Chapter 4 presents detailed guidelines for basic tasks of prediction of failure modes, critical component analysis, and design review. Utilizing these guidelines, the following chapter provides the reader with a background in the design process from a reliability standpoint to include attributes of equipment derating. The final chapter of this text emphasizes the need for detailed fault tree analysis of systems, continued reliability testing requirements for failure reporting, and the desirability of analysis of corrective actions. The body of this text is followed by Appendixes that provide the user with definitions, a listing of applicable standards and specifications, and a bibliography of other useful handbooks, and regulatory guidelines.

This book evolved from work performed by the authors for the U.S. Nuclear Regulatory Commission, the Federal Aviation Administration, the National Aeronautics and Space Administration, and industry. The authors provide a wealth of data to include hardware failure rates and human error statistics. This text can be utilized as a guide by management or design engineers to relate equipment reliability to specifications, cost trade-offs, and design and testing of equipment. It is also recommended as a text for upper level college instruction or as a training document for regulatory agencies.

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.

Thorium Dioxide: Properties and Nuclear Applications

Editors J. Belle and R. M. Berman

Publisher U.S. Department of Energy (August 1984)

Pages 573

Price $40.95

Reviewer Geoffrey G. Eichholz

After an interval of 25 years, this book has appeared as the latest in the series of *Naval Reactors Handbooks*. In their day those books included some of the most informative volumes on nuclear materials, and this tightly printed book is a worthy successor. In many ways this may be described as the obituary of the Shippingport Light Water Breeder Reactor (LWBR), because what the editors set out to do here is to collate and present most of the enormous amount of technical know-how that was generated during the design and operation of the LWBR, which was shut down in 1982 after operating without refueling for 5 years.

To some extent the treatment is parochial; there is only passing reference to the experience with other thorium-fueled reactors; Fort St. Vrain is barely mentioned and the German thorium breeder not at all. However, it is hard to cavil at the sheer wealth of detail, which is a tribute to the thoroughness of the naval program. After discussing the nuclear physics aspects of a thorium fuel cycle, several lengthy chapters deal with all significant properties of ThO_2 and ThO_2-UO_2 mixed oxides: physical, thermodynamic, mechanical properties, phase equilibria, and transport phenomena. Fuel fabrication is described for three types of fuel elements and a variety of preparation methods. One chapter reviews fuel irradiation behavior, including dimensional stability and fission product release. The final chapter discusses fuel reprocessing and waste handling. Each chapter is followed by an extensive bibliography, and there is an adequate index.

This book is a valuable and exhaustive reference for all nuclear engineers interested in fuel technology. The editors should be congratulated on preserving such a useful trove of irreplaceable data.

Geoffrey G. Eichholz is Regents' Professor of Nuclear Engineering at the Georgia Institute of Technology, which he joined in 1963. He obtained his PhD in physics at the University of Leeds, England, and was awarded the DSc degree in 1979. He edited the book Radioisotopes Engineering *and is the author of* Environmental Aspects of Nuclear Power *and* Principles of Nuclear Radiation Detection, *both published by Lewis Publishers. His research interests include the migration of radioactive wastes, environmental surveillance problems, radiation detector development, industrial radiation applications, nuclear materials technology, and the health physics of nonionizing radiations.*

Guidebook to Light Water Reactor Safety Analysis

Editor Paul B. Abramson

Publisher Hemisphere Publishing Corporation (1985)

Pages 393

Price $89.95

Reviewer Raymond L. Murray

The subject of reactor safety is important and challenging, especially in light of the Chernobyl accident. This book provides a great deal of information about potential events in light water reactors. It is described by the editor as an expanded version of a series of lectures given in 1981 at the International Centre for Heat and Mass Transfer in Yugoslavia.

Chapter 1, "Licensing and Safety Analysis Background," lists transient and accident types and gives risk values, discusses emergency procedures for operator action, and reviews multifailure events. Chapter 2, "PWR Systems Transient Analysis," reviews the event classifications that the U.S. Nuclear Regulatory Commission (NRC) uses in Chap. 15 of the standard review plan for preparing safety analysis reports, outlines the functions of computer codes such as RELAP and RETRAN, and describes pressurized water reactor (PWR) undercooling and overcooling transients. Chapter 3, "PWR Small Break LOCA," more than one-quarter of the book, gives a qualitative description of the phenomenon and then displays many graphs of responses in time of