BOOK REVIEWS

Selection of books for review is based on the editor's opinions regarding possible reader interest and on the availability of the book to the editor. Occasional selections may include books on topics somewhat peripheral to the subject matter ordinarily considered acceptable.

The Geological Disposal of Nuclear Waste

Authors	Neil A. Chapman and Ian G. McKinley; with contributions on radiological protection by Marion D. Hill
Publisher	John Wiley & Sons, Ltd., Chichester, Great Britain (1987)
Pages	280
Price	$69.95
Reviewer	Mary G. White

A volume carefully prepared and substantiated by references and ongoing research, *The Geological Disposal of Nuclear Waste* is authored by Neil A. Chapman of the Fluid Processes Research Group of the British Geological Survey, and by Ian G. McKinley of the Swiss Federal Institute for Reactor Research, Würenlingen, Switzerland. Marion D. Hill, of the National Radiological Protection Board, United Kingdom, and also a member of several of the International Atomic Energy Agency (IAEA) Task Forces for publishing "guidebooks" in the IAEA Safety Series and its Technical Report Series, contributed the sections on radiological protection included in the volume.

The authors' early objective in the preparation of the volume primarily was to document high-level waste (HLW) disposal in the United Kingdom. However, the final treatment of the material includes a review of related activities in other countries. The book succeeds in providing a comprehensive, semitechnical overview of the scientific rationale and methodology of geological disposal of nuclear waste in the United Kingdom, Sweden, and Switzerland, with occasional discussion of activities elsewhere. The scope of the book is stated to be to concentrate principally on disposal of long-lived radioactive waste in deep repositories, for which containment must last for very long periods of time. In addition, the book also contains some references to the application of selected principles and technologies to disposal of other types of waste.

A cursory discussion of the application of the as low as reasonably achievable (ALARA) principle to waste disposal options appears in the first chapter, including the distinction between utilizing the ALARA principle versus cost-benefit analyses in decision making for selection of certain disposal options that may be available. General definitions of radioactivity and International Commission on Radiological Protection radiological protection principles precede the more difficult explanations concerning radioactive waste and the nuclear fuel cycle as it now exists. An indication is given of the dissimilarities in waste production from a future fusion reactor to those waste products currently generated in the nuclear fuel cycle. Categorization of wastes, waste conditioning for disposal, containers and packaging, waste inventories, and radionuclide content of wastes to be disposed are addressed.

Principles of waste management and disposal are covered in critical discussions, well presented by the authors. The selection of a dilution and dispersal process in the deep geological environment as being the most efficient available option for disposal of high-level radioactive waste is offered as a complement to ocean disposal, also an available, efficient, though less desirable option in the present international sociopolitical era. Problems of some of the alternative disposal options for long-lived wastes briefly discussed are space disposal, ice sheet disposal, disposal beneath the seabed, rock melting, and nuclear incineration. Other important aspects reported are the many factors that must be considered in modeling the performance of a waste disposal system, with emphasis on the deep geological confinement of HLW: mined and unmined repositories, safety barriers (natural and/or engineered), potential migration of radionuclides in the near- and far-field zones of the system, a detailed listing of the processes and events that may lead to the eventual release of some of the disposed waste, leach-testing, and the research under way to develop realistic near-field models, particularly for design of multibarrier disposal systems; addressing the all-important hydrogeological permeability problems and potential groundwater movement of waste materials, planning the field and laboratory measurements of migration and estimation of transfer coefficients once the site is selected and established, and the extremely difficult radiological safety assessments for release through environmental media.

The outstanding contributions of this volume are the

chapters concerned with considerations of site selection, the valuable discussion of long-term radiological protection and safety planning requirements, explanations of potential problem areas in modeling definitions, model validation and the use of natural analogues, and in the "experienced scientist" documentation of certain philosophical deliberations that have occurred, and still are occurring in many national programs for disposal of long-lived wastes. An introduction to radioactive waste management programs in other nations, a basic reference list (not intended to be complete), and some major waste management conferences are also included.

The volume will be of interest to both technical and nonscientific readers, and will prove to be a valuable reference for waste management professionals and university personnel.

Mary Gerry White is currently a research specialist in the nuclear and energy engineering department, University of Arizona, Tucson. She formerly served as program manager and later as technical measurements and quality assurance manager for U.S. Department of Energy remedial action programs, specializing in waste management problems relating to environmental migration of low-level, high-level, transuranics, and other radionuclides from waste generated in defense and commercial activities.