New publications

General interest

The Strategic Plan of the Nuclear Energy Agency – 2011-2016

ISBN 978-92-64-99135-4. 40 pages. Free: paper or web.

Nuclear Energy Technology Roadmap

48 pages. Free: paper or web.

This nuclear energy roadmap has been prepared jointly by the International Energy Agency (IEA) and the OECD Nuclear Energy Agency (NEA). Unlike most other low-carbon energy sources, nuclear energy is a mature technology that has been in use for more than 50 years. The latest designs for nuclear power plants build on this experience to offer enhanced safety and performance, and are ready for wider deployment over the next few years. Several countries are reactivating dormant nuclear programmes, while others are considering nuclear for the first time. In the longer term, there is great potential for new developments in nuclear energy technology to enhance the role of nuclear power in a sustainable energy future.

Economic and technical aspects of the nuclear fuel cycle

Comparing Nuclear Accident Risks with Those from Other Energy Sources

ISBN 978-92-64-99122-4. 52 pages. Free: paper or web.

Nuclear accident risks are raised frequently in discussions of the acceptability of nuclear power generation, often framed in the context of the Three Mile Island and Chernobyl accidents. In reality, the safety record of nuclear power plants, by comparison with other electricity generation sources, is very good. This report describes how safety has been enhanced in nuclear power plants over the years, as the designs have progressed from Generation I to Generation III, and why it is important that safety remain the highest priority. This is illustrated by considering core damage frequencies and large radioactive release frequencies for each generation of nuclear power plants. It also compares severe accident data (those resulting in five or more fatalities) between different energy sources, both for immediate fatalities and for delayed (latent) fatalities, recognising that the latter data are often more difficult to estimate. Finally, it uses results of opinion surveys to analyse public confidence in nuclear operations and how this is correlated with trust in legislation and regulatory systems. It has been written for a general audience.

The Supply of Medical Radioisotopes

An Economic Study of the Molybdenum-99 Supply Chain

ISBN 978-92-64-99149-1. 128 pages. Free: paper or web.

An Economic Study of the Molybdenum-99 Supply Chain: Summary

ISBN 978-92-64-99150-7. 36 pages. Free: paper or web.

The reliable supply of molybdenum-99 (^{99}Mo) and its decay product, technetium-99m (^{99m}Tc), is a vital component of modern medical diagnostic practices. Disruptions in the supply chain of these radioisotopes – which cannot be effectively stored – can suspend important medical testing services. Unfortunately, supply reliability has declined over the past decade, due to unexpected or extended shutdowns at the few ageing, ^{99}Mo producing, research reactors and processing facilities. These shutdowns have created global supply shortages. This study offers a unique analysis of the economic structure and present state of the ^{99}Mo/^{99m}Tc supply chain. It finds that the shortages are a symptom of a longer-term problem linked to insufficient capital investment, which has been brought about by an economic structure that does not provide sufficient remuneration for producing ^{99}Mo or support for developing additional production and processing infrastructure. To assist governments and other decision makers in their efforts to ensure long-term, reliable supply of these important medical isotopes, the study presents options for creating a sustainable economic structure. The study will also enhance understanding amongst stakeholders of the costs of supplying ^{99}Mo and ultimately contribute to a better functioning market.

Uranium 2009: Resources, Production and Demand

ISBN 978-92-64-04789-1. 456 pages. Price: € 130, US$ 182, £ 117, ¥ 16 900.

With several countries currently building nuclear power plants and planning the construction of more to meet long-term increases in electricity demand, uranium resources, production and demand remain topics of notable interest. In response to the projected growth in demand for uranium and declining inventories, the uranium industry – the first critical link in the fuel supply chain for nuclear reactors – is boosting production and developing plans for further increases in the near future. Strong market conditions will, however, be necessary to trigger the investments required to meet projected demand. The "Red Book", jointly prepared by the OECD Nuclear Energy Agency and the International Atomic Energy Agency, is a recognised world reference on uranium. It is based on information compiled in 40 countries, including those that are major producers and consumers of uranium. This 23rd edition provides a comprehensive review of world uranium supply and demand as of 1 January 2009, as well as data on global uranium exploration, resources, production and reactor-related requirements. It provides substantive new information from major uranium production centres around the world, as well as from countries developing production centres for the first time. Projections of nuclear generating capacity and reactor-related uranium requirements through 2035 are also featured, along with an analysis of long-term uranium supply and demand issues.

Radioactive waste management

Geoscientific Information in the Radioactive Waste Management Safety Case

Main Messages from the AMIGO Project

ISBN 978-92-64-99138-5. 56 pages. Free: paper or web.

Radioactive waste is associated with all phases of the nuclear fuel cycle as well as the use of radioactive materials in medicine, research and industry. For the most hazardous and long-lived waste, the solution being investigated worldwide is disposal in engineered repositories deep underground. The importance of geoscientific information in selecting a site for geological disposal has long been recognised, but there has been growing acknowledgement of the broader role of this information in assessing and documenting the safety of disposal. The OECD/NEA Approaches and Methods for Integrating Geological Information in the Safety Case (AMIGO) project has demonstrated that geological data and understanding serve numerous roles in safety cases. The project, which ran from 2002 to 2008, underscored the importance of integrating geoscientific information in the development of a disposal safety case and increasingly in the overall process of repository development, including, for example, siting decisions and ensuring the practical feasibility of repository layout and engineering.

Radioactive Waste in Perspective

ISBN 978-92-64-09261-7. 204 pages. Price: € 48, US$ 67, £ 43, ¥ 6 200.

Large volumes of hazardous wastes are produced each year, however only a small proportion of them are radioactive. While disposal options for hazardous wastes are generally well-established, some types of hazardous waste face issues similar to those for radioactive waste and also require long-term disposal arrangements. The objective of this NEA study is to put the management of radioactive waste into perspective, firstly by contrasting features of radioactive and hazardous wastes, together with their management policies and strategies, and secondly by examining the specific case of the wastes resulting from carbon capture and storage of fossil fuels. The study seeks to give policy makers and interested stakeholders a broad overview of the similarities and differences between radioactive and hazardous wastes and their management strategies.

Radiological protection

Evolution of the System of Radiological Protection

Implementing the 2007 ICRP Recommendations – Fifth Asian Regional Conference, Chiba, Japan, 3-4 September 2009

ISBN 978-92-64-99147-7. 28 pages. Free: paper or web.

Since 2002, the NEA has been actively facilitating the detailed discussion of the evolving system of radiological protection in an Asian context. Its work in this area has included four previous conferences to discuss various International Commission on Radiological Protection (ICRP) draft general recommendations. The Fifth Asian Regional Conference on the Evolution of the System of Radiological Protection was the first in this series to be focused directly on the implementation of the new ICRP recommendations. This conference report provides very useful, practical insight into the Asian approach to implementing this new radiological protection philosophy.

Occupational Radiological Protection Principles and Criteria for Designing New Nuclear Power Plants

ISBN 978-92-64-99142-2. 112 pages. Free: paper or web.

Global demand for electricity continues to grow and numerous new nuclear power plants (NPPs) are being planned or constructed in NEA member countries. Most of these new NPPs will be of the third generation, and will be designed for as long as 80 years of operation. The successful design, construction and operation of these plants will depend broadly on appropriately implementing the lessons from experience accumulated to date. This case study introduces a policy and technical framework that may be used when formulating technical assistance and guidance for senior managers of NPPs, designers, manufacturers, contractors and authorities responsible for regulating occupational radiation exposure. It is aimed in particular at assisting design and license assessments of new NPPs. Although not targeting the needs of countries introducing nuclear power for the first time, this case study can also provide valuable input on occupational radiological protection issues for the implementation of new nuclear energy programmes.

Strategic Aspects of Nuclear and Radiological Emergency Management

Planning for Effective Decision Making; Consequence Management and Transition to Recovery

ISBN 978-92-64-99146-0. 72 pages. Free: paper or web.

The collective experience of the NEA Working Party on Nuclear Emergency Matters (WPNEM), and in particular, the experience from the International Nuclear Emergency Exercise (INEX) series, has shown that it is important to plan and to implement emergency response actions based on a guiding strategic vision. Within this context, Strategic Aspects of Nuclear and Radiological Emergency Management presents a framework of strategic planning elements to be considered by national emergency management authorities when establishing or enhancing processes for decision making, and when developing or implementing protection strategies. The focus is on nuclear or radiological emergency situations leading to complex preparedness and response conditions, involving multiple jurisdictions and significant international interfaces. The report is aimed at national emergency management authorities, international organisations and those who are seeking to improve the effectiveness of emergency management. Its goal is to provide insights into decision-making processes within existing emergency planning arrangements. It also highlights common areas of good practice in decision making. Specific areas for improvement, identified during the INEX-3 consequence management exercise, are included, particularly in support of decision making for countermeasures for consequence management and the transition to recovery.

Nuclear law

International Nuclear Law: History, Evolution and Outlook

10th Anniversary of the International School of Nuclear Law

ISBN 978-92-64-99143-9. 424 pages. Free: paper or web.

This publication commemorates the International School of Nuclear Law which is celebrating its 10th anniversary in 2010. The purpose of the publication is to provide an overview of the international nuclear law instruments, their background, content and development over the years and to present an outlook on future needs in the field of international nuclear law. Renowned experts in the nuclear law field have contributed scholarly papers on the various aspects of international nuclear law, including international institutions, protection against ionising radiation, nuclear safety, non-proliferation of nuclear weapons and safeguards, nuclear security, transport of nuclear material and fuel, management of spent fuel and radioactive waste, liability, compensation and insurance for nuclear damages, environmental protection and international trade in nuclear material and equipment. This publication is dedicated to the school's 500+ alumni from all around the world.

Nuclear Law Bulletin, No. 85

Volume 2010/1

ISSN 0304-341X. 164 pages. 2010 subscription (2 issues): € 114, US$ 150, £ 91, ¥ 16 500.

The *Nuclear Law Bulletin* is a unique international publication for both professionals and academics in the field of nuclear law. It provides subscribers with authoritative and comprehensive information on nuclear law developments. Published twice a year in both English and French, it features topical articles written by renowned legal experts, covers nuclear legislative developments worldwide and reports on relevant case law, bilateral and international agreements and regulatory activities of international organisations. Feature articles in this issue address the independence of the nuclear regulator, the European nuclear safety directive, the nuclear renaissance in Italy and the Temelín case in the European Court of Justice.

Boiling Water Reactor Turbine Trip (TT) Benchmark

Volume IV: Summary Results of Exercise 3

ISBN 978-92-64-99137-8. 276 pages. Free: paper or web.

In the field of coupled neutronics/thermal-hydraulics computation there is a need to enhance scientific knowledge in order to develop advanced modelling techniques for new nuclear technologies and concepts, as well as for current applications. Recently developed "best-estimate" computer code systems for modelling 3-D coupled neutronics/thermal-hydraulics transients in nuclear cores and for coupling of the core phenomena and system dynamics (PWR, BWR, VVER) need to be compared against each other and validated against results from experiments. International benchmark studies have been set up for that purpose. The present volume is the last in a series of four and summarises the results of the third benchmark exercise, which analyses a turbine trip (TT) in a BWR in its entirety, involving pressurisation events in which the coupling between core phenomena and system dynamics plays an important role. Exercise 3 also analyses four extreme scenarios which allowed participants to test the capabilities of their code(s) in terms of coupling and feedback modelling. The data made available from experiments carried out at the plant make the present benchmark particularly valuable. The data used are from events at the Peach Bottom 2 reactor (a GE-designed BWR/4).

JANIS 3

A Java-based Nuclear Data Display Program – 2010

DVD. Free: paper or web.

NUPEC BWR Full-size Fine-mesh Bundle Test (BFBT) Benchmark

Volume II: Uncertainty and Sensitivity Analyses of Void Distribution and Critical Power – Specification

ISBN 978-92-64-99124-8. 44 pages. Free: paper or web.

The government of Japan and the Japanese Nuclear Power Engineering Corporation (NUPEC) have released high-quality data, based on a series of void measurements using full-size mock-up tests for boiling water reactors (BWRs), with the aim of assisting the scientific community to advance its understanding of the two-phase flow (a system containing both gas and liquid) in BWR fuel bundles. An international benchmark, based on the NUPEC data, has been defined to encourage advancement in the development of two-phase flow theory which is of importance, for example, for the evaluation of the safety margins in a reactor. The benchmark specifications are being designed so that it systematically assesses and compares the capability of the numerical models to predict detailed void distributions and critical powers. This report is the second in a series and describes the specification of the sensitivity and uncertainty analysis exercises undertaken to assess the accuracy of the results obtained when modelling basic thermal-hydraulics in a single channel relative to void fraction and critical power. Further volumes will be published, with a synthesis showing to what extent the most recent models are capable of predicting two-phase flow in BWR fuel bundles.

VVER-1000 Coolant Transient Benchmark

Phase 2 (V1000CT-2) Summary Results of Exercise 1 on Vessel Mixing Simulation

ISBN 978-92-64-99152-1. 144 pages. Free: paper or web.

Recently developed best-estimate computer code systems for modelling 3-D coupled neutronics/thermal-hydraulics transients in nuclear reactors need to be validated against results from experiments and compared with each other to help understand how the different modelling methods adopted affect the accuracy of the simulation. This benchmark was set up for that purpose. This report is one of a series covering benchmarks designed to test modelling methods for a range of transient scenarios in a VVER-1000 reactor. In this case, the transient is initiated by isolation of one steam generator causing asymmetric loop heat-up. The benchmark is based on experiments conducted at the Kozloduy nuclear power plant.

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