temperatures, pressures, flow rates, void fractions and liquid level, mainly based on RELAP. One class of accidents—total loss of feedwater flow with concurrent loss of off-site power—was presented without any reference to the loss-of-fluid tests (LOFT) of Idaho National Engineering Laboratory. LOFT achieved successful reactor shutdown without operator intervention and a verification of RELAP. Chapter 4, "Boiling Water Reactor System Analysis," describes the system and subsystems in outline form and devotes one section to the basic theory of two-phase flow. It then shows a large number of responses based on computer programs RETRAN and RAMONA. Chapter 5, "BWR Small Break Loss of Coolant Accident Analysis," is a relatively brief discussion of calculation methods. The program TRAC is mentioned, but no results from it are provided. Instead, experimental tests are discussed. Chapter 6, "Boiling Water Containment," is the only chapter in the book that presents extensive theory and formulas (except for those noted for Chap. 4), and since the subject of the chapter is specialized, the material seems out of place. Alternatively, it may be that the rest of the chapters would be more useful to analysts if some theory were included, either as needed or in the early part of the book, as is common in many textbooks. Chapter 7, "Anticipated Transients Without Scram," is a logically organized and well-written tutorial on the phenomenon with the acronym ATWS, in which the control system fails to act when the core heats up, either by a power rise or by inadequate cooling. The long-term controversy about ATWS is mentioned but not explained. (For an excellent history of ATWS, *Nuclear Reactor Safety* by David Okrent is recommended.) Presented are the nature of calculations on various processes and graphs of typical results for both PWRs and boiling water reactors. The chapter was apparently written before the NRC issued its rule on required shutdown equipment to reduce the risk of ATWS. Chapter 8, "Containment of Degraded Core Accidents," indicates how Class 9 accidents, those resulting in core damage, can be initiated. A general scenario leading eventually to breach of containment is given, and the status of calculation methods is provided.

This reviewer has mixed reactions to the book. It clearly collects and consolidates useful information found only in many reports. The book is more expensive than one would expect, considering that it was printed from typed copy. Unfortunately, Chap. 8 was not proofread adequately, such that the typographical errors distract from the flow of ideas and give this reader an uneasy feeling about the accuracy of the subject material itself. The virtue of using word processing with a spelling checker is well demonstrated.

The authors have experience ranging from 10 to more than 20 years, and some are recognized authorities. There is some unnecessary repetition, partly because there are several authors, even within a single chapter, and partly because of the practice of presenting general trends, then more detailed response data. More thorough coordination and editing could have eliminated such deficiencies.

As noted earlier, theory is largely missing and none of the chapters describes the computer codes in any detail. The book relies on descriptive material, and thus assumes the reader is already very knowledgeable in reactor design and thermal-hydraulic principles. The editor notes in the preface that the material "grew out of an advanced course," and is intended to "provide guidance to practitioners." Much of the contents of the book can be found in Sec. 15 of a Final Safety Analysis Report for a nuclear station, written to meet requirements of Chap. 15 of the NRC *Standard Review Plan* (NUREG-0800). Many of the practitioners for whom the book is presumably written will already be familiar with such material. For the uninitiated, there is inadequate detail in the book about methods of analysis, the computer codes, and calculation methods.

Although the book was published in 1985, most of the references are dated 1981 and earlier, suggesting that a minimal updating was made for this publication. As such, it fails to reflect the major new efforts in "source term" analysis, calculation methods, and results. The final chapter gives the impression that the consequences of a meltdown are very poorly understood, in contrast with the more recent favorable state-of-the art information, for example as in NUREG-0956 (1985). There is only casual mention of NRC's interest in the degraded core topic, and no indication that the nuclear industry was investigating the subject in the IDCOR program, which was nearly completed by the time the book came out. Central to any relevant reactor safety analysis are topics such as chemical aspects of fission product release and retention, and radiation doses due to exposure to radioactive materials. These topics are covered in the *Reactor Safety Study* (WASH-1400) but are ignored or avoided in this book. The phrase "source term" does not appear in the index, and may not be in the book at all. In view of the keen interest in the consequences of major core damage on the part of the industry, the NRC, and the public, it might have been better for the editor and the authors to take the necessary time to update their material, postponing publication for as long as a year if necessary.

Raymond L. Murray received degrees in science education and physics at the University of Nebraska and the University of Tennessee, respectively. He was a researcher and supervisor in the Manhattan Project, and served as active faculty member in nuclear engineering at North Carolina State University for 30 years. He is a charter member and Fellow of the American Nuclear Society, and recipient of the Arthur Holly Compton Award. Dr. Murray is the author of a number of books in nuclear technology, including Nuclear Energy *(1980) and* Understanding Radioactive Waste *(1983). He is currently a consultant to Bechtel Power Corporation on criticality prevention at Three Mile Island Unit 2, is a member of the Institute of Nuclear Power Operations' Advisory Council, serves on the North Carolina Radiation Protection Commission, and is busy with writing and lecturing.*

Nuclear Energy—A Sensible Alternative

Editors	Karl O. Ott and Bernard I. Spinrad
Publisher	Plenum Publishing Corporation (1985)
Pages	386
Price	$25.00
Reviewer	Gerald A. Schlapper

As stated in the forward by E. L. Zebroski, the articles contained in this volume were written by professionals who are concerned that the myths associated with the use of nuclear energy have outrun the realities associated with the use of this necessary energy source. The lack of a true energy policy in the United States is noted as in the fact that energy technologies to solve the "energy problem" must be thought of as complementary rather than as competitive. Specific issues addressed include energy and society, nuclear power economics, the fuel cycle, nuclear weapons proliferation, safety, and risks. The authors include in their presentations discussion of some of the past and present myths associated with the nuclear industry. The authors feel they lack the necessary expertise in the political, sociological, and psychological areas; therefore these areas are not addressed in detail. However, the importance of these factors is clearly noted.

Review of this text shows that the nuclear industry is learning the techniques employed by the "anti-nuke" movement to include methods of media and political structure manipulation. Delays of government action related to some attitudes of "let the next administration solve it" and the impact of these delays on nuclear power programs are detailed. Examples of the current energy situation are discussed with the purpose of illustrating the failure to distinguish symptoms from substance and to emphasize the need for a good energy employment strategy.

This book should be considered essential reading for those concerned with America's energy future. While pronuclear in theme, there is not an attempt to convert the dedicated antinuclear individual. All energy sources are analyzed with respect to general properties, inherent risks, and capability for meeting the energy demands of industrial societies.

After receiving his MS in nuclear engineering from the University of Missouri at Columbia in 1970, Gerald A. Schlapper joined the reactor operations staff of the University of Missouri Research Reactor Facility. Dr. Schlapper received his PhD in 1977 and remained on the staff of the Research Reactor Facility until January 1981, when he assumed his current position as a faculty member of the nuclear engineering department at Texas A&M University. During his career he has served as a consultant to various government and private organizations.

Introductory Nuclear Reactor Dynamics

Authors	K. O. Ott and R. J. Neuhold
Publisher	American Nuclear Society (1985)
Pages	362
Price	$43.00
Reviewer	David L. Hetrick

Among the books on nuclear reactor dynamics published since 1970 are those by Akcasu et al.,[1] Hetrick,[2] Lewins,[3] and Ash.[4] The new book by Ott and Neuhold is a welcome addition to this list.

The five books are very different in scope and depth. Ott and Neuhold have restricted the scope of their book by not including reactor stability, control systems, or noise analysis. They have included derivations and solutions of reactor dynamics equations in many approximations. There is a good selection of practical applications and academic illustrations.

I was pleased that the title of the book contains the word "dynamics" rather than "kinetics." But on p. 3 we read that dynamics is to be divided into two subtopics: (a) kinetics (dynamics without feedback) and (b) dynamics (dynamics with feedback). This definition explains the title of Sec. 11-4C: "Comparison of Kinetics and Dynamics Results." There is a tradition in engineering mechanics (not honored by all textbooks in that field) that mechanics is divided into statics and dynamics, and that dynamics is divided into kinematics and kinetics. The late Jack Chernick said 20 years ago: "Who cares? Kinetics, dynamics; if there's a difference, then I do reactor kinematics." Indeed, let us stamp out the difference.

I have a personal bias against the symbol "Λ" for the neutron generation time. I had hoped that this usage was dying out. It must be tiresome to stand in the classroom, chalk in hand, speaking of "big lambda" and "little lambda" in the same equation.

The concept of "reduced precursors" is useful, particularly in providing better scaling in numerical computations. It can, however, be misleading. One can lose sight of the physical sources $\lambda_k C_k$ and claim that "the stationary solution is independent of the generation time" (p. 84); this is proper only for some nonphysical reduced variables. Nor is it especially helpful to claim that the zero-generation-time (prompt-jump) approximation is any more elegant in terms of reduced variables (pp. 35 and 162); it is no chore to remember that $p(t)$ and ΛC_k are of the same order in slow transients. Of course, this becomes moot if one uses state variables normalized to their stationary values, as suggested by good computer programming practice.

I find it awkward to think in terms of several different point reactor models (intuitive, plain, exact, etc.). In particular, one need not have a time-independent shape function to derive the point reactor model (p. 76). Indeed, it seems preferable, from both physical and mathematical viewpoints, to identify one basic point reactor model that has a multitude of derivations and a corresponding multitude of parameter definitions. Surely this is better than having a different dynamic model with its own special name for each set of definitions of parameters.

Chapters 6 and 8 are particularly well done, except that the so-called precursor accumulation approximation (p. 88) seems like excess baggage. It is equivalent to a second-order system that is mathematically no simpler than the ordinary one-group point reactor model, but one of its eigenvalues is always positive (even for negative reactivity). Its validity is restricted to reactivities near prompt critical and beyond (the same range as the ordinary one-group model using a weighted average λ). It is also physically inconsistent; the quantities $\lambda_k C_k$ are treated as constants in the precursor equations and variables in the power equation.

Chapter 7 ("Microkinetics") is a pseudostatistical treatment of neutron flux as a superposition of "average fission chains," each of which is described by ordinary continuous reactor dynamics. I found it philosophically unsatisfying and of limited usefulness. I would have preferred some probabilistic neutronics such as Rossi-α or an introduction to reactor noise analysis.

The distinction between "static" and "dynamic" reactivities (p. 186) seems artificial. Whatever definition of reactivity is applied, static reactivity ought to be a special case of dynamic reactivity (for example, the initial and asymptotic