These volumes bring together, from all over the world, papers from specialists working in all the diverse forms of energy derived from the sun. Experts in all fields of research in solar and renewable energy have also contributed an added feature: the latest research and developments in related areas such as wind energy, biomass, photovoltaics and energy conversion. Emphasis is placed on the many solutions solar and renewable energy offers to the global energy problem, and the different ways of combining solar and renewable energy to solve these problems. The work should stimulate readers to consider the broader horizons of renewable energy, energy conservation and the impact of new technologies on society from the small remote village to the modern metropolis.

A complete overview of solar technologies relevant to the built environment, including solar thermal energy for heating and cooling, passive solar energy for daylighting and heating supply, and photovoltaics for electricity production. Provides practical examples and calculations to enable component and system simulation e.g. Calculation of U-values, I-V curve parameters and radiance distribution modelling. Discusses the new trends in thermal energy use, including the architectural integration of collector systems, integrated ventilation photovoltaics facades and solar powered absorption cooling systems. Coverage of cutting-edge applications such as active and passive cooling techniques and results from ongoing research projects.

Solar thermal is now a proven technology in terms of reliability, cost-benefit, and low environmental impact. The integration of solar thermal systems and installations into the design of buildings can provide a clean, efficient and sustainable low-energy solution for heating and cooling, whilst, taken in a wider context, contributing to climate protection. This book covers the state of the art in the application of solar thermal technologies for buildings. This is the first book in the BEST (Buildings, Energy and Solar Technology) Series. This series presents high-quality theoretical and application-oriented material on solar energy and energy-efficient technologies. Leading international experts cover the strategies and technologies that form the basis of high-performance, sustainable buildings, crucial to enhancing our built and urban environment.
New buildings can be designed to be solar oriented, naturally heated and cooled, naturally lit and ventilated, and made with renewable, sustainable materials—no matter the location or climate. In this comprehensive overview of passive solar design, two of America’s solar pioneers give homeowners, architects, designers, and builders the keys to successfully harnessing the sun and maximizing climate resources for heating, cooling, ventilation, and daylighting. Bainbridge and Haggard draw upon examples from their own experiences, as well as those of others, of more than three decades to offer both overarching principles as well as the details and formulas needed to successfully design a more comfortable, healthy, and secure place in which to live, laugh, dance, and be comfortable. Even if the power goes off. Passive Solar Architecture also discusses “greener” and more-sustainable building materials and how to use them, and explores the historical roots of green design that have made possible buildings that produce more energy and other resources than they use.

The International Energy Agency's Task 13 is to advance solar building technologies. As part of that programme, 15 houses in 12 countries have been built to test new technologies and strategies for achieving low energy demand while maintaining a good indoor climate. The principal strategies used and evaluated are: minimization of heat losses, profiting from passive solar and internal gains, heating with an active solar system, heating with recovered heat and providing auxiliary heat efficiently. For each house, this work provides a list of energy features incorporated, an analysis of energy demand, a floor plan, and a description of methods of construction. The houses range from apartment blocks to detached and terraced housing. Local weather conditions, building styles and cultural requirements are taken into consideration.

The gap between active and passive solar could hardly be wider. The reasons for this are discussed and advantages to narrowing the gap are analyzed. Ten years of experience in both active and passive systems are reviewed, including costs, frequent problems, performance prediction, performance modeling, monitoring, and cooling concerns. Trends are analyzed, both for solar space heating and for service water heating. A tendency for the active and passive technologies to be converging is observed. Several recommendations for narrowing the gap are presented.

A broad range of difficulties encountered in active and passive solar space heating systems and active solar space cooling systems is covered. The problems include design errors, installation mistakes, inadequate durability of materials, unacceptable reliability of components, and wide variations in performance and operation of different solar systems. Feedback from designers and manufacturers involved in the solar market is summarized. The designers' experiences with and criticisms of solar components are presented, followed by the manufacturers' replies to the various problems encountered. Information is presented on the performance and operation of solar heating and cooling systems so as to enable future designs to maximize performance and eliminate costly errors. (LEW).

Discusses solar-energy concepts and requirements and the principles of heat transfer and details the designs and operation of economically feasible systems for heating and air-conditioning buildings

Advances in Solar Heating and Cooling presents new information on the growing concerns about climate change, the security of energy supplies, and the ongoing interest in replacing fossil fuels with renewable energy sources. The amount of energy used for heating and cooling is very significant, estimated, for example, as half of final energy consumption in Europe. Solar thermal installations have the potential to meet a large proportion of the heating and
cooling needs of both buildings and industry and the number of solar thermal installations is increasing rapidly. This book provides an authoritative review of the latest research in solar heating and cooling technologies and applications. Provides researchers in academia and industry with an authoritative overview of heating and cooling for buildings and industry in one convenient volume Part III, ‘Solar cooling technologies’ is contributed by authors from Shanghai Jiao Tong University, which is a world-leader in this area Covers advanced applications from zero-energy buildings, through industrial process heat to district heating and cooling

This study analyzes the performance of active charge/passive discharge solar space heating systems. This type of system combines liquid-cooled solar collector panels with a massive integral storage component that passively heats the building interior by radiation and free convection. The TRNSYS simulation program is used to evaluate system performance and to provide input for the development of a simplified analysis method. Performance simulation results are used for comparisons with active and passive solar designs. Economic comparisons are based on these data and additional system features, such as cooling augmentation and integration of heating components with structural members.

Recent Advances in Renewable Energy Technologies is a comprehensive reference covering critical research, laboratory and industry developments on renewable energy technological, production, conversion, storage, and management, including solar energy systems (thermal and photovoltaic), wind energy, hydropower, geothermal energy, bioenergy and hydrogen production, and large-scale development of renewable energy technologies and their impact on the global economy and power capacity. Technological advancements include resources assessment and deployment, materials performance improvement, system optimization and sizing, instrumentation and control, modeling and simulation, regulations, and policies. Each modular chapter examines recent advances in specific renewable energy systems, providing theoretical and applied aspects of system optimization, control and management and supports them with global case studies demonstrating practical applications and economical and environmental aspects through life cycle analysis. The book is of interest to engineering graduates, researchers, professors and industry professionals involved in the renewable energy sector and advanced engineering courses dealing with renewable energy, sources, thermal and electrical energy production and sustainability. Focuses on the progress and research trends in solar, wind, biomass, and hydropower and geothermal energy production and conversion. Includes advanced techniques for the distribution, management, optimization, and storage of heat and energy using case studies.

This is the final report of a survey and evaluation of insulation materials for use with components of solar heating and cooling systems. The survey was performed by mailing questionnaires to manufacturers of insulation materials and by conducting an extensive literature search to obtain data on relevant properties of various types of insulation materials. The study evaluated insulation materials for active and passive solar heating and cooling systems and for multifunction applications. Primary and secondary considerations for selecting insulation materials for various components of solar heating and cooling systems are presented.

Analysis methods for solar design allow the designer or researcher to investigate and, in many cases, predict the thermal performance of a particular building or system. These tools provide an alternative to constructing costly working models and often allow an extended forecast of system behavior, under varying loads and inputs, which may not be attainable through a physical representation. This brochure, developed by the Building Applications and Regulatory Support Branch, is intended to serve as a source guide for available software packages to be used on a variety of microcomputes. It is not to be viewed as a statement of advocacy for any of the methods described within. Detailed technical questions regarding the programs and data files described in this brochure are best directed to the contacts listed with each entry.

Solar Energy in Buildings presents solar radiation fundamentals and their applications in buildings, supported by theoretical analysis and results of original simulation studies in solar energy availability, collection, and conversion for both active and passive use. In-depth coverage of energy balance and heat transfer in building envelopes is supported by the inclusion of calculations and case studies, while contextualizing within an integrated design approach. Explains the best uses of cutting-edge advances such as concentrated solar thermal, thermoelectric and polymetric materials Covers active and passive solar collection and conversion systems Provides energy balance calculations and case studies deriving from real installations connect theory and practice.
"Great book featuring designs for solar construction of homes and other architecture by David Wright, Environmental Architect. Over 80 black and white diagrams, plans, charts and illustrations of passive and solar designs. Measurement charts, topographical information."--

The Dictionary of Energy, Second Edition is a comprehensive and authoritative reference on all aspects of energy and its role in society. Edited by Cutler J. Cleveland and Christopher Morris, the editors of Handbook of Energy, Volumes 1 and 2, this authoritative resource comes at a time when the topic of energy prices, resources and environmental impacts are at the forefront of news stories and political discussions. The Second Edition of Dictionary of Energy contains over 10,000 terms, across 40 key subject areas in energy (e.g. solar, oil & gas, economics, models, policy, basic concepts, sustainable development, systems, renewable/alternative energy, water, etc), with additional window essays on key issues, such as Biomass, Ecological Footprint, Exergy, Fuel Cell, and Hybrid Vehicles. Dictionary of Energy, Second Edition is a valuable reference for undergraduate and graduate students, academics, and research scientists who study energy, as well as business corporations, professional firms, government agencies, foundations, and other groups whose activities relate to energy. Comprises over 10,000 terms and definitions covering 40 scientific disciplines and topics Window essays on subjects such as life cycle assessment, methane, and tragedy of the commons written by leading scientists in the field Definitions are accompanied by photos and illustrations Over 2,200 new or revised terms Seventy-five percent of photos and illustrations either revised or new for this edition

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