

1. Record Nr.	UNINA990004809480403321
Autore	Manzoni, Alessandro <1785-1873>
Titolo	Fermo e Lucia / Alessandro Manzoni ; a cura di Cesare Federico Goffis
Pubbl/distr/stampa	Milano, : Marzorati, c1970
Descrizione fisica	2 v. ; 22 cm
Collana	Scrittori italiani , Sezione letteraria ; 1
Disciplina	853.7
Locazione	FLFBC
Collocazione	853.7 MANZ 12(1;1-2) ALPHA 0807 (1 BIS) ALPHA 0807 (2 BIS)
Lingua di pubblicazione	Italiano
Formato	Materiale a stampa
Livello bibliografico	Monografia

2. Record Nr.	UNINA9910139568103321
Titolo	Nuclear power and the environment
Pubbl/distr/stampa	Cambridge, : RSC Pub., 2011 Cambridge : , : RSC Pub., , 2011
ISBN	9781849732888 1849732884
Edizione	[1st ed.]
Descrizione fisica	1 online resource (247 p.)
Collana	Issues in environmental science and technology, , 1350-7583 ; ; v. 32
Disciplina	333.7924
Soggetti	Nuclear power plants - Environmental aspects
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Nuclear Power and the Environment -- Contents -- Nuclear Power Generation - Past, Present and Future -- 1 Introduction -- 2 Origins of Nuclear Power: The Nuclear Weapons Programme -- 3 Expansion of Nuclear Power -- 4 A Period of Decline -- 5 A Nuclear Renaissance? Possibilities and Challenges -- 5.1 Uranium: A Sustainable Energy Source? -- 5.2 Nuclear Power Economics -- 5.3 Shortages in Skilled Labour and Materials -- 5.4 Nuclear Safety -- 5.5 Nuclear Waste Disposal and Decommissioning Nuclear Plants -- 5.6 Proliferation Risks -- 6 Conclusions -- References -- Nuclear Fuel Cycles: Interfaces with the Environment -- 1 Nuclear Fission as an Energy Resource -- 2 Nuclear Fuel -- 2.1 Uranium Mining -- 2.2 Uranium Fuel Production and Use -- 2.3 Modern Civil Reactor Fuels -- 2.3.1 Plutonium -- 2.4 Irradiation of Nuclear Fuel -- 2.5 Alternative Fuels -- 2.5.1 Uranium/Plutonium Fast Reactors -- 2.5.2 Highly Enriched Uranium -- 2.5.3 Thorium -- 3 Nuclear Fuel Recycling -- 3.1 Separation of Uranium and Plutonium -- 3.2 Other Reasons to Reprocess -- 3.3 Historical Reprocessing Technologies -- 3.3.1 Precipitation Processes -- 3.4 Purex -- 3.5 Wastes from Fuel Reprocessing -- 3.6 Other Solvent Extraction Processes -- 4 Waste Management Options -- 4.1 The UK Waste Inventory -- 5 Impact of the "Global Nuclear Renaissance" -- 5.1 Growth in Demand -- 5.2 Implications for the Fuel Cycle -- 6 Conclusions -- Acknowledgements -- References -- Nuclear

Accidents -- 1 Introduction -- 2 The 1957 Windscale Fire -- 2.1 Events Leading to the Accident -- 2.2 Environmental Contamination -- 2.3 Radiation Exposures and Health Impacts -- 2.4 Social and Psychological Consequences -- 3 The Kyshtym Explosion -- 3.1 Events Leading to the Accident -- 3.2 Environmental Contamination -- 3.3 Radiation Exposures and their Environmental and Health Impacts. 3.4 Social and Psychological Impacts -- 4 Three-Mile Island -- 4.1 Events Leading to the Accident -- 4.2 Environmental Contamination -- 4.3 Radiation Exposures and their Environmental and Health Impacts -- 4.4 Social and Psychological Impacts -- 5 The Chernobyl Accident -- 5.1 Events Leading to the Accident -- 5.2 Environmental Contamination -- 5.3 Radiation Exposures and their Environmental and Health Impacts -- 5.4 Social and Psychological Impacts -- 6 Conclusions -- References -- Management of Land Contaminated by the Nuclear Legacy -- 1 Introduction -- 2 Contamination at Worldwide Nuclear Facilities -- 2.1 United Kingdom -- 2.1.1 Sellafield -- 2.1.2 Dounreay -- 2.2 Russia -- 2.2.1 Mayak -- 2.3 United States of America -- 2.3.1 Rocky Flats -- 2.3.2 Oak Ridge -- 2.3.3 Hanford -- 3 Depleted Uranium -- 4 Remediation -- 4.1 Bioremediation -- 4.2 Chemical Redox Reactions -- 4.3 Permeable Reactive Barrier -- 4.4 Sediment Washing -- 4.5 Electrokinetic Remediation -- 5 Case Studies -- 5.1 Hanford Case Study -- 5.2 Rifle Case Study -- 5.3 Oak Ridge Case Study -- 6 Conclusions -- Acknowledgements -- References -- Decommissioning of Nuclear Sites -- 1 Introduction -- 2 The Goal of Decommissioning -- 3 Stages of Decommissioning -- 4 The Scale of the Decommissioning Challenge in the UK -- 5 Decommissioning Techniques -- 6 Selection of a Decommissioning Approach -- 7 Environmental Impacts of Decommissioning -- 8 Conclusions -- References -- Geodisposal of Higher Activity Wastes -- 1 Introduction -- 2 Radioactive Wastes -- 2.1 High Level Wastes -- 2.2 Intermediate Level Waste -- 2.3 Low Level Waste -- 2.4 Other Potential Wastes -- 3 Geological Disposal -- 3.1 The GDF Concept -- 3.2 International Experience -- 3.2.1 Suitable Host Geologies -- 3.2.2 Engineering Approaches -- 3.3 Implementing the UK GDF. 3.3.1 Historical Perspective, Public Consultation, Policy Decisions, and Responsibilities -- 3.3.2 Guiding Principles and Timeline -- 3.3.3 Site Selection -- 3.3.4 Inventory of Geodisposal Wastes -- 3.3.5 Conditioning and Packaging of Geodisposal Wastes -- 3.3.6 Interim Storage of Geodisposal Wastes -- 3.3.7 Reference Scenarios -- 4 Environmental Chemistry Research Challenges in Geological Disposal -- Acknowledgements -- References -- Pathways of Radioactive Substances in the Environment -- 1 Introduction -- 2 Sources of Radionuclides in the Environment -- 2.1 Nuclear Weapons -- 2.2 Nuclear Fuel Cycle -- 2.3 Depleted Uranium -- 2.4 Naturally Occurring Radioactive Material -- 2.5 Accidental Release -- 3 Environmental Chemistry of Key Contaminants -- 4 Processes and Factors affecting Radionuclide Transport in the Atmosphere -- 5 Processes and Factors affecting Radionuclide Transport in Aquatic Systems -- 5.1 Sorption to Mineral Surfaces -- 5.2 Redox Reactions -- 5.3 Complexation Reactions -- 5.4 (Co-)Precipitation -- 5.5 Colloidal Transport -- 6 Conclusions -- References -- Radiation Protection of the Environment: A Summary of Current Approaches for Assessment of Radionuclides in Terrestrial Ecosystems -- 1 Introduction -- 2 Radiation Protection of Wildlife -- 3 Environmental Transfer in Terrestrial Ecosystems -- 3.1 Atmospheric Deposition -- 3.2 Radionuclides in Soil -- 3.3 Radionuclide Transfer to Plants -- 3.3.1 Quantification of Transfer to Plants -- 3.4 Radionuclide Transfer to Terrestrial Animals -- 3.4.1 Gastrointestinal Absorption -- 3.4.2 Radionuclide Distribution in

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Sommario/riassunto

The environmental implications of generating electric power from nuclear fission have been a matter of concern since the construction of the earliest nuclear reactors and power stations in the 1950's. After two or more decades of construction of nuclear power stations, this ceased in many countries, largely as a result of concerns for the environment and human health. However, the pressing need to reduce greenhouse gas emissions is leading many countries to plan extensive new programmes of construction of nuclear power stations which serves to re-emphasis concerns over environmental impacts.
