes that the solar heating and cooling 10 paths for buildings applications are to be cost effective if key problems can be solved. However, the report is calling for both information dissemination and component development.

A-M. R. Rezk

Stanley F. Gilman (Coordinator and Editor), **Solar Energy Heat Pump Systems for Heating and Cooling Buildings.** ERDA Doc. COO-2560-1, Con. 7506130. The Pennsylvania State University (June 1975).

This document (248 pages) is the proceedings of a workshop on solar-energy heat-pump systems for heating and cooling of buildings, conducted by the Pennsylvania State University College of Engineering, June 1975, and financed by U.S. Energy Research and Development Administration (ERDA). The theme of the workshop is mainly exchange of information and ideas on solar heat-pump systems, designs, applications, equipment and performance characteristics. The document also shows public-utility view points on the potential of heat-pump systems, federal programs and future research and development needs.

The proceedings contain 32 papers complete with their discussions and working group session reports, grouped in 6 parts. Part 1 has 5 papers on the descriptions and discussions of recent solar energy heat-pump systems. Part II (7 papers) concerns evaluation of a solar building, design philosophy of a residential system, closed-loop system for moderate size commercial building, a turbo-compressor air-conditioning system and a Rankine-cycle vapour-compression (RC-VC) heat pump, featuring pivoting-tip vanes.

In part III, 4 papers deal with compound systems: solar boosted and cascaded heat pumps, solar augmented air-to-air systems, and systems utilizing combined solar-energy and internal heat sources. Another 3 papers present a comparison of systems for a proposed building, installations in cold climates, and energy use analysis and residential construction techniques.

Part IV contains 7 papers about various heat-pump systems, e.g. solar systems in a commercial building, water-source and air-to-air systems, heating and cooling systems, large built-up systems, and engine-driven heat pumps. Part V is a group of 6 papers, half of them are studies of residential solar heat-pump design, solar steam-turbine driven heat pump, and analytical comparison of systems. The other 3 papers are about analytical evaluation of the impact of electric heating loads on utility operation, energy availability and the electric utility view point, and probable future researches and development.

The last part presents brief reports of the working-group sessions; Group A reporting on heat-pump fluids and machine interactions, Group B on heat pump and collector interaction, Group C on heat and storage system interaction, and Group D on system modelling.

It will be apparent that these 32 papers with their discussions and the enormous lists of references gathered in this document will be of use to researchers, consulting engineers, manufacturers and public utility representatives when concerned with design, equipment selection and optimum models of operation of a solar heat-pump system for heating and cooling of a building.

A-M. A. Rezk

A. A. M. Sayigh (Editor), **Solar Energy Engineering.** Academic Press, New York (1977), 506 pp.

This book by a panel of 18 international contributors from eight different countries, is concerned with research and development into utilizing solar energy. As the editor has recognised the insufficiency of texts for scientists and engineers on solar energy, he based his selection of contributors and topics so as to provide ample information on all forms and topics of solar energy, thus making the book in the general form to serve as an international text book as well as a work of reference.

The wide range of topics, scope and authority of this book can be sufficiently indicated by the following list of contents: the sun and celestial vault by Enrico Coffari; solar irradiance, total and spectral by Thekaekara; solar energy availability prediction from climatological data by Sayigh; heat transfer for solar-energy utilization by Sabbagh; liquid-flat-plate collectors, and convective heat-transfer effects within honeycomb structures for collectors by Charters; solar air-heaters and their applications by Kudret; concentrating collectors by Meinel; solar pond by Savage; solar furnaces by Takemaro; photovoltaic conversion and application of solar energy in space by Backus;