

## Waste Disposal For Nuclear Power Plants | 78d7916fa772c45c65e2e817d8927b68

Principles and Standards for the Disposal of Long-lived Radioactive Wastes Nuclear Waste Disposal Multifunctional Nanocomposites for Energy and Environmental Applications Handbook of Advanced Radioactive Waste Conditioning Technologies Separation Techniques in Nuclear Waste Management (1995) Nuclear Materials Science Radioactive Waste Nuclear Waste Governance Advanced Separation Techniques for Nuclear Fuel Reprocessing and Radioactive Waste Treatment Low-Level Radioactive Waste Management and Disposition Technical Bases for Yucca Mountain Standards Forevermore The Geological Disposal of Nuclear Waste Geological Repository Systems for Safe Disposal of Spent Nuclear Fuels and Radioactive Waste Nuclear Decommissioning, Waste Management, and Environmental Site Remediation Nuclear Energy Disposal of Radioactive Waste On Land The Nuclear Energy Option Nuclear Waste Management Strategies Nuclear Wastes Reprocessing and Recycling of Spent Nuclear Fuel An Introduction to Nuclear Waste Immobilisation The Legacy of Nuclear Power Nuclear Waste Nuclear Waste Politics Conflicts, Participation and Acceptability in Nuclear Waste Governance Disposition of High-Level Radioactive Waste Through Geological Isolation Disposal of Radioactive Waste Cement-Based Materials for Nuclear Waste Storage The Road to Yucca Mountain Nuclear Back-end and Transmutation Technology for Waste Disposal Coupled Thermo-Hydro-Mechanical-Chemical Processes in Geo-systems An Introduction to Nuclear Waste Immobilisation Disposition of High-Level Waste and Spent Nuclear Fuel Reflections on the Fukushima Daiichi Nuclear Accident Radioactive Waste Engineering and Management The Microbiology of Nuclear Waste Disposal Decision-making and Radioactive Waste Disposal Radioactive Waste Management and Contaminated Site Clean-Up Geologic Disposal of Radioactive Waste in Perspective

Principles and Standards for the Disposal of Long-lived Radioactive Wastes This report reviews the progress to date in geological disposal of radioactive waste and the further steps that may be required to implement geologic disposal, taking into account both the technical and regulatory requirements, and the need to achieve an appropriate level of societal acceptance.

Nuclear Waste Disposal This handbook is concerned with developing principles and standards for the safe disposal of solid radioactive wastes by burial deep in the Earth's crust. Radioactive wastes have focussed thinking on long-term environmental protection issues in an unprecedented way. Consequently, the way in which principles and standards are set, and the thinking behind this, is of wider interest than to the nuclear field alone. The issues are not just technical and scientific. There is also a much wider philosophical context to the debate, centering on ethics, human values and the expectations of society. In this handbook it is intended that all these issues are brought together, suggesting appropriate ways forward in each area, culminating in a proposed structure for safety regulation. It also aims to provide a detailed discussion of some of the most difficult logical and ethical issues facing those wishing to dispose of long-lived radioactive wastes.

Multifunctional Nanocomposites for Energy and Environmental Applications The question of what to do with radioactive waste has dogged political administration of nuclear-powered electricity-producing nations since the inception of the technology in the 1950s. As the issue rises to the forefront of current energy and environmental policy debates, a critical policy analysis of radioactive waste management in the UK provides important insights for the future. Nuclear Waste Politics sets out a detailed historical and social scientific analysis of radioactive waste management and disposal in the UK from the 1950s up to the present day, drawing international comparisons with Sweden, Finland, Canada and the US. A theoretical framework is presented for analysing nuclear politics: blending literatures on technology policy, environmental ethics and the geography and politics of scale. The book proffers a new theory of "ethical incrementalism" and practical policy suggestions to facilitate a fair and efficient siting process for radioactive waste management facilities. The book argues that a move away from centralised, high capital investment national siting towards a regional approach using deep borehole disposal, could resolve many of the problems that the high stakes, inflexible "megaproject" approach has caused across the world. This book is an important resource for academics and researchers in the areas of environmental management, energy policy, and science and technology studies.

Handbook of Advanced Radioactive Waste Conditioning Technologies Focusing on real applications of nanocomposites and nanotechnologies for sustainable development, this book shows how nanocomposites can help to solve energy and environmental problems, including a broad overview of energy-related applications and a unique selection of environmental topics. Clearly structured, the first part covers such energy-related applications as lithium ion batteries, solar cells, catalysis, thermoelectric waste heat harvesting and water splitting, while the second part provides unique perspectives on environmental fields, including nuclear waste management and carbon dioxide capture and storage. The result is a successful combination of fundamentals for newcomers to the field and the latest results for experienced scientists, engineers, and industry researchers.

Separation Techniques in Nuclear Waste Management (1995) Reprocessing and Recycling of Spent Nuclear Fuel presents an authoritative overview of spent nuclear fuel reprocessing, considering future prospects for advanced closed fuel cycles. Part One introduces the recycling and reprocessing of spent nuclear fuel, reviewing past and current technologies, the possible implications of Generation IV nuclear reactors, and associated safety and security issues. Parts Two and Three focus on aqueous-based reprocessing methods and pyrochemical methods, while final chapters consider the cross-cutting aspects of engineering and process chemistry and the potential for implementation of advanced closed fuel cycles in different parts of the world. Expert introduction to the recycling and reprocessing of spent nuclear fuel Detailed overview of past and current technologies, the possible implications of Generation IV nuclear reactors, and associated safety and security issues A lucid exploration of aqueous-based reprocessing methods and pyrochemical methods

Nuclear Materials Science This book describes essential and effective management for reliably ensuring public safety from radioactive wastes in Japan. This is the first book to cover many aspects of wastes from the nuclear fuel cycle to research and medical use, allowing readers to understand the characterization, treatment and final disposal of generated wastes, performance assessment, institutional systems, and social issues such as intergenerational ethics. Exercises at the end of each chapter help to understand radioactive waste management in context.

Radioactive Waste This book covers essential aspects of transmutation technologies, highlighting especially the advances in Japan. The accident at the Fukushima Daiichi Nuclear Power Plant (NPP) has caused us to focus attention on a large amount of spent nuclear fuels stored in NPPs. In addition, public anxiety regarding the treatment and disposal of high-level radioactive wastes that require long-term control is growing. The Japanese policy on the back-end of the nuclear fuel cycle is still unpredictable in the aftermath of the accident. Therefore, research and development for enhancing the safety of various processes involved in nuclear energy production are being actively pursued worldwide. In particular, nuclear transmutation technology has been drawing significant attention after the accident. This publication is timely with the following highlights: 1) Development of accelerator-driven systems (ADSs), which is a brand-new reactor concept for transmutation of highly radioactive wastes; 2) Nuclear reactor systems from the point of view of the nuclear fuel cycle. How to reduce nuclear wastes or how to treat them including the debris from TEPCO's Fukushima nuclear power stations is discussed; and 3) Environmental radioactivity, radioactive waste treatment and geological disposal policy. State-of-the-art technologies for overall back-end issues of the nuclear fuel cycle as well as the technologies of transmutation are presented here. The chapter authors are actively involved in the development of ADSs and transmutation-related technologies. The future of the back-end issues in Japan is very uncertain after the accident at the Fukushima Daiichi NPP and this book provides an opportunity for readers to consider the future direction of those issues.

Nuclear Waste Governance The Department of Energy's Office of Environmental Management (DOE) is responsible for the safe cleanup of sites used for nuclear weapons development and government-sponsored nuclear energy research. Low-level radioactive waste (LLW) is the most volumetrically significant waste stream generated by the DOE cleanup program. LLW is also generated through commercial activities such as nuclear power plant operations and medical treatments. The laws and regulations related to the disposal of LLW in the United States have evolved over time and across agencies and states, resulting in a complex regulatory structure. DOE asked the National Academies of Sciences, Engineering, and Medicine to organize a workshop to discuss approaches for the management and disposition of LLW. Participants explored the key physical, chemical, and radiological characteristics of low-level waste that govern its safe and secure management and disposal in aggregate and in individual waste streams, and how key characteristics of low level waste are incorporated into standards, orders, and regulations that govern the management and disposal of LLW in the United States and in other major waste-producing countries. This publication summarizes the presentations and discussions from the workshop.

Advanced Separation Techniques for Nuclear Fuel Reprocessing and Radioactive Waste Treatment Disposal of radioactive waste from nuclear weapons production and power generation has caused public outcry and political consternation. Nuclear Wastes presents a critical review of some waste management and disposal alternatives to the current national policy of direct disposal of light water reactor spent fuel. The book offers clearcut conclusions for what the nation

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should do today and what solutions should be explored for tomorrow. The committee examines the currently used "once-through" fuel cycle versus different alternatives of separations and transmutation technology systems, by which hazardous radionuclides are converted to nuclides that are either stable or radioactive with short half-lives. The volume provides detailed findings and conclusions about the status and feasibility of plutonium extraction and more advanced separation technologies, as well as three principal transmutation concepts for commercial reactor spent fuel. The book discusses nuclear proliferation; the U.S. nuclear regulatory structure; issues of health, safety and transportation; the proposed sale of electrical energy as a means of paying for the transmutation system; and other key issues.

**Low-Level Radioactive Waste Management and Disposition** This second edition represents an extensive revision of the first edition, - though the motivation for the book and the intended audiences, as described in the previous preface, remain the same. The overall length has been increased substantially, with revised or expanded discussions of a number of topics, - cluding Yucca Mountain repository plans, new reactor designs, health effects of radiation, costs of electricity, and dangers of terrorism and weapons proliferation. The overall status of nuclear power has changed rather little over the past eight years. Nuclear reactor construction remains at a very low ebb in much of the world, with the exception of Asia, while nuclear power's share of the electricity supply continues to be about 75% in France and in the United States. However, there are signs of a heightened interest in considering possible nuclear growth. In the late 1990s, the U. S. Department of Energy began new programs to stimulate research and planning for future reactors, and many candidate designs are now contending—at least on paper—to be the next generation leaders. Outside the United States, the commercial development of the Pebble Bed Modular Reactor is being pursued in South Africa, a French-German consortium has won an order from Finland for the long-planned EPR (European Pressurized Water Reactor), and new reactors have been built or planned in Asia. In an unanticipated positive development for nuclear energy, the capacity factor of U. S. reactors has increased dramatically in recent years, and most operating reactors now appear headed for 20-year license renewals.

**Technical Bases for Yucca Mountain Standards** Radioactive wastes are generated from a wide range of sources, including the power industry, and medical and scientific research institutions, presenting a range of challenges in dealing with a diverse set of radionuclides of varying concentrations. Conditioning technologies are essential for the encapsulation and immobilisation of these radioactive wastes, forming the initial engineered barrier required for their transportation, storage and disposal. The need to ensure the long term performance of radioactive waste forms is a key driver of the development of advanced conditioning technologies. The Handbook of advanced radioactive waste conditioning technologies provides a comprehensive and systematic reference on the various options available and under development for the treatment and immobilisation of radioactive wastes. The book opens with an introductory chapter on radioactive waste characterisation and selection of conditioning technologies. Part one reviews the main radioactive waste treatment processes and conditioning technologies, including volume reduction techniques such as compaction, incineration and plasma treatment, as well as encapsulation methods such as cementation, calcination and vitrification. This coverage is extended in part two, with in-depth reviews of the development of advanced materials for radioactive waste conditioning, including geopolymers, glass and ceramic matrices for nuclear waste immobilisation, and waste packages and containers for disposal. Finally, part three reviews the long-term performance assessment and knowledge management techniques applicable to both spent nuclear fuels and solid radioactive waste forms. With its distinguished international team of contributors, the Handbook of advanced radioactive waste conditioning technologies is a standard reference for all radioactive waste management professionals, radiochemists, academics and researchers involved in the development of the nuclear fuel cycle. Provides a comprehensive and systematic reference on the various options available and under development for the treatment and immobilisation of radioactive wastes. Explores radioactive waste characterisation and selection of conditioning technologies including the development of advanced materials for radioactive waste conditioning. Assesses main radioactive waste treatment processes and conditioning technologies, including volume reduction techniques such as compaction.

**Forevermore** Radioactive waste management and contaminated site clean-up reviews radioactive waste management processes, technologies, and international experiences. Part one explores the fundamentals of radioactive waste including sources, characterisation, and processing strategies. International safety standards, risk assessment of radioactive wastes and remediation of contaminated sites and irradiated nuclear fuel management are also reviewed. Part two highlights the current international situation across Africa, Asia, Europe, and North America. The experience in Japan, with a specific chapter on Fukushima, is also covered. Finally, part three explores the clean-up of sites contaminated by weapons programmes including the USA and former USSR. Radioactive waste management and contaminated site clean-up is a comprehensive resource for professionals, researchers, scientists and academics in radioactive waste management, governmental and other regulatory bodies and the nuclear power industry. Explores the fundamentals of radioactive waste including sources, characterisation, and processing strategies. Reviews international safety standards, risk assessment of radioactive wastes and remediation of contaminated sites and irradiated nuclear fuel management. Highlights the current international situation across Africa, Asia, Europe, and North America specifically including a chapter on the experience in Fukushima, Japan.

## The Geological Disposal of Nuclear Waste

**Geological Repository Systems for Safe Disposal of Spent Nuclear Fuels and Radioactive Waste** The International Atomic Energy Agency estimates that nuclear power generation facilities produce about 200,000 cubic meters of low and intermediate-level waste each year. Vital medical procedures, industrial processes and basic science research also produce significant quantities of waste. All of this waste must be shielded from the population for extended periods of time. Finding suitable locations for disposal facilities is beset by two main problems: community responses to siting proposals are generally antagonistic and, as a result, governments have tended to be reactive in their policy-making. Decision-making and Radioactive Waste Disposal explores these issues utilizing a linear narrative case study approach that critically examines key stakeholder interactions in order to explain how siting decisions for low level waste disposal are made. Five countries are featured: the US, Australia, Spain, South Korea and Switzerland. This book seeks to establish an understanding of the political, economic, environmental, legal and social dimensions of siting across those countries. This valuable resource fills a gap in the literature and provides recommendations for future disposal facility siting efforts. The book will be of interest to students and scholars of environmental law, justice, management, politics, energy and security policy as well as decision-makers in government and industry.

**Nuclear Decommissioning, Waste Management, and Environmental Site Remediation** Separation Techniques in Nuclear Waste Management is an up-to-date, comprehensive survey of processes for separation of nuclear wastes. Comprised of articles by scientists and engineers at universities and national laboratories in the U.S. and overseas, the book provides excellent reference information for individuals working in nuclear waste management. Specifically, the book covers current separation technologies and techniques for waste liquid, solid, and gas streams that contain radionuclides. Such wastes are typical of those produced as a result of nuclear materials processing and spent fuel reprocessing. Chapters on promising new technologies and state-of-the-art processes currently in use provide valuable information for design engineers, as well as for research scientists. The articles in Separation Techniques in Nuclear Waste Management are brief and concise - designed for quick access to pertinent information. Many of the contributors are leaders in their fields. It is the most current survey available of the nuclear waste management techniques.

## Nuclear Energy

**Disposal of Radioactive Waste On Land** Decommissioning nuclear facilities is a relatively new field, which has developed rapidly in the last ten years. It involves materials that may be highly radioactive and therefore require sophisticated methods of containment and remote handling. The wastes arising from decommissioning are hazardous and have to be stored or disposed of safely in order to protect the environment and future generations. Nuclear decommissioning work must be carried out to the highest possible standards to protect workers, the general public and the environment. This book describes the techniques used for dismantling redundant nuclear facilities, the safe storage of radioactive wastes and the restoration of nuclear licensed sites. \* Describes the techniques used for dismantling nuclear facilities, safe storage of radioactive wastes, and the restoration of nuclear licensed facilities. \* Provides the reader with decommissioning experience accumulated over 15 years by UKAEA. \* Contains valuable information to personnel new to decommissioning and waste management.

**The Nuclear Energy Option** Among the most important and exciting current steps forward in geo-engineering is the development of coupled numerical models. They represent the basic physics of geo-engineering processes which can include the effects of heat, water, mechanics and chemistry. Such models provide an integrating focus for the wide range of geo-engineering disciplines. The articles within this volume were originally presented at the inaugural GeoProc conference held in Stockholm and contain a collection of unusually high quality information not available elsewhere in an edited and coherent form. This collection not only benefits from the latest theoretical developments but also applies them to a number of practical and wide ranging applications. Examples include the environmental issues around radioactive waste disposal deep in rock, and the search for new reserves of oil and gas.

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**Nuclear Waste Management Strategies** Nuclear energy leaves behind an infinitely dangerous legacy of radioactive wastes in places that are remote and polluted landscapes of risk. Four of these places - Hanford (USA) where the plutonium for the first atomic bombs was made, Sellafield, where the UK's nuclear legacy is concentrated and controversial, La Hague the heart of the French nuclear industry, and Gorleben, the focal point of nuclear resistance in Germany - provide the narratives for this unique account of the legacy of nuclear power. The Legacy of Nuclear Power takes a historical and geographical perspective going back to the origins of these places and the ever changing relationship between local communities and the nuclear industry. The case studies are based on a variety of academic and policy sources and on conversations with a vast array of people over many years. Each story is mediated through an original theoretical framework focused on the concept of 'peripheral communities' developing through changing discourses of nuclear energy. This interdisciplinary book brings together social, political and ethical themes to produce a work that tells not just a story but also provides profound insights into how the nuclear legacy should be managed in future. The book is designed to be enjoyed by academics, policy-makers and professionals interested in energy, environmental planning and politics and by a wider group of stakeholders and the public concerned about our nuclear legacy.

**Nuclear Wastes** Congressional interest in nuclear waste is generally focused on managing commercial spent nuclear fuel (SNF), the waste produced from commercial nuclear power plants, and other high-level nuclear wastes (HLW), largely from Cold War-era nuclear weapons materials production. Chapter 1 examines the management of spent nuclear fuel, concerns related to the storage of nuclear waste, and the need for long-term solutions. Chapter 2 discusses a permanent geologic repository for disposal of commercial spent nuclear fuel and other high-level nuclear wastes. Chapter 3 is a draft of a bill to find a solution to the safe disposal of nuclear waste. The United States currently has no permanent disposal facility for spent nuclear fuel or other highly radioactive waste. The book makes critical reforms to our Nation's nuclear waste management policy. Chapter 4 reports on The Nuclear Waste Policy Act of 1982 (NWPA) which calls for disposal of spent nuclear fuel in a deep geologic repository. Chapter 5 examines the extent to which the Office of Environmental Management's (EM's) management of the Integrated Waste Treatment Unit follows selected project management best practices; challenges EM faces in disposing of the sodium-bearing waste; and challenges EM faces in treating and disposing of the calcine waste.

**Reprocessing and Recycling of Spent Nuclear Fuel** The Microbiology of Nuclear Waste Disposal is a state-of-the-art reference featuring contributions focusing on the impact of microbes on the safe long-term disposal of nuclear waste. This book is the first to cover this important emerging topic, and is written for a wide audience encompassing regulators, implementers, academics, and other stakeholders. The book is also of interest to those working on the wider exploitation of subsurface, such as bioremediation, carbon capture and storage, geothermal energy, and water quality. Planning for suitable facilities in the U.S., Europe, and Asia has been based mainly on knowledge from the geological and physical sciences. However, recent studies have shown that microbial life can proliferate in the inhospitable environments associated with radioactive waste disposal, and can control the long-term fate of nuclear materials. This can have beneficial and damaging impacts, which need to be quantified. Encompasses expertise from both the bio and geo disciplines, aiming to foster important collaborations across the disciplinary divide Includes reviews and research papers from leading groups in the field Provides helpful guidance in light of plans progressing worldwide for geological disposal facilities Includes timely research for planning and safety case development

**An Introduction to Nuclear Waste Immobilisation** Advanced separations technology is key to closing the nuclear fuel cycle and relieving future generations from the burden of radioactive waste produced by the nuclear power industry. Nuclear fuel reprocessing techniques not only allow for recycling of useful fuel component for further power generation, but by also separating out the actinides, lanthanides and other fission products produced by the nuclear reaction, the residual radioactive waste can be minimised. Indeed, the future of the industry relies on the advancement of separation and transmutation technology to ensure environmental protection, criticality-safety and non-proliferation (i.e., security) of radioactive materials by reducing their long-term radiological hazard. Advanced separation techniques for nuclear fuel reprocessing and radioactive waste treatment provides a comprehensive and timely reference on nuclear fuel reprocessing and radioactive waste treatment. Part one covers the fundamental chemistry, engineering and safety of radioactive materials separations processes in the nuclear fuel cycle, including coverage of advanced aqueous separations engineering, as well as on-line monitoring for process control and safeguards technology. Part two critically reviews the development and application of separation and extraction processes for nuclear fuel reprocessing and radioactive waste treatment. The section includes discussions of advanced PUREX processes, the UREX+ concept, fission product separations, and combined systems for simultaneous radionuclide extraction. Part three details emerging and innovative treatment techniques, initially reviewing pyrochemical processes and engineering, highly selective compounds for solvent extraction, and developments in partitioning and transmutation processes that aim to close the nuclear fuel cycle. The book concludes with other advanced techniques such as solid phase extraction, supercritical fluid and ionic liquid extraction, and biological treatment processes. With distinguished international team of contributors, Advanced separation techniques for nuclear fuel reprocessing and radioactive waste treatment is a standard reference for all nuclear waste management and nuclear safety professionals, radiochemists, academics and researchers in this field. A comprehensive and timely reference on nuclear fuel reprocessing and radioactive waste treatment Details emerging and innovative treatment techniques, reviewing pyrochemical processes and engineering, as well as highly selective compounds for solvent extraction Discusses the development and application of separation and extraction processes for nuclear fuel reprocessing and radioactive waste treatment

**The Legacy of Nuclear Power** Geological disposal has been internationally adopted as the most effective approach to assure the long-term, safe disposition of the used nuclear fuels and radioactive waste materials produced from nuclear power generation, nuclear weapons programs, medical, treatments, and industrial applications. Geological repository systems take advantage of natural geological barriers augmented with engineered barrier systems to isolate these radioactive materials from the environment and from future populations. Geological repository systems for safe disposal of spent nuclear fuels and radioactive waste critically reviews the state-of-the-art technologies, scientific methods, regulatory developments, and social engagement approaches directly related to the implementation of geological repository systems. Part one introduces geological disposal, including multiple-barrier geological repositories, as well as reviewing the impact of nuclear fuel recycling practices and underground research laboratory activities on the development of disposal concepts. Part two reviews geological repository siting in different host rocks, including long-term stability analysis and radionuclide transport modelling. Reviews of the range of engineered barrier systems, including waste immobilisation technologies, container materials, low pH concretes, clay-based buffer and backfill materials, and barrier performance are presented in Part three. Part four examines total system performance assessment and safety analyses for deep geological and near-surface disposal, with coverage of uncertainty analysis, use of expert judgement for decision making, and development and use of knowledge management systems. Finally, Part five covers regulatory and social approaches for the establishment of geological disposal programs, from the development of radiation standards and risk-informed, performance-based regulations, to environmental monitoring and social engagement in the siting and operation of repositories. With its distinguished international team of contributors, Geological repository systems for safe disposal of spent nuclear fuels and radioactive waste is a standard reference for all nuclear waste management and geological repository professionals and researchers. Critically reviews the state-of-the-art technologies, scientific methods, regulatory developments, and social engagement approaches related to the implementation of geological repository systems Chapters introduce geological disposal and review the development of disposal concepts Examines long-term stability analysis, the range of engineered barrier systems and barrier performance

**Nuclear Waste** This researched study marshalls new information from once-secret governmental reports, internal documents, private correspondences, and interviews to create an account of the forty-year failure to grapple with deadly radioactive waste

**Nuclear Waste Politics** Safety and environmental impact is of uppermost concern when dealing with the movement and storage of nuclear waste. The 20 chapters in 'An Introduction to Nuclear Waste Immobilisation' cover all important aspects of immobilisation, from nuclear decay, to regulations, to new technologies and methods. Significant focus is given to the analysis of the various matrices used in transport: cement, bitumen and glass, with the greatest attention being given to glass. The last chapter concentrates on the performance assessment of each matrix, and on new developments of ceramics and glass composite materials, thermochemical methods and in-situ metal matrix immobilisation. The book thoroughly covers all issues surrounding nuclear waste: from where to locate nuclear waste in the environment, through nuclear waste generation and sources, treatment schemes and technologies, immobilisation technologies and waste forms, disposal and long term behaviour. Particular attention is paid to internationally approved and worldwide-applied approaches and technologies. \* Each chapter focuses on a different matrix used in nuclear waste immobilisation: Cement, bitumen, glass and new materials. \* Keeps the most important issues surrounding nuclear waste - such as treatment schemes and technologies, and disposal - at the forefront.

**Conflicts, Participation and Acceptability in Nuclear Waste Governance**

**Disposition of High-Level Radioactive Waste Through Geological Isolation** Focused attention by world leaders is needed to address the substantial challenges posed by disposal of spent nuclear fuel from reactors and high-level radioactive waste from processing such fuel. The biggest challenges in achieving safe and secure storage and permanent waste disposal are societal, although technical challenges remain. Disposition of radioactive wastes in a deep geological repository

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is a sound approach as long as it progresses through a stepwise decision-making process that takes advantage of technical advances, public participation, and international cooperation. Written for concerned citizens as well as policymakers, this book was sponsored by the U.S. Department of Energy, U.S. Nuclear Regulatory Commission, and waste management organizations in eight other countries.

**Disposal of Radioactive Waste** This book is the last part of a trilogy and concludes a long-term project that focussed on nuclear waste governance in 24 countries. It deals with core themes of the disposal of high-level radioactive waste (HLW), e.g. the wicked problems of housing nuclear waste disposal facilities, public participation and public discourse, voluntarism and compensation in siting as well as the role of advisory bodies and commissions. The volume reflects on the diverse factors that shape the debate on what can be considered an "acceptable solution" and on various strategies adopted in order to minimise conflicts and possibly increase acceptability. The various theoretical and empirical contributions shed light on several mechanisms and issues touched upon in these strategies such as the role of trust, voluntarism, economic interests at stake, compensation, ethics, governance, and participation.

**Cement-Based Materials for Nuclear Waste Storage** This book focuses on nuclear engineering education in the post-Fukushima era. It was edited by the organizers of the summer school held in August 2011 in University of California, Berkeley, as part of a collaborative program between the University of Tokyo and UC Berkeley. Motivated by the particular relevance and importance of social-scientific approaches to various crucial aspects of nuclear technology, special emphasis was placed on integrating nuclear science and engineering with social science. The book consists of the lectures given in 2011 summer school and additional chapters that cover developments in the past three years since the accident. It provides an arena for discussions to find and create a renewed platform for engineering practices, and thus nuclear engineering education, which are essential in the post-Fukushima era for nurturing nuclear engineers who need to be both technically competent and trusted in society.

**The Road to Yucca Mountain Drawing on the authors' extensive experience in the processing and disposal of waste, An Introduction to Nuclear Waste Immobilisation, Second Edition** examines the gamut of nuclear waste issues from the natural level of radionuclides in the environment to geological disposal of waste-forms and their long-term behavior. It covers all-important aspects of processing and immobilization, including nuclear decay, regulations, new technologies and methods. Significant focus is given to the analysis of the various matrices used, especially cement and glass, with further discussion of other matrices such as bitumen. The final chapter concentrates on the performance assessment of immobilizing materials and safety of disposal, providing a full range of the resources needed to understand and correctly immobilize nuclear waste. The fully revised second edition focuses on core technologies and has an integrated approach to immobilization and hazards. Each chapter focuses on a different matrix used in nuclear waste immobilization: cement, bitumen, glass and new materials. Keeps the most important issues surrounding nuclear waste - such as treatment schemes and technologies and disposal - at the forefront.

**Nuclear Back-end and Transmutation Technology for Waste Disposal** During the next several years, decisions are expected to be made in several countries on the further development and implementation of the geological disposition option. The Board on Radioactive Waste Management (BRWM) of the U.S. National Academies believes that informed and reasoned discussion of relevant scientific, engineering and social issues can and should play a constructive role in the decision process by providing information to decision makers on relevant technical and policy issues. A BRWM-initiated project including a workshop at Irvine, California on November 4-5, 1999, and subsequent National Academies' report to be published in spring, 2000, are intended to provide such information to national policy makers both in the U.S. and abroad. To inform national policies, it is essential that experts from the physical, geological, and engineering sciences and experts from the policy and social science communities work together. Some national programs have involved social science and policy experts from the beginning, while other programs have only recently recognized the importance of this collaboration. An important goal of the November workshop is to facilitate dialogue between these communities, as well as to encourage the sharing of experiences from many national programs. The workshop steering committee has prepared this discussion for participants at the workshop. It should elicit critical comments and help identify topics requiring in-depth discussion at the workshop. It is not intended as a statement of findings, conclusions, or recommendations. It is rather intended as a vehicle for stimulating dialogue among the workshop participants. Out of that dialogue will emerge the findings, conclusions, and recommendations of the National Academies' report.

**Coupled Thermo-Hydro-Mechanical-Chemical Processes in Geo-systems** Concerns around global warming have led to a nuclear renaissance in many countries. Meanwhile the nuclear industry is already warning of a need to train more nuclear engineers and scientists who are needed in a range of areas from healthcare and radiation detection to space exploration and advanced materials, as well as for the nuclear power industry. Here Karl Whittle provides a solid overview of the intersection of nuclear engineering and materials science at a level approachable by advanced students from materials, engineering and physics. The text explains the unique aspects needed in the design and implementation of materials for use in demanding nuclear settings. In addition to material properties and their interaction with radiation, the book covers a range of topics including reactor design, fuels, fusion, future technologies and lessons learned from past incidents. Accompanied by problems, videos and teaching aids the book is suitable for a course text in nuclear materials and a reference for those already working in the field.

**An Introduction to Nuclear Waste Immobilisation** As the re-emergence of nuclear power as an acceptable energy source on an international basis continues, the need for safe and reliable ways to dispose of radioactive waste becomes ever more critical. The ultimate goal for designing a predisposal waste-management system depends on producing waste containers suitable for storage, transportation and permanent disposal. **Cement-Based Materials for Nuclear-Waste Storage** provides a roadmap for the use of cementation as an applied technique for the treatment of low- and intermediate-level radioactive wastes. Coverage includes, but is not limited to, a comparison of cementation with other solidification techniques, advantages of calcium-silicate cements over other materials and a discussion of the long-term suitability and safety of waste packages as well as cement barriers.

**Disposition of High-Level Waste and Spent Nuclear Fuel** This volume examines the national plans that ten Euratom countries plus Switzerland and the United States are developing to address high-level radioactive waste storage and disposal. The chapters, which were written by 23 international experts, outline European and national regulations, technology choices, safety criteria, monitoring systems, compensation schemes, institutional structures, and approaches to public involvement. Key stakeholders, their values and interests are introduced, the responsibilities and authority of different actors considered, decision-making processes are analyzed as well as the factors influencing different national policy choices. The views and expectations of different communities regarding participatory decision making and compensation and the steps that have been or are being taken to promote dialogue and constructive problem-solving are also considered.

**Reflections on the Fukushima Daiichi Nuclear Accident** This book traces the efforts of policy makers to find solutions to the complex issues for disposal of radioactive waste that has become a source of scientific inquiry, programmatic deadlock, and public controversy. The author's focus is on waste from the commercial applications of nuclear energy, not exclusively from nuclear power plants. Additionally, author, J. Samuel Walker, examines the early history of radioactive waste disposal at government installations that produced materials for nuclear weapons within this book. Related products; Permissible Dose ISBN: 9780160949432 Three Mile Island ISBN: 9780160945983 Other products produced by the United States Nuclear Regulatory Commission (USNRC) can be found here: <https://bookstore.gpo.gov/agency/nuclear-regulatory-commission-nrc>

**Radioactive Waste Engineering and Management** The disposal of nuclear waste is becoming a major concern. Many nuclear power plants around the world are nearing the end of their operating lives. This is particularly true in the United States where most nuclear power plants are approaching the end of the operation time period allowed in their licenses. The disposal of radioactive waste from nuclear power plants and nuclear missiles is as politically intense an issue as the plants and missiles themselves. Yet the three issues have remained curiously separate in spite of their close physical ties. Few debates on nuclear power or nuclear weapons discuss the problems of waste disposal should the power plant or missile be decommissioned. Few debates on nuclear waste disposal discuss the opportunities to close nuclear power plants or get rid of nuclear weapons a disposal site would afford. Nuclear waste can be generally classified as either "low level" radioactive waste or "high level" radioactive waste. Low level nuclear waste usually includes material used to handle the highly radioactive parts of nuclear reactors (i.e. cooling water pipes and radiation suits) and waste from medical procedures involving radioactive treatments or x-rays. Low level waste is comparatively easy to dispose of. The level of radioactivity and the half life of the radioactive isotopes in low level waste is relatively small. Storing the waste for a period of 10 to 50 years will allow most of the radioactive isotopes in low level waste to decay, at which point the waste can be disposed of as normal refuse. High level radioactive waste is generally material from the core of the nuclear reactor or nuclear weapon. This waste includes uranium, plutonium, and other highly radioactive elements made during fission. Most of the radioactive isotopes in high level waste emit large amounts of radiation and have extremely long half-lives (some longer than 100,000 years) creating long time periods before the waste will settle to safe levels of radioactivity. This new book explores the issues pertaining, either directly or indirectly, to nuclear waste disposal.

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## The Microbiology of Nuclear Waste Disposal

Decision-making and Radioactive Waste Disposal Nuclear Waste Management Strategies: An International Perspective presents worldwide insights into nuclear waste management strategies from a technical engineering perspective, with consideration for important legal aspects. It provides a one-stop, comprehensive analysis of both historical and up-to-date nuclear waste management strategies, while consulting important legal aspects of decision-making and implementation processes. With case studies from around the world, this book provides a unique understanding of nuclear waste management technologies and methods available, ensuring that researchers and engineering professionals are equipped with the right knowledge to design, build, implement and improve their own waste management strategies. This book will benefit those researching and learning in the nuclear energy sector, especially those specializing in nuclear waste management strategies, as well as technical and legal communities within nuclear and environmental areas. It is also a valuable resource for lawmakers and regulatory bodies concerned with nuclear policy and waste management. Provides a one-stop location for reference material on nuclear waste management strategies from around the world Focuses on the associated technical engineering elements of planning for, and implementing, waste management strategies Includes real-life examples from Europe, North America, South America, Asia, the Middle East and Africa

Radioactive Waste Management and Contaminated Site Clean-Up The Geological Disposal of Nuclear Waste Neil A. Chapman and Ian G. McKinley The disposal of radioactive wastes is becoming a central issue in the nuclear debate and any consideration of the future of nuclear power, and its effect on the environment must take waste management into account. Nuclear waste is currently a significant political issue in Western Europe and North America and is becoming increasingly important in all other countries with existing or planned nuclear programmes. This is the first book to tackle in a comprehensive and integrated fashion the problems associated with the geological disposal of nuclear waste. International research and development launched during the last decade has enabled the authors to describe detailed concepts for the long-term management and disposal of such material. The level of presentation is such that readers with high school science will be able to understand the issues involved. However, the broad scope of coverage with references provided throughout as well as a guide to the key sources of information, make this an invaluable book for both the researcher and the lay environmental scientist.

Geologic Disposal of Radioactive Waste in Perspective The United States currently has no place to dispose of the high-level radioactive waste resulting from the production of the nuclear weapons and the operation of nuclear electronic power plants. The only option under formal consideration at this time is to place the waste in an underground geologic repository at Yucca Mountain in Nevada. However, there is strong public debate about whether such a repository could protect humans from the radioactive waste that will be dangerous for many thousands of years. This book shows the extent to which our scientific knowledge can guide the federal government in developing a standard to protect the health of the public from wastes in such a repository at Yucca Mountain. The U.S. Environmental Protection Agency is required to use the recommendations presented in this book as it develops its standard.

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