

New publications



Annual Report 2008

ISBN 978-92-64-99076-0. 48 pages. Free: paper or web.

Economic and technical aspects of the nuclear fuel cycle

Strategic and Policy Issues Raised by the Transition from Thermal to Fast Nuclear Systems

ISBN 978-92-64-06064-7. 84 pages. Price: € 40, US\$ 54, £ 34, ¥ 5 000.

The renewed interest in nuclear energy triggered by concerns about global climate change and security of supply, which could lead to substantial growth in nuclear electricity generation, enhances the attractiveness of fast neutron reactors with closed fuel cycles. Moving from the current fleet of thermal neutron reactors to fast neutron systems will require many decades and extensive RD&D efforts. This book identifies and analyses key strategic and policy issues raised by such a transition, aiming at providing guidance to decision makers on the best approaches for implementing transition scenarios. The topics covered in this book will be of interest to government and nuclear industry policy makers as well as to specialists working on nuclear energy system analyses and advanced fuel cycle issues.

Nuclear safety and regulation

CSNI Technical Opinion Papers – No. 10

The Role of Human and Organisational Factors in Nuclear Power Plant Modifications

ISBN 978-92-64-99064-7. 28 pages. Free: paper or web.

Nuclear power plant modifications may be needed for a number of different reasons. These include physical ageing of plant systems, structures and components; obsolescence in hardware and software; feedback from operating experience; and opportunities for improved plant safety, reliability or capability. However, experience has also shown that weaknesses in the design and/or implementation of modifications can present significant challenges to plant safety. They can also have a considerable impact on the commercial performance of the plant. It is therefore important that the plant modification process reflect a recognition of the potential impact of human errors and that it incorporate suitable measures to minimise the potential for such errors.

In this context, the NEA Committee on the Safety of Nuclear Installations (CSNI) and its Working Group on Human and Organisational Factors organised an international workshop in 2003 to discuss the role of human and organisational performance in the nuclear plant modification process. This technical opinion paper represents the consensus of specialists in human and organisational factors (HOF) in the NEA member countries on commendable practices and approaches to dealing with nuclear plant modifications. It considers factors that should be taken into account when developing a modification process and identifies some lessons learnt from application of the process. The paper should be of particular interest to nuclear safety regulators and nuclear power plant operators.

CSNI Technical Opinion Papers – No. 11

Better Nuclear Plant Maintenance: Improving Human and Organisational Performance

ISBN 978-92-64-99065-4. 28 pages. Free: paper or web.

Errors during maintenance and periodic testing are significant contributors to plant events. These errors may not always be revealed by post-maintenance tests and may remain undetected for extended periods until the affected system is called upon to function. It is therefore important that the plant maintenance process take into account the potential impact of human and organisational errors, and that it incorporate suitable measures to minimise the potential for such errors.

The NEA Committee on the Safety of Nuclear Installations (CSNI) and its Working Group on Human and Organisational Factors organised an international workshop to discuss the role of human and organisational performance on maintenance. This technical opinion paper represents the consensus of specialists on human and organisational factors in NEA member countries on commendable practices and approaches to dealing with nuclear power plant maintenance. It sets out a framework for including a systematic consideration of human and organisational factors in the plant maintenance process. The paper should be of particular interest to nuclear safety regulators and nuclear power plant operators.

Improving Nuclear Regulation

Compilation of NEA Regulatory Guidance Booklets

ISBN 978-92-64-99075-3. 208 pages. Free: paper or web.

A common theme throughout the series of NEA regulatory guidance reports, or “green booklets”, is the premise that the fundamental objective of all nuclear safety regulatory bodies is to ensure that nuclear facilities are operated at all times and later decommissioned in an acceptably safe manner. In meeting this objective the regulator must keep in mind that it is the operator that has responsibility for safely operating a nuclear facility; the role of the regulator is to oversee the operator’s activities as related to assuming that responsibility.

For the first time, the full series of these reports has been brought together in one edition. As such, it is intended to serve as a knowledge management tool both for current regulators and the younger generation of nuclear experts entering the regulatory field. While the audience for this publication is primarily nuclear regulators, the information and ideas may also be of interest to nuclear operators, other nuclear industry organisations and the general public.

Radiological protection

Occupational Exposures at Nuclear Power Plants

Seventeenth Annual Report of the ISOE Programme, 2007

ISBN 978-92-64-99082-1. 120 pages. Free: paper or web.

The Information System on Occupational Exposure (ISOE) was created by the OECD Nuclear Energy Agency in 1992 to promote and co-ordinate international co-operative undertakings in the area of worker protection at nuclear power plants. ISOE provides experts in occupational radiological protection with a forum for communication and exchange of experience.

The programme includes 71 participating utilities in 29 countries (334 operating units and 45 shutdown units), as well as the regulatory authorities of 25 countries. The ISOE database, annual symposia and ISOE Network website facilitate the exchange of operational experience and lessons learnt among participants. The Seventeenth Annual Report of the ISOE Programme summarises occupational exposure data trends and ISOE achievements made during 2007. Principal developments in ISOE participating countries are also described. ISOE is jointly sponsored by the OECD Nuclear Energy Agency and the International Atomic Energy Agency (IAEA).

今日の世界における放射線防護：持続可能性に向けて

Japanese version of *Radiation Protection in Today's World: Towards Sustainability*

ISBN 978-92-64-99063-0. 72 pages. Free: paper or web.

Summary Report of the CRPPH 50th Anniversary Conference

Committee on Radiation Protection and Public Health (CRPPH), 31 May 2007

ISBN 978-92-64-99078-4. 48 pages. Free: paper or web.

The NEA Committee on Radiation Protection and Public Health (CRPPH) celebrated its 50th anniversary in May 2007. Taking advantage of its half century of experience, the Committee took this occasion to look forward towards the next 50 years in order to identify the most significant emerging challenges to radiological protection policy, regulation and application. This report summarises the presentations and discussions of the high-level regulators and international radiological protection organisations' leaders who attended, providing their views on how the radiological protection community can best move forward together to address emerging challenges.

The NEA Contribution to the Evolution of the International System of Radiological Protection

ISBN 978-92-64-99080-7. 122 pages. Free: paper or web.

Since the International Commission on Radiological Protection (ICRP) initiated a dialogue in 1999 on the evolution of the system of radiological protection, the NEA Committee on Radiation Protection and Public Health (CRPPH) has actively engaged in providing the ICRP with input and views. The Committee's work on this subject has included eight expert group reports, seven international conferences, and four detailed review and comment assessments of draft ICRP recommendations. This report presents a chronological summary of the issues, views and concerns raised by the CRPPH as the ICRP issued various draft versions of its new recommendations (ICRP Publication 103, published in December 2007), and of the response by the ICRP as seen in its subsequent draft recommendations. The interest of this summary report is that it will not only assist readers in understanding the main themes and concepts of the new ICRP recommendations, but also why and how the changes from the previous ICRP Publication 60 recommendations came about.

Radioactive waste management

Considering Timescales in the Post-closure Safety of Geological Disposal of Radioactive Waste

ISBN 978-92-64-06058-6. 160 pages. Price: € 40, US\$ 54, £ 34, ¥ 5 000.

A key challenge in the development of safety cases for the deep geological disposal of radioactive waste is handling the long time frame over which the radioactive waste remains hazardous. The intrinsic hazard of the waste decreases with time, but some hazard remains for extremely long periods. Safety cases for geological disposal typically address performance and protection for thousands to millions of years into the future. Over such periods, a wide range of events and processes operating over many different timescales may impact on a repository and its environment. Uncertainties in the predictability of such factors increase with time, making it increasingly difficult to provide definite assurances of a repository's performance and the protection it may provide over longer timescales. Timescales, the level of protection and the assurance of safety are all linked.

Approaches to handling timescales for the geological disposal of radioactive waste are influenced by ethical principles, the evolution of the hazard over time, uncertainties in the evolution of the disposal system (and how these uncertainties themselves evolve) and the stability and predictability of the geological environment. Conversely, the approach to handling timescales can affect aspects of repository planning and implementation including regulatory requirements, siting decisions, repository design, the development and presentation of safety cases and the planning of pre- and post-closure institutional controls such as monitoring requirements. This is an area still under discussion among NEA member countries. This report reviews the current status and ongoing discussions of this issue.

Natural Tracer Profiles Across Argillaceous Formations: The CLAYTRAC Project

ISBN 978-92-64-06047-0. 364 pages. Price: € 75, US\$ 101, £ 63, ¥ 3 900.

Disposal of high-level radioactive waste and spent nuclear fuel in engineered facilities, or repositories, located deep underground in suitable geological formations is being developed worldwide as the reference solution to

protect humans and the environment both now and in the future. An important aspect of assessing the long-term safety of deep geological disposal is developing a comprehensive understanding of the geological environment in order to define the initial conditions for the disposal system as well as to provide a sound scientific basis for projecting its future evolution. The transport pathways and mechanisms by which contaminants could migrate in the surrounding host rock are key elements in any safety case. Relevant experiments in laboratories or underground test facilities can provide important information, but the challenge remains in being able to extrapolate the results to the spatial and temporal scales required for performance assessment, which are typically tens to hundreds of metres and from thousands to beyond a million years into the future. Profiles of natural tracers dissolved in pore water of argillaceous rock formations can be considered as large-scale and long-term natural experiments which enable the transport properties to be characterised.

The CLAYTRAC Project on Natural Tracer Profiles Across Argillaceous Formations was established by the NEA Clay Club to evaluate the relevance of natural tracer data in understanding past geological evolution and in confirming dominant transport processes. Data were analysed for nine sites to support scientific understanding and development of geological disposal. The outcomes of the project show that, for the sites and clay-rich formations that were studied, there is strong evidence that solute transport is controlled mainly by diffusion. The results can improve site understanding and performance assessment in the context of deep geological disposal and have the potential to be applied to other sites and contexts.

Regulating the Decommissioning of Nuclear Facilities

Relevant Issues and Emerging Practices

ISBN 978-92-64-99059-3. 84 pages. Free: paper or web.

The removal of fuel from a permanently shutdown nuclear facility eliminates the major source of radiological hazard, a nuclear criticality. Combined with the cessation of operations at high temperatures and pressures, the risk to public health and to the environment is thereby very significantly reduced. The process of decommissioning does however necessitate processes involving both conventional and radiological hazards such as the cutting and dismantling of structures, plant and equipment and the use of explosive cutting techniques. Some radiological hazards remain because of the possibility of coming into contact with radioactively contaminated or activated material. This report considers how regulatory arrangements are being adapted to the continuously changing environment, and associated risk levels in a nuclear facility that is being decommissioned. It uses examples of current practices in several countries with large decommissioning programmes to illustrate emerging regulatory trends.

Release of Radioactive Materials and Buildings from Regulatory Control

A Status Report

ISBN 978-92-64-99061-6. 72 pages. Free: paper or web.

The radiological concept of clearance can be defined as the release of radioactive materials or buildings from any further regulatory control applied for radiological protection purposes by the competent body. It is generally based on the assumption that, following clearance, any potential radiological exposure of the public will be trivial. Clearance is now a mature concept being used for the management of large amounts of radioactive materials (including metals, building rubble, cables and plastics) and disused buildings associated with a controlled nuclear activity. There are, however, differences in the ways in which clearance is dealt with in the regulatory frameworks of various countries and the ways in which clearance has been implemented in diverse decommissioning projects. This report provides up-to-date information on an array of national approaches to clearance. It should be of particular help to those planning the implementation of a clearance procedure, such as that for decommissioning a nuclear facility.

Stability and Buffering Capacity of the Geosphere for Long-term Isolation of Radioactive Waste: Application to Crystalline Rock

Workshop Proceedings, Manchester, United Kingdom, 13-15 November 2007

ISBN 978-92-64-06056-2. 304 pages. Price: € 65, US\$ 87, £ 55, ¥ 8 100.

Geological settings selected as potential host formations for the deep geological disposal of radioactive waste are chosen for, among other assets, their long-term stability and buffering capacity against disruptive or destabilising events and processes. The NEA Integration Group for the Safety Case organised a workshop on geosphere stability to develop a better understanding of the scientific evidence and arguments that contribute to confidence in the geological stability for deep geological disposal.

These proceedings present the outcomes of a geosphere stability workshop, held in November 2007, that focused on crystalline and other types of hard, fractured rocks. The workshop underscored the fact that many such rocks are intrinsically stable environments that evolve extremely slowly and provide good buffering against external events and processes. There is a good understanding of the processes and events that can affect crystalline rocks and, although there is less confidence in predicting exactly when and where such events will occur and the volume of rock that will be affected, the extent of the impacts on a geological repository can be confidently addressed using bounding approaches supported by geological information from similar sites around the world.

Nuclear law

Nuclear Law Bulletin

ISSN 0304-341X. 2009 subscription: € 114, US\$ 150, £ 79, ¥ 16 500.

Considered to be the standard reference work for both professionals and academics in the field of nuclear law, the *Nuclear Law Bulletin* is a unique international publication providing its subscribers with up-to-date information on all major developments falling within the domain of nuclear law. Published twice a year in both English and French, it covers legislative developments in almost 60 countries around the world as well as reporting on relevant jurisprudence and administrative decisions, international agreements and regulatory activities of international organisations.

Nuclear science and the Data Bank

Chemical Thermodynamics of Thorium – Volume 11

ISBN 978-92-64-05667-1. 942 pages. Price: € 175, US\$ 248, £ 136, ¥ 26 200.

This volume is the eleventh in the OECD Nuclear Energy Agency (NEA) “Chemical Thermodynamics” series. It is based on a critical review of the thermodynamic properties of thorium, its solid compounds and aqueous complexes, initiated as part of the NEA Thermochemical Database Project Phase III (TDB III). The database system developed at the OECD/NEA Data Bank ensures consistency not only within the recommended data sets of thorium, but also amongst all the data sets published in the series. This volume will be of particular interest to scientists carrying out performance assessments of deep geological disposal sites for radioactive waste.

Mobile Fission and Activation Products in Nuclear Waste Disposal

Workshop Proceedings, La Baule, France, 16-19 January 2007

ISBN 978-92-64-99072-2. 264 pages. Free: paper or web.

Most experts worldwide agree that disposal of spent nuclear fuel in appropriate formations deep underground provides a suitable option. Most public discussions about these underground repositories concentrate on the radiological hazard associated with the potential leak of actinides to the biosphere. However, the radiotoxicity of the fission products dominates the total radiotoxicity of the spent nuclear fuel during the first 100 years. Thereafter, their radiotoxicity diminishes and the long-term radiotoxicity becomes dominated by the actinides, mainly by the plutonium and americium isotopes.

The aim of the international workshop on Mobile Fission and Activation Products in Nuclear Waste Disposal, MOFAP07, was to review and to identify the needs for further studies on the transport and chemical behaviour of fission products in the geosphere for the safety assessment of radioactive waste repositories. These proceedings contain 22 peer-reviewed papers from the workshop, which should be of particular interest to professionals in the radioactive waste management field.

Nuclear Fuel Cycle Transition Scenario Studies

Status Report

ISBN 978-92-64-99068-5. 124 pages. Free: paper or web.

Future nuclear fuel cycles could effectively address radioactive waste issues with the implementation of partitioning and transmutation (P&T). Previous studies have defined the infrastructure requirements for several key technical approaches. While these studies have proven extremely valuable, several countries have also recognised the complex, dynamic nature of the infrastructure problem: severe new issues arise when attempting to transit from current open or partially closed cycles to a final equilibrium or burn-down mode. While the issues are country-specific when addressed in detail, it is believed that there exists a series of generic issues related only to the current situation and to the desired end point. These issues are critical to implementing a sustainable nuclear energy infrastructure. The present report focuses on the definition of key issues, the assessment of technologies and national scenario assessments.

PENELOPE-2008: A Code System for Monte Carlo Simulation of Electron and Photon Transport

Workshop Proceedings, Barcelona, Spain, 30 June-3 July 2008

ISBN 978-92-64-99066-1. 336 pages. Free: paper or web.

Radiation is used in many applications of modern technology. However, its proper handling requires competent knowledge of the basic physical laws governing its interaction with matter. To ensure its safe use, appropriate tools for predicting radiation fields and doses, and subsequently establishing pertinent regulations, are required. One area of radiation physics that has received much attention concerns electron-photon transport in matter. PENELOPE is a modern, general-purpose Monte Carlo tool for simulating the transport of electrons and photons, which is applicable for arbitrary materials and in a wide energy range. PENELOPE provides quantitative guidance for many practical situations and techniques, including electron and X-ray spectroscopies, electron microscopy and microanalysis, biophysics, dosimetry, medical diagnostics and radiotherapy, and radiation damage and shielding. These proceedings contain the extensively revised teaching notes of the latest workshop/training course on PENELOPE (version 2008), along with a detailed description of the improved physics models, numerical algorithms and structure of the code system.

The JEFF-3.1.1 Nuclear Data Library

JEFF Report 22 - Validation Results from JEF-2.2 to JEFF-3.1.1

ISBN 978-92-64-99074-6. 62 pages. Free: paper with CD-ROM or web.

The JEFF-3.1.1 library is an updated version of the JEFF-3.1 Joint Evaluated File for Fission and Fusion. It consists of sets of evaluated nuclear data for reactor applications. Reliable data of this sort are necessary to improve the safety and economy of existing installations, as well as for the design and efficient operation of advanced nuclear reactors. The improvements in this latest version of the JEFF-3.1.1 library are particularly noteworthy as regards light water reactor applications and the associated fuel cycle. The present report provides detailed information on the analysis and incremental validation process employed with regard to the JEF-2.2 library, which has provided the basis for the JEFF-3.1.1 library.

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