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Energy: Demand, Conservation, and Institutional Problems. Edited by Michael S. Macrakis. The MIT Press, Cambridge, Massachusetts and London, England (1974). 556 pp. $25.00.

In February 1973, a conference on energy was held at the Massachusetts Institute of Technology (MIT) under the joint sponsorship of MIT and the National Science Foundation. The purpose of the conference was to bring together energy specialists from all disciplines—engineering, economics, government, industry, and research laboratories. This book is a collection of 38 papers and 28 abstracts of talks presented at the conference. The list of authors is a veritable "who's who" from the ranks of energy scholars. Conspicuous by their absence were many names that have loomed so large in energy events of the two intervening years since the conference. Perhaps a major common weakness of all the models and scenarios arises from the fact that the primary variables of the system—the Ahmed Zaki Yamanis, Henry Jacksons, Chet Holifields, Rogers Mortons—cannot be treated analytically. The events of the past two years, when compared with the predictions and extrapolations of models contained in the book, illustrate very forcefully the hazards of energy forecasting.

The contents of any book derived from conference proceedings will inevitably be "pot luck." Even though the conference planners issue invitations so as to yield an integrated program, the authors have a tendency to digress in unexpected directions. This book is no exception. In fact, because of the diversity of interests of the participants, the distribution of subject matter is unusually broad. The editor has made heroic efforts to sort out the material into logical groupings and to prepare an introduction that attempts to interrelate the wide range of subject matter. But a stew is a stew, and a scholarly commentary on the menu card about the blending of ingredients cannot alter the basic stew-like characteristic. Every stew has its good points and its limitations. On the good side, a reader can quickly review many fields to learn who is working on what. On the negative side, the space devoted to each paper is limited so that none of the chapters can give exhaustive treatment of its particular subject matter.

In the case of this book, the chapters are not uniformly useful to initiate the reader into new fields. Some chapters have used specialized terminology without defining the words, which could not be expected to be universally understood by the nonspecialist. Several of these same chapters had inadequate bibliographies so that the reader could not pursue the subject further in more complete publications. I found this disappointing in several chapters in which I had anticipated obtaining a basic introduction to new subject matter.

I am sure that any reader will find several papers of special interest that will undoubtedly differ from my tastes. My two favorite papers are Chap. 14, "Theory and Practice of Effluent Control," by Robert Dorfman, and Chap. 34, "The Fuel Shortage and Thermodynamics—The Entropy Crisis," by Joseph H. Keenan, Elias P. Gyftopoulos, and George N. Hatsopoulos.

Dorfman presents an eloquent discussion of the basic theory of how economic systems can cope with externalities. In the framework of a few equations, alternate methods of pollution control—effluent limits, production ceilings, input limits, and pollution taxes—are compared. The complexities of collecting necessary information required for decision and enforcement lead to the conclusion that the theoretical "ideal levels of pollution" cannot be identified in a practical way. Instead, it appears that many economists are subscribing to the practical compromise in which environmental quality standards are set so to lead to achievable improvement and practical enforcement.

The paper by Keenan, Gyftopoulos, and Hatsopoulos is a reminder of the basic thermodynamics of irreversibility. For a given application, the effectiveness in fuel utilization should be evaluated in terms of a function devised a century ago by J. Willard Gibbs. This function, the *available useful work*, takes into account such irreversible processes as combustion of fuel, transfer of heat from one fluid to another, etc. Analysis of systems in these terms discloses opportunities for economies in fuel consumption of which each engineer should be continually aware. Gaining more practical value from each unit of entropy increase should become an "ethic" of modern engineering.

The above two examples that I have selected to discuss briefly would not necessarily be the choice of another reviewer. The collection contains many fascinating glimpses of modeling efforts that can serve as useful tools in understanding society's energy systems, forecasting of demands, and impacts of new technologies. Even though most of the forecasts and extrapolations have been disrupted by recent political events, the models and methods are still valid and will no doubt prove of great future value in decision making.

This book has high value for reference purposes and should be on the library shelf of every institution engaged in coping with the energy situation. The individual seeking to upgrade his personal library may be wise to scrutinize the content more thoroughly before committing $25 for its purchase. The printing, editing, style, and indexing are of very high quality, and I found no typographical errors.

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About the Reviewer: Vance L. Sailor is a senior physicist at Brookhaven National Laboratory, where he has been a member of the staff since 1949. For the past five years he has worked on a variety of energy systems analysis problems including, in particular, nuclear safety, resource bases of nuclear and fossil fuels, synthetic fuel cycles, and energy conservation measures. Dr. Sailor did his undergraduate work at De Pauw and completed his graduate studies at Yale.