

# New publications

## General information

### Annual Report 2006

ISBN 978-92-64-99003-6. Free: paper or web.



## Economic and technical aspects of the nuclear fuel cycle

### Innovation in Nuclear Energy Technology

ISBN 978-92-64-00644-7. Price: € 45, US\$ 60, £ 32, ¥ 6 200.

This report provides an overview of the state of the art in nuclear innovation systems, including their driving forces, main actors, institutional and legal frameworks, and infrastructure for knowledge and programme management. It also offers policy recommendations based on country reports and case studies supplied by participating member countries.

### Management of Recyclable Fissile and Fertile Materials

ISBN 978-92-64-03255-2. Price: € 30, US\$ 39, £ 21, ¥ 4 100.

This report provides an overview of recyclable fissile and fertile materials inventories which can be reused as nuclear fuel. It reviews the options available for managing those materials, through recycling and/or disposal. The potential energetic value of recyclable materials is assessed, taking into account the variability of retrievable energy contents of various materials according to technology and strategy choices made by the owners of the materials. The analyses contained in this report will be of particular interest to energy policy makers and to nuclear fuel cycle experts.

### Nuclear Energy Data 2007/Données sur l'énergie nucléaire 2007

ISBN 978-92-64-03453-2. Price: € 30, US\$ 39, £ 21, ¥ 4 100.

This new edition of *Nuclear Energy Data*, the OECD Nuclear Energy Agency's annual compilation of essential statistics on nuclear energy in OECD countries, offers projections lengthened to 2030 for the first time and information on the development of new centrifuge enrichment capacity in member countries. The compilation gives readers a comprehensive and easy-to-access overview of the current situation and expected trends in various sectors of the nuclear fuel cycle, providing authoritative information to policy makers, experts and academics working in the nuclear energy field.

### Risks and Benefits of Nuclear Energy

ISBN 978-92-64-03551-5. Price: € 24, US\$ 29, £ 17, ¥ 3 300.

In the context of sustainable development policies, decision making in the energy sector should be based on carefully designed trade-offs which take into account, insofar as feasible, all of the alternative options' advantages and drawbacks from the economic, environmental and social viewpoints. This report examines

various aspects of nuclear and other energy chains for generating electricity, and provides illustrative examples of quantitative and qualitative indicators for those chains with regard to economic competitiveness, environmental burdens (such as air emissions and solid waste streams) and social aspects (including employment and health impacts). This report will be of interest to policy makers and analysts in the energy and electricity sectors. It offers authoritative data and references to published literature on energy chain analysis which can be used in support of decision making.

## Nuclear safety and regulation

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### Benchmarking of CFD Codes for Application to Nuclear Reactor Safety

Workshop Proceedings, Garching (Munich), Germany, 5-7 September 2006

CD-ROM. Free on request.

On 5-7 September 2006, the OECD Nuclear Energy Agency organised a workshop on Benchmarking of CFD Codes for Application to Nuclear Reactor Safety (CFD4NRS) in co-operation with the International Atomic Energy Agency. The workshop was hosted in Germany by the *Gesellschaft für Anlagen und Reaktorsicherheit* (GRS). The purpose of the workshop was to provide a forum for numerical analysts and experimentalists to exchange information on nuclear reactor safety activities relevant to computational fluid dynamics (CFD) validation, with the objective of providing input to create a practical, state-of-the-art, web-based assessment matrix on the use of CFD for nuclear reactor safety applications. These proceedings contain the 39 technical papers presented at the workshop, which was attended by 100 participants.

### CSNI Technical Opinion Papers – No. 9

Level-2 PSA for Nuclear Power Plants

ISBN 978-92-64-99008-1. Free: paper or web.

This technical opinion paper represents the consensus of risk analysts in NEA member countries on the current state of the art of level-2 probabilistic safety assessment (PSA) and its applications in accident management of nuclear power plants. Level-2 PSA models the phenomena that could occur following the onset of core damage that have the potential to challenge the containment integrity and lead to a release of radioactive material to the environment. The paper's objective is to present decision makers in the nuclear field with a clear technical opinion on the status as implemented in industrial PSAs. The intended audience is primarily nuclear safety regulators, researchers and industry representatives dealing with safety management and severe accidents. Government authorities and nuclear power plant operators may also be interested in the paper.

### Evaluation of Uncertainties in Relation to Severe Accident and Level-2 Probabilistic Safety Analysis

Workshop Proceedings, Aix-en-Provence, France, 7-9 November 2005

CD-ROM. Free on request.

Uncertainty in relation to several severe accident phenomena plays a major role in probabilistic safety analyses involving beyond-design-basis accident scenarios for nuclear power plants. The technical papers presented herein will be valuable for nuclear safety analysts, nuclear power plant designers and R&D managers, especially with regard to unresolved severe accident issues or issues where risk uncertainty is high.

### Nuclear Safety Research in OECD Countries

Support Facilities for Existing and Advanced Reactors (SFEAR)

ISBN 978-92-64-99005-0. Free: paper or web.

This report provides an overview of experimental facilities that can be used to address nuclear safety research issues in OECD member countries, and identifies priorities for organising international co-operative programmes centred on selected facilities. The information has been gathered and analysed by a Senior Group of Experts on Nuclear Safety Research, in the context of an ongoing initiative of the NEA Committee on the Safety of Nuclear Installations (CSNI) aimed at maintaining critical experimental infrastructure for nuclear safety studies in member countries.

# Radiological protection

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## Environmental Radiological Protection in the Law

### A Baseline Survey

ISBN 978-92-64-99000-5. Free: paper or web.

This publication describes a study of international, European and national legislation which protect the environment from radiation. Countries covered include Australia, Canada, France, Japan, the United Kingdom and the United States. The analysis of the legislation draws conclusions about how well the environment is protected from radiation, and identifies strengths and weaknesses of current approaches as well as trends in regulation. The book will be useful reading for regulators and policy makers in radiological protection, but also for those interested in environmental regulation more generally.

## Fifty Years of Radiological Protection

### The CRPPH 50<sup>th</sup> Anniversary Commemorative Review

ISBN 978-92-64-99017-3. Free: paper or web.

On 21 March 1957, the Steering Committee for Nuclear Energy of the Organisation for European Economic Co-operation established the Working Party on Public Health and Safety. From this early date onwards, radiological protection formed a central part of the work of what was to become the OECD Nuclear Energy Agency. Now, 50 years later, the Committee on Radiation Protection and Public Health (CRPPH) has commissioned this historical review of half a century of work and accomplishments. Over this period, the key topics in radiological protection have been identified, debated and addressed by the CRPPH. This report brings this history to life, presenting the major questions in the context of their time, and of the personalities who worked to address them. The developments and views of the past condition how we are able to assess and manage radiological risks today, as well as how we may adjust to challenges that will or could emerge in the coming years. This heritage is thus an important element for the CRPPH to consider as it looks forward to its next 50 years of accomplishments.

## Occupational Exposures at Nuclear Power Plants

### Fifteenth Annual Report of the ISOE Programme, 2005

ISBN 978-92-64-99010-4. 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 radiation protection with a forum for communication and exchange of experience. The ISOE databases enable the analysis of occupational exposure data from 480 commercial nuclear power plants participating in the programme (representing some 90% of the world's total operating commercial reactors). The Fifteenth Annual Report of the ISOE Programme summarises achievements made during 2005 and compares annual occupational exposure data. Principal developments in ISOE participating countries are also described.

## Radiation Protection in Today's World: Towards Sustainability

ISBN 978-92-64-99013-5. Free: paper or web.

The science and application of radiological protection have continually evolved since the beginning of the 20<sup>th</sup> century when the health effects of radiation first began to be discovered. Given these changes, notably over the past 10 to 15 years, and considering the recent evolution of social values and judgements, the NEA Committee on Radiation Protection and Public Health (CRPPH) felt that it would be worthwhile to identify possible emerging challenges as well as ongoing challenges that will require new approaches to reach sustainable decisions. This report concisely describes the CRPPH views of the most significant challenges to radiological protection policy, regulation and application that are likely to emerge or are already emerging. While not proposing solutions to these issues, the report characterises key aspects and pressures, taking into account the evolution of science, society and experience, such that governments can better foresee these challenges and be prepared to address them appropriately.

# Radioactive waste management

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## **Engineered Barrier Systems (EBS) in the Safety Case: The Role of Modelling**

Workshop Proceedings, La Coruña, Spain, 24-26 August 2005

ISBN 978-92-64-00664-5. Price: € 45, US\$ 60, £ 32, ¥ 6 200.

These proceedings include the main findings and presented papers from the third NEA-EC workshop on engineered barrier systems, which focused on the role of EBS modelling in the safety case for deep disposal. Some national programmes are placing increased emphasis on EBS and, as implementation of underground repositories approaches, more realistic assessments of EBS performance are needed. The workshop examined the modelling tools currently available and identified complex areas of assessment in which further dialogue is needed.

## **Fostering a Durable Relationship Between a Waste Management Facility and its Host Community**

Adding Value Through Design and Process

ISBN 978-92-64-99015-9. Free: paper or web.

Any long-term radioactive waste management project is likely to last decades to centuries. It requires a physical site and will impact in a variety of ways on the surrounding community over that whole period. The societal durability of an agreed solution is essential to success. This report identifies a number of design elements (including functional, cultural and physical features) that favour a durable relationship between the facility and its host community by improving prospects for quality of life across generations.

## **Linkage of Geoscientific Arguments and Evidence in Supporting the Safety Case**

Second AMIGO Workshop Proceedings, Toronto, Canada, 20-22 September 2005

ISBN 978-92-64-01966-9. Price: € 50, US\$ 65, £ 36, ¥ 6 900.

Through a series of technical workshops, the OECD Nuclear Energy Agency (NEA) project on Approaches and Methods for Integrating Geological Information in the Safety Case (AMIGO), is devoted to defining and improving the collection and use of geological evidence that contribute to the understanding of long-term safety for radioactive waste disposal. The second AMIGO workshop was organised in Canada in September 2005. It examined how geoscientific arguments and data are compiled and linked to create a unified description of the geological setting to support a safety case. It also examined practical aspects and limitations in collecting, linking, extrapolating and communicating such information. These proceedings present the outcomes of the workshop.

## **The NEA Co-operative Programme on Decommissioning**

A Decade of Progress

ISBN 92-64-02332-1. Free: paper or web.

The NEA Co-operative Programme for the Exchange of Scientific and Technical Information Concerning Nuclear Installation Decommissioning Projects (CPD) is a joint undertaking which functions within the framework of an agreement between 21 organisations actively executing or planning the decommissioning of nuclear facilities. The objective of the CPD is to acquire and share information from operational experience in the decommissioning of nuclear installations that is useful for future projects. This report describes the progress made and the main results obtained by the CPD during 1995-2005. Although part of the information exchanged within the CPD is confidential and restricted to programme participants, experience of general interest gained under the programme's auspices is released for broader use. Such information is brought to the attention of all NEA members through regular reports to the NEA Radioactive Waste Management Committee (RWMC), as well as through experience summary documents such as this report. The RWMC Working Party on Decommissioning and Dismantling (WPDD) is grateful to the CPD for sharing the experience from its important work.

## Stakeholder Involvement in Decommissioning Nuclear Facilities

### International Lessons Learnt

ISBN 978-92-64-99011-1. Free: paper or web.

Significant numbers of nuclear facilities will need to be decommissioned in the coming decades. In this context, NEA member countries are placing increasing emphasis on the involvement of stakeholders in the associated decision procedures. This study reviews decommissioning experience with a view to identifying stakeholder concerns and best practice in addressing them. The lessons learnt about the end of the facility life cycle can also contribute to better foresight in siting and building new facilities. This report will be of interest to all major players in the field of decommissioning, in particular policy makers, implementers, regulators and representatives of local host communities.

## Nuclear law

### Nuclear Law Bulletin

ISSN 0304-341X. Price: € 99, US\$ 125, £ 68, ¥ 13 400.

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

### Boiling Water Reactor Turbine Trip (TT) Benchmark

#### Volume III: Summary Results of Exercise 2

ISBN 92-64-02331-3. Free: paper or web.

The present volume is the third in a series of four and summarises the results of the second benchmark exercise, which identifies the key parameters and important issues concerning the coupled neutronics/thermal-hydraulic core modelling with provided core inlet and outlet boundary conditions. The transient addressed is a turbine trip in a boiling water reactor, involving pressurisation events in which the coupling between core phenomena and system dynamics plays an important role. In addition, the data made available from experiments carried out at the Peach Bottom 2 reactor (a GE-designed BWR/4) make the present benchmark particularly valuable.

### Burn-up Credit Criticality Benchmark

#### Phase II-D: PWR-UO<sub>2</sub> Assembly – Study of Control Rod Effects on Spent Fuel Composition

ISBN 92-64-02316-X. Free: paper or web.

The objective of the Phase II-D Burn-up Credit Criticality Benchmark was to study the impact of control rod (CR) insertion on spent fuel composition and on reactivity for a PWR-UO<sub>2</sub> assembly. For this purpose, a range of CR insertion profiles during irradiation were defined, and participants were asked to calculate the spent fuel inventory and the neutron multiplication factor for each case. To assist in the evaluation of the benchmark results, the sensitivity of the neutron multiplication factor to a variation of isotope concentration was performed. The large effect of CR insertion (9 000 pcm when the CRs are inserted from 0 to 45 GWd/t) is due in part to the fact that the CRs are axially fully inserted in this benchmark. A more “typical” CR insertion profile would not consider CRs fully inserted throughout the irradiation, particularly over three cycles. An additional benchmark has been initiated to study the effect of CR insertion when considering partial axial CR insertion and an axial burn-up profile.

## Handbook on Lead-bismuth Eutectic Alloy and Lead Properties, Materials Compatibility, Thermal-hydraulics and Technologies

ISBN 978-92-64-99002-9. Free: paper or web.

As part of the development of advanced nuclear systems, including accelerator-driven systems (ADS) proposed for high-level radioactive waste transmutation and generation IV reactors, heavy liquid metals such as lead (Pb) or lead-bismuth eutectic (LBE) are under evaluation as reactor core coolant and ADS neutron target material. Heavy liquid metals are also being envisaged as target materials for high-power neutron spallation sources. The objective of this handbook is to collate and publish properties and experimental results on Pb and LBE in a consistent format in order to provide designers with a single source of qualified properties and data and to guide subsequent development efforts. The handbook covers liquid Pb and LBE properties, materials compatibility and testing issues, key aspects of the thermal-hydraulics and system technologies, existing test facilities, open issues and perspectives.

## Mixed-oxide (MOX) Fuel Performance Benchmark

### Summary of the Results for the Halden Reactor Project MOX Rods

ISBN 978-92-64-99019-7. Free: paper or web.

Within the framework of the NEA Expert Group on Reactor-based Plutonium Disposition, a fuel modelling code benchmark test for MOX fuel was initiated, with in-pile irradiation data on two short MOX rods provided by the OECD/NEA Halden Reactor Project. This report summarises the in-pile data and fuel characteristics, and presents the calculation results provided by the contributors.

## Physics of Plutonium Recycling

### Volume VIII: Results of a Benchmark Considering a High-temperature Reactor (HTR) Fuelled with Reactor-grade Plutonium

ISBN 978-92-64-99007-4. Free: paper or web.

This report provides an analysis of the twelve sets of results supplied by seven experts from five countries. Participants have used nuclear data from three different evaluations having applied both Monte Carlo and deterministic methods of analysis. Participants using the same nuclear data report similar results, although some differences have been noted, particularly in relation to the fuel temperature coefficients and the whole-core xenon fission product poisoning effect. There is also evidence of good agreement between Monte Carlo and deterministic solutions for some of the participants despite the difficult nature of the problem with stochastic geometry.

### Volume IX: Benchmark on Kinetic Parameters in the CROCUS Reactor

ISBN 978-92-64-99020-3. Free: paper or web.

The present report provides an evaluation and analysis of the reactor period measurements carried out in the CROCUS reactor of the *École polytechnique fédérale de Lausanne* (EPFL) for several different delayed super-critical conditions. Two types of reactivity changes were measured employing an appropriate stable period technique in each case. The first series of experiments involved increasing the water level above the critical level. The second series was carried out by inserting/removing one of the absorber rods into/out of the core. The report also provides a benchmark model and the results obtained with different computer codes. The report will be of interest to reactor physicists and designers.

## Pressurised Water Reactor MOX/UO<sub>2</sub> Core Transient Benchmark

### Final Report

ISBN 92-64-02330-5. Free: paper or web.

Computational benchmarks based on well-defined problems with a complete set of input and a unique solution are often used as a means of verifying the reliability of numerical solutions. The problems usually employ some simplifications in order to make the analysis manageable and to enable the consistent comparison of several different models, yet complex enough to make the problem applicable to actual reactor core designs. The present benchmark has been designed to provide the framework to assess the ability of modern reactor kinetic codes to predict the transient response of a core partially loaded with mixed-oxide (MOX) fuel. It is a follow-up to a pressurised water reactor (PWR) benchmark designed to assess the ability of spatial kinetics codes to model rod ejection transients in a core with uranium-dioxide (UO<sub>2</sub>) fuel. The current problem adds



the complexity of modelling a rod eject in a core fuelled partially with weapons-grade MOX. The core chosen for the simulation is based on a four-loop Westinghouse PWR power plant similar to the reactor chosen for plutonium disposition in the United States. This report provides an analysis of the results supplied by experts. The report will be of interest to reactor physicists and designers as well as to nuclear power plant utilities.

## Reference Values for Nuclear Criticality Safety

ISBN 92-64-02333-X. Free: paper or web.

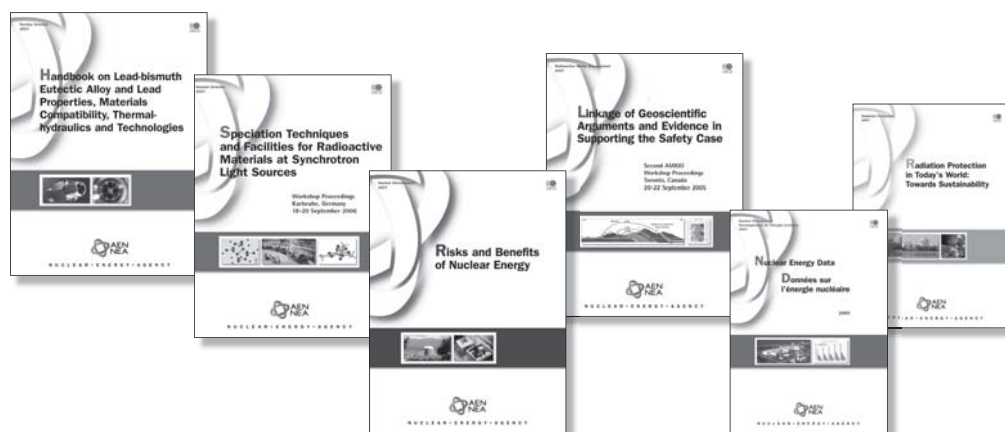
The present report represents the outcome of the NEA study and contains a compilation and evaluation of nuclear criticality safety reference values from various sources. Some of the values were taken from published reports, while others were calculated specifically for this study. Many discrepancies have been identified and resolved, thus reinforcing the importance of data verification and validation as essential tools in this field.

## Speciation Techniques and Facilities for Radioactive Materials at Synchrotron Light Sources

Workshop Proceedings, Karlsruhe, Germany, 18-20 September 2006

ISBN 978-92-64-99006-7. Free: paper or web.

This workshop was the fourth in a series devoted to the application of synchrotron radiation techniques for studying actinide species. The unique properties of synchrotron radiation allow the elucidation of the molecular and electronic structure of radionuclide samples. Since 2004 when the previous workshop was held, worldwide experimental capabilities for carrying out such studies have expanded. Synergy is developing with advanced theoretical and simulation tools, and it is expected that this progress will contribute significantly to developments in areas such as radioactive waste management, site environmental remediation and separation technologies, as well as in the radiopharmaceutical industry. The Actinide-XAS-2006 workshop brought together experts in solution, co-ordination and solid state chemistry of the actinides, actinide physics and environmental and life sciences. Workshop sessions were organised on cutting-edge experimental techniques, theoretical and modelling tools and reports on experimental facilities. These proceedings contain abstracts and peer-reviewed papers for 24 presentations as well as 33 poster session contributions, representing the current state of the art in speciation techniques and facilities for radioactive materials at synchrotron light sources.



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